United States Patent

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[54] **GATE VALVE FOR HOPPER CARS OR THE LIKE**
8 Claims, 6 Drawing Figs.

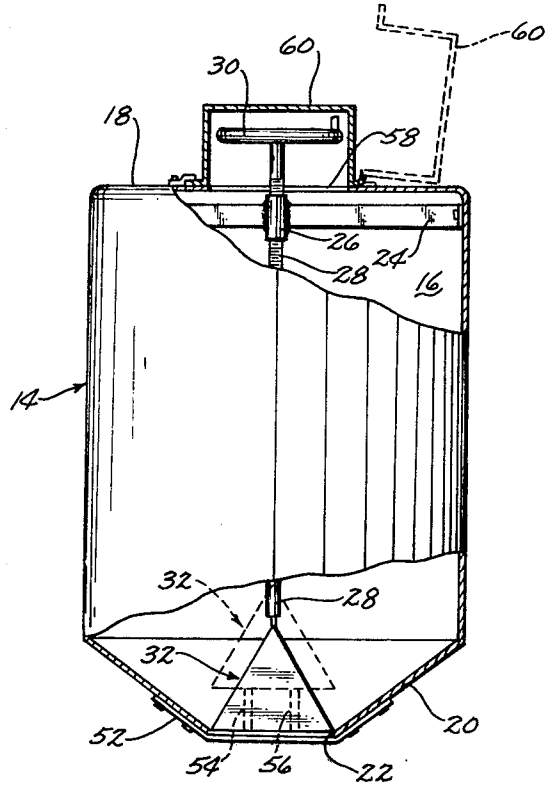
[52] **U.S. Cl.** **251/144,**
222/504, 510; 105/280, 358, 360
[51] **Int. Cl.** **B61d 7/26,**
B61d 7/28
[50] **Field of Search** 251/144,
86, 62; 222/510, 504; 105/247, 248, 249, 280,
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[56] **References Cited**
UNITED STATES PATENTS

635,442	10/1899	Merrill	251/144
2,513,450	7/1950	Carlisle, Sr.	105/360X
3,065,949	11/1962	De Flees	251/144X
3,215,398	11/1965	Etlis et al.	251/144X

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ABSTRACT: A gate valve for a material storage container such as a railway hopper car which has a discharge opening formed in the bottom area thereof. A pyramid shaped valve member is vertically movably mounted in the hopper car and has a lower end adapted to close the discharge opening of the hopper car when it is moved to its lowermost position. A vertically disposed shaft is rotatably secured to the upper end of the valve member and threadably extends upwardly through a support member and through the upper end of the car whereby rotation of the shaft will cause the valve member to be vertically moved. A modified form of the invention employs a hydraulic cylinder means for raising and lowering the valve member. A guide means is also provided to prevent undesirable lateral and rotational movement of the valve member with respect to the discharge opening.



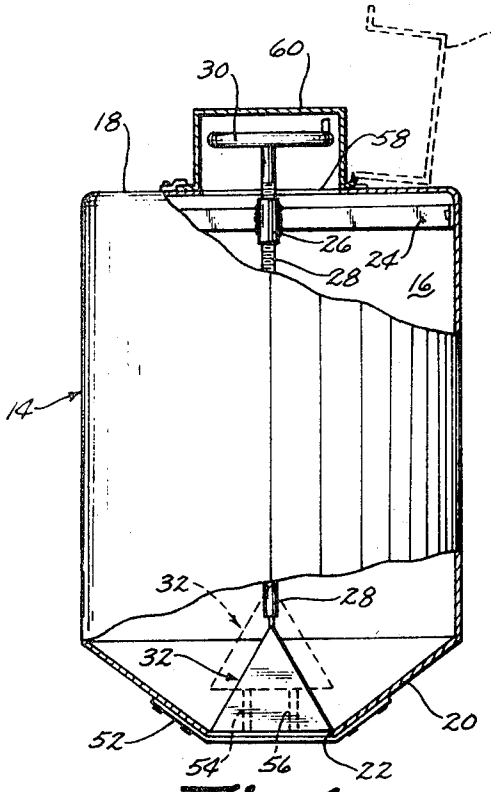


Fig. 1

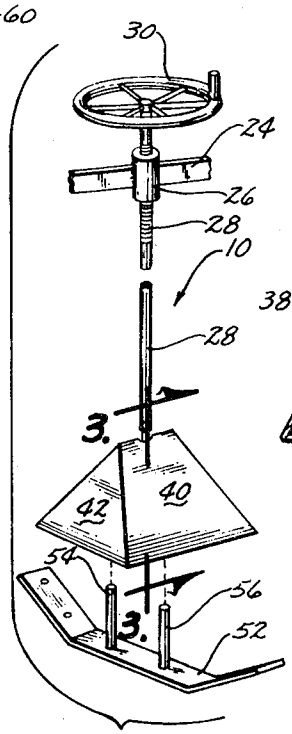


Fig. 2

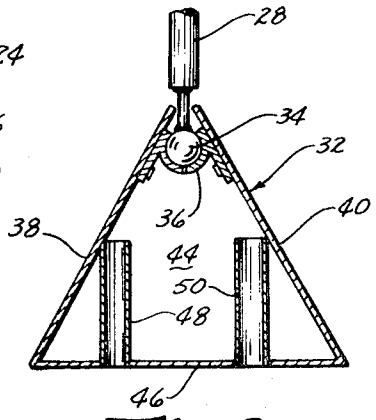


Fig. 3

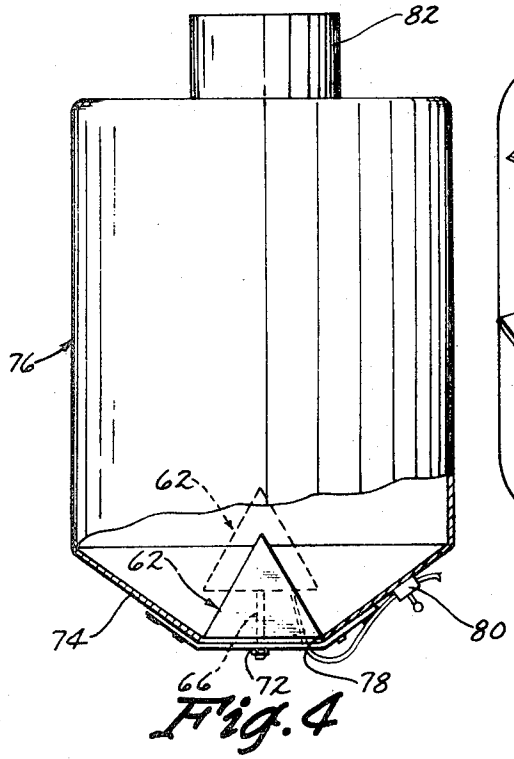


Fig. 4

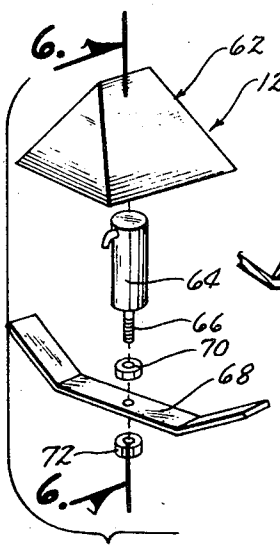


Fig. 5

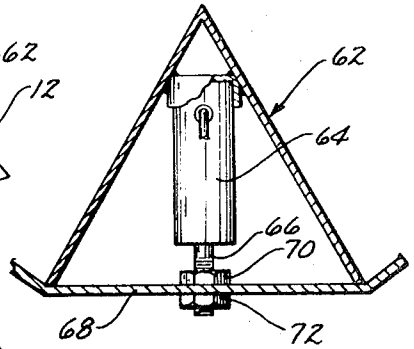


Fig. 6

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GATE VALVE FOR HOPPER CARS OR THE LIKE

Conventional railroad hopper cars are generally provided with a slide gate or the like which is adapted to close the hopper car discharge opening at the bottom thereof. The slide gates are usually manually moved by a rack and pinion gear arrangement which requires that the person crawl beneath the hopper car to operate the same. The rack and pinion gear arrangement is exposed to the atmosphere and may become jammed due to snow, sleet, ice, rocks and cinders becoming lodged thereon. It is also usually necessary to use expensive tools to open the slide gates. Further, the material material flowing from the hopper car tends to bridge due to the material first flowing from the hopper car tends to bridge due to the material first flowing from one side of the car as the slide gate is opened. The bridging may be eliminated only by expensive vibrators attached to the car or by pounding on the cars with sledges or the like.

Therefore, it is a principal object of this invention to provide a gate valve for hopper cars or the like.

A further object of this invention is to provide a gate valve for hopper cars wherein all of the parts thereof are enclosed.

A further object of this invention is to provide a gate valve for hopper which permits the vale to be opened from above the car.

A further object of this invention is to provide a gate valve for hopper cars wherein the discharge opening of the hopper car is tightly sealed.

A further object of this invention is to provide a gate valve for hopper cars which prevents the material from bridging as the same is being discharged from the car.

A further object of this invention is to provide a gate valve for hopper cars which is easily operated and which permits precise control of the material flow.

A further object of this invention is to provide a gate valve for hopper cars having means thereon for preventing a vacuum from forming in the interior of the hopper.

A further object of this invention is to provide a gate valve for hopper cars which prevents contamination of the interior of the hopper.

A further object of this invention is to provide a gate valve for hopper cars which creates a Venturi so as to increase the material flow.

A further object of this invention is to provide a gate valve for hopper cars wherein the weight of the material in the hopper aids in sealing the gate valve on its seat.

A further object of this invention is to provide a gate valve for hopper cars which is economical of manufacture, durable in use and refined in appearance.

These and other objects will be apparent to those skilled in the art.

This invention consists in the construction, arrangements, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in the claims, and illustrated in the accompanying drawings in which:

FIG. 1 is an end view of a hopper having one form of the gate valve mounted therein;

FIG. 2 is an exploded perspective view of the gate valve of FIG. 1;

FIG. 3 is an enlarged sectional view as seen along lines 3–3 of FIG. 2;

FIG. 4 is a partial end view illustrating a modified form of the gate valve mounted in a hopper;

FIG. 5 is an exploded perspective view of the gate valve of FIG. 4; and

FIG. 6 is a fragmentary sectional view as would be seen along lines 6–6 of FIG. 5.

The gate valve illustrated in FIGS. **1**, **2** and **3** is generally designated by the reference numeral **10** while the modified form of the gate valve seen in FIGS. **4**, **5** and **6** is generally designated by the reference numeral **12**. The numeral **14** refers generally to a hopper such as commonly found on railroad hopper cars or the like and including an interior **16**, upper end **18** and a tapered lower end **20** having a discharge opening **22** formed therein. Strap **24** is secured to opposite sides of the hopper **14** by any convenient means such as bolts or the like and has an internally threaded sleeve **26** secured thereto by welding or the like. A threaded shaft **28** is threadably received by the sleeve **26** and has a hand wheel **30** secured to its upper end. The lower end of shaft **28** is rotatably connected to valve member **32** by means of ball **34** being received in the socket **36** which is secured to the valve member **32**.

Valve member **32** is substantially pyramidal in shape and includes sides **38**, **40**, **42** and **44**. Valve member **32** has a bottom **46** closing the lower end thereof as best illustrated in FIG. **3**. As seen in FIG. **3**, a pair of spaced apart tubes **48** and **50** are provided in the interior of the valve member **32** and are mounted on the bottom **46** so as to register with openings formed therein. Strap **52** is secured to the lower end of the hopper **14** by bolts or the like and extends across the discharge opening **22** below the valve member **32**. Strap **52** has a pair of guide rods **54** and **56** which are secured by any convenient means and which extend upwardly thereto as illustrated in FIG. **2**. Guide rods **54** and **56** are slidably received by the tubes **48** and **50** to prevent valve **32** from becoming laterally or rotationally displaced with respect to the discharge opening **22** as the valve member **32** is raised and lowered by the rotational operation of the shaft **28**. As seen in FIG. **1**, shaft **28** extends upwardly through an access opening **58** in the upper end of hopper **14**. A hatch cover **60** is pivotally secured to the top of hopper **14** and is pivotal from the position illustrated in solid lines in FIG. **1** to the position illustrated by broken lines in FIG. **1** to provide access to the hand wheel **30** at times and to seal the access opening **58** at other times.

In operation, the hopper **14** would normally be filled with material for transportation thereof and the gate valve **10** would normally be in its lowered position illustrated by solid lines in FIG. **1** so that valve member **32** seals the discharge opening **22**. The weight of the material on the valve member **32** aids in maintaining the sealed condition of the discharge opening due to the weight of the material bearing downwardly against the sides of the valve member **32**. When the material is being transported, the hatch cover **60** would normally be closed and would seal the access opening **58** so as to prevent contamination of the material in the hopper **14**. It can be seen that all of the operating components of the gate valve **10** are enclosed which prevents foreign material such as rocks, snow, sleet, etc. from jamming or clogging the same. When it is desired to empty the material from the hopper **14**, it is simply necessary to pivot the hatch cover **60** to the position illustrated by broken lines in FIG. **1** so as to provide access to the hand wheel **30**. Rotational movement of the hand wheel **30** causes shaft **28** to be raised which causes valve member **32** to be raised from the position illustrated by solid lines in FIG. **1** to the position illustrated by broken lines in FIG. **1** as to permit the material to flow downwardly through the discharge opening **22**. Guide rods **54** and **56** and their relationship with tubes **48** and **50** respectively ensures that the valve member **32** will not be permitted to rotate during the operation of the gate valve to ensure that the valve member **32** will be maintained in position so as to again seal the discharge opening **22** upon the subsequent lowering thereof. The material flowing over the valve member **32** as it is discharging from the discharge opening **22** acts as a Venturi and creates a partial vacuum to help and enhance the flow of material from the opening **22**. As the valve member **32** is raised to open the discharge opening **22**, the pyramid shape of the valve member **32** breaks up and loosens the material that has possibly bridged therearound so that an even flow of material will flow from the four sides of the car which prevents separation of the fine particles from the larger particles. The amount of material flowing from discharge opening **22** is easily controlled through the operation of the hand wheel **30** and it can be appreciated that the hand wheel **30** and its location with respect to the hopper **14** eliminates the necessity of the person crawling beneath the

hopper **14** for any reason whatsoever. When the material has been discharged from the hopper **14**, the hand wheel **30** is rotated in a rotational direction so as to lower the valve member **32** downwardly into its seating engagement with respect to the discharge opening **22**. It can be appreciated that the valve member **32** must be lowered so as to permit the hatch cover **60** to be closed which eliminates the car from being transferred with the gate open which would permit the contamination of the interior of the hopper **14**. It should also be noted that access opening **58** will be in communication with the atmosphere when the valve member **32** is raised to prevent a vacuum from occurring within the hopper which could cause structural damage to the hopper if such access opening was not provided.

In conclusion, it can be seen that a unique gate valve has been provided which efficiently functions with a minimum amount of maintenance problems being encountered. The gate valve **10** is efficient in operation and accomplishes at least all of its stated objectives.

The gate valve **12** of FIGS. **4**, **5** and **6** functions substantially identical to the gate valve **10** of FIGS. **1—3** with the only difference being in the manner of raising and lowering the same. As seen in FIG. **6**, valve member **62** has a hydraulic cylinder **64** secured to the interior thereof. Cylinder **64** may be powered by either hydraulic fluid or air and has a threaded rod **66** slidably extending from the lower end thereof. Rod **66** is secured to strap **68** by nuts **70** and **72**. Strap **68** is secured to the tapered lower end **74** of the hopper **76** by any convenient means such as bolts or the like so as to extend across the discharge opening **78** formed in the hopper **76**. Cylinder **64** is connected to a suitable control **80** to permit the operation of the same. Hopper **76** is provided with a hatch cover **82** at the upper end thereof which may be opened to permit communication of the interior of the hopper when the material is being discharged therefrom to prevent a vacuum from forming in the interior thereof, which could cause structural damage to the hopper. When it is desired to open the gate valve **12**, it is simply necessary to operate the control **80** so as to cause the slidable extension of the rod **66** from the cylinder **64** which causes the valve member **62** to be raised with respect to the strap **68** to open the discharge opening **78**. If desired, rod **66** may be keyed with respect to the cylinder **64** so as to prevent the valve member **62** from rotating with respect to the discharge opening **78**. The gate valve **12** accomplishes all of the objectives of the gate valve **10** with the only difference being in the manner in raising and lower the valve member with respect to the discharge opening **78**.

From the foregoing it can be seen that the gate valves **10** and **12** accomplish at least all of their stated objectives.

I claim:

1. A gate valve for vertical disposed material storage container having upper and lower ends and a discharge opening formed in the lower end thereof, comprising:

a valve member of substantially pyramidal shape vertically movably mounted in the storage container,

said valve member having a lower end portion adapted to close the discharge opening when it is in its lowered position with respect to the storage container; and

drive means connected to said valve member for vertically moving it

with respect to said storage container.

2. The structure of claim **1** wherein said drive means is a vertically disposed hydraulic cylinder means positioned inside of said valve member and being connnected at its upper end to said valve member, a support member secured to the storage container at the lower end thereof and extending across the discharge opening, said hydraulic cylinder means being connected at its lower end to said support member.

3. The structure of claim **2** wherein said support member has guide means thereon and extending upwardly therefrom adapted to engage said valve member to prevent lateral and rotational displacement of the valve member with respect to the discharge opening.

4. The structure of claim **1** wherein said drive means is a vertically disposed shaft rotatably connected at its lower end to the upper end of said valve member, a support member operatively secured to the storage container and threadably receiving said shaft extending therethrough, the upper end of said shaft extending above the upper end of the storage container.

5. The structure of claim **4** wherein said shaft has a hand wheel connected to its upper end and wherein the storage container has a pivotal hatch cover adapted to extend over and enclose the hand wheel when said valve member is closing the discharge opening.

6. The structure of claim **4** wherein a support member is secured to the storage container at the lower end thereof and extends across the discharge opening, said valve member and said support member having guide means thereon for preventing lateral and rotational displacement of the valve member with respect to the discharge opening.

7. The structure of claim **4** wherein said shaft has a ball means at its lower end, said ball means being rotatably received by a pocket at the upper end of said valve member.

8. A gate valve for a vertically disposed material storage container having upper and lower ends and a discharge opening formed in the lower end thereof, comprising:

a valve member vertically movably mounted in the storage container, said valve member having a lower end portion adapted to close the discharge opening when it is in its lowered position with respect to the storage container;

drive means connected to said valve member for vertically moving it with respect to said storage container; and

said drive means being a vertically disposed hydraulic cylinder means positioned inside of said valve member and being connected at its upper end to said valve member, a support member secured to the storage container at the lower end thereof and extending across the discharge opening, said hydraulic cylinder means being connected at its lower end to said support member.