A railway hopper car outlet for either gravity or pneumatic unloading includes an inclined wedge shaped gate, which is mounted on upper and lower rollers for limiting tilting of the gate during opening. A pneumatic discharge tube extends along the lower edge of the gate in a direction perpendicular to the direction of the movement of the gate so that the gate in its closed position guides the lading toward the pneumatic tube. The pneumatic tube has a rotatable valve adapted to open at and above the lower edge of the gravity gate for receiving lading. For gravity operation, the rotatable valve is left closed and the gate only is moved longitudinally. For pneumatic operation, the gate is left closed and only the valve is opened.

15 Claims, 11 Drawing Figures
RAILWAY HOPPER CAR OUTLET

BACKGROUND OF THE INVENTION

Gravity pneumatic outlets have been provided heretofore, but generally they require opening the gate during pneumatic operation. Since the gate is opened by means of a rack and pinion assembly, considerable work is entailed. It is one of the objects of this invention to provide an outlet in which operation in either the gravity mode or the pneumatic mode does not require manipulation of the mechanism of the other mode. That is, for the gravity mode only the gravity gate is open, and for the pneumatic mode only the pneumatic valve is open.

Another object of the invention is to provide a hopper outlet in which the gravity gate is mounted in an inclined plane and a rotatable pneumatic tube extends in a direction perpendicular to the direction of movement of the gate and is positioned adjacent the leading edge of the gate, so that the inclined gate directs the lading downwardly to the pneumatic tube for discharge without opening of the gate.

SUMMARY OF THE INVENTION

The invention provides a gravity pneumatic outlet for a railway car hopper having an inclined wedge-shaped gate adapted to be moved by racks and pinions to open the gate for gravity unloading. A pneumatic tube extends transversely of the car along the leading edge of the gate when the gate is in its closed position. The pneumatic tube includes a rotatable valve which is opened for pneumatic unloading. During pneumatic unloading, the lading is directed downwardly along the inclined gate into the pneumatic tube. The gate is mounted on a series of nylon rollers on the bottom side thereof, and at least a pair of rollers on an upper side thereof for preventing tilting of the date during opening and closing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an elevation of a covered hopper railway car having hopper outlets for unloading the car by gravity or pneumatically.

FIG. 2 is an end elevation of an outlet structure according to the invention.

FIG. 3 is a top plan view of the outlet structure.

FIG. 4 is a side elevation of the outlet structure.

FIG. 5 is a sectional view of the outlet showing the gate in open position in dashed lines.

FIG. 6 is a section taken along the line 6—6 of FIG. 5.

FIG. 7 is a sectional view showing the rack and pinion.

FIG. 8 is a sectional view through the pneumatic tube.

FIG. 9 is an enlarged section of the leading end of the gate and adjacent structure.

FIG. 10 is a section partly broken away of one end of the pneumatic tube.

FIG. 11 is a section taken along line 11—11 of FIG. 10.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1 of the drawing, a covered railway hopper car 10 has a plurality of hoppers 12. A truck assembly 14 is arranged at each end of car 10. Spaced along the top of the car are a series of hatch covers 16 for loading the car with granular or pulverulent material, such as grain, cement, sugar, etc. Hopper sheet 18 slopes downwardly to outlets 20 supported on flange 22. Outlet 20 includes slope sheets 24, 26, side walls 28, gravity gate 30, and pneumatic discharge tube 32.

Gate 30 has an upper smooth plate 34 which is effectively a continuation of slope sheet 24. Leading end 36 of plate 34 is adapted to abut stop 38 and is provided with an inclined face 40 for closely engaging a similarly inclined face 42 of stop 38, as shown in FIG. 9. Angle brace 44 is fastened to the bottom of plate 34 and extends across end 36 thereof. Resilient seal 46 fixed to brace 44 is adapted to engage stop 38 and form a tight seal therewith along the entire length of end 36 of gate 30. At its upper end, top plate 34 presses against seat 48 (FIG. 7) mounted on slope sheet 24, and turns downwardly at 50. On the bottom side, gate 30 has gear racks 54 at each side thereof. Pinions 56 on shaft 58 engage racks 54. Each rack is supported by a plate 60 and a bracket 62 having a flange 64 extending outwardly. A series of nylon rollers 66 on both sides of pinions 56 engage the bottom of each flange 64, and a roller 68 is located above the flange for supporting and preventing tilting of the gate during its movement. Pinions 56 are mounted on shaft 58 having fitting 72 for turning the shaft and pinions. A locking lever assembly is provided, including a lever 74 and pawls 76 adapted to engage the pinions and thereby hold the gate locking in its closed position during transit.

Pneumatic discharge tube 32 may be of any suitable design. As shown, it includes inner rotatable tube 78 having an opening 80 through which the lading enters it. Tube 78 extends into cylinders 82 fixed to walls 28 at each side of the outlet. Rotatable ring 86 is mounted on the end of each cylinder and has a seal 88, which end cap 90 abuts. The end cap is supported by a slotted bracket 92. When placed in its closed position, cap 90 is fastened to bracket 92 by means of bolt 93 and nut 94, after being drawn tightly against seal 88 by captive wing screws 96. Tube 78 is adapted to be rotated by means of handles 98 which turn ring 86. Ring 86, as shown in FIG. 11, is connected to tube 78 by bolts 100, which move through slots 102 cut in cylinders 82.

The operation of the apparatus just described is as follows: Granular lading in a hopper can be unloaded by opening one hatch cover 16 of each hopper, loosening screws 96 and removing one or both caps 90, connecting a suction hose (not shown) to tube 78 having a lowered pressure therein, and turning tube 78 to its open position by means of handles 98. The granular material moves through opening 80 of tube 78, being directed into opening 80 by sloping surface 34 of closed gate 30, and then moves through tube 78 and the suction tube. Each hopper is thus unloaded in turn.

For unloading by gravity, tube 78 remains in its closed position and gate 30 is opened by turning lever 74 to unlock pawls 76 and then rotating pinions 56 by turning fitting 72 on shaft 58. As gate 30 is opened it moves away from the lading, so that the weight of the lading does not hold the gate frictionally against opening. The lading then falls through the open gate. Upper wall 34 of the gate has a sufficient slope to enable lading on it to slide or move down through the gate.

WHAT IS CLAIMED IS:

1. A hopper discharge outlet for gravity or pneumatic discharge of lading comprising:
opposed sloping walls extending downwardly from
said hopper; a pneumatic discharge conduit affixed
to the lower portion of a first one of said sloping
walls; said pneumatic discharge conduit having a
pneumatic discharge opening extending at least
partly across the width of said outlet communicat-
ing with the inside of said hopper; a rotatable tube
mounted within said pneumatic discharge opening
in the pneumatic discharge conduit for opening
and closing said pneumatic discharge conduit, and
regulating lading discharged through said conduit;
a second one of said sloping walls opposite said first
sloping wall, having a stationary portion and defin-
ing a gravity discharge opening between the pne-
umatic discharge conduit and said stationary por-
tion, said gravity discharge opening being closed by
a wedge-shaped gate affixed at an incline to at least
one of the other of said walls with the thin portion
of the wedge being at the lower end of said incline,
said gate having flanges at each side thereof, and
rollers mounted on said outlet engaging said
flanges for supporting said gate and facilitating
moving the same between open and closed posi-
tions; in the closed position said gate closing said
gravity discharge opening with the upper surface of
said gate defining a vertical incline; means to move
said gate between said open and closed positions
whereby in the open position said hopper may be
discharged by gravity while the opening in said
pneumatic discharge conduit remains closed, and
whereby said outlet is adapted to discharge a lading
pneumatically when said pneumatic discharge con-
duit communicates with the inside of said hopper
while said gravity discharge opening remains
closed, the lading passing from said hopper to said
outlet and being at least partly directed by said ver-
tical incline of said gate to the opening in the pne-
umatic discharge conduit.

2. A hopper outlet according to claim 1 wherein said
gate is wedge-shaped along substantially the entire gate
length.

3. A hopper outlet according to claim 1 wherein said
wedge-shaped gate engages stops mounted adjacent
said pneumatic discharge conduit in closed position.

4. A hopper outlet according to claim 3 wherein a
seal is mounted on said gate and wherein said seal en-
gages said stop when said gate is in closed position.

5. A hopper outlet according to claim 4 wherein the
tip portion of said gate and said stop have cooperating
inclined surfaces when said gate is in closed position.

6. A hopper outlet according to claim 1 wherein rol-
ers are mounted above and below said flanges and en-
gage said flanges when said gate is moved between
open and closed positions.

7. A hopper outlet according to claim 1 wherein lock
means are provided to hold said gate in closed position.

8. A hopper outlet according to claim 1 wherein said
gate is moved between open and closed positions by
means of a rack and pinion.

9. A hopper outlet according to claim 8 wherein
when said gate is in closed position lock means engage
said pinion to hold said gate in closed position.

10. A hopper discharge outlet for gravity or pneu-
matic discharge of lading comprising:

Opposed sloping walls extending downwardly from
said hopper; a pneumatic discharge conduit affixed
to the lower portion of a first one of said sloping
walls; said pneumatic discharge conduit having a
pneumatic discharge opening extending at least
partly across the width of said outlet communicat-
ing with the inside of said hopper; a rotatable tube
mounted within said pneumatic discharge opening
in the pneumatic discharge conduit for opening
and closing said pneumatic discharge conduit, and
regulating lading discharged through said conduit;
a second one of said sloping walls opposite said first
sloping wall, having a stationary portion and defin-
ing a gravity discharge opening between the pne-
umatic discharge conduit and said stationary por-
tion, said gravity discharge opening being closed by
a wedge-shaped gate affixed at an incline to at least
one of the other of said walls with the thin portion
of the wedge being at the lower end of said incline,
said gate having flanges at each side thereof, and
rollers mounted on said outlet engaging said
flanges for supporting said gate and facilitating
moving the same between open and closed posi-
tions; in the closed position said gate closing said
gravity discharge opening with the upper surface of
said gate defining a vertical incline; stop means
mounted adjacent or upon said pneumatic dis-
charge conduit which are engaged by said gate in
closed position; rack and pinion means to move
said gate between said open and closed positions
whereby in the open position said hopper may be
discharged by gravity while the opening in said
pneumatic discharge conduit remains closed, and
whereby said outlet is adapted to discharge a lading
pneumatically when said pneumatic discharge con-
duit communicates with the inside of said hopper
while said gravity discharge opening remains
closed, the lading passing from said hopper to said
outlet and being at least partly directed by said ver-
tical incline of said gate to the opening in the pne-
umatic discharge conduit.

11. A hopper outlet according to claim 10 wherein
rollers are mounted above and below said flanges and
engage said flanges when said gate is moved between
open and closed positions.

12. A hopper outlet according to claim 10 wherein a
seal is mounted on said gate and wherein said seal en-
gages said stop when said gate is in closed position.

13. A hopper outlet according to claim 10 wherein
said gate is wedge-shaped along substantially the entire
gate length.

14. A hopper outlet according to claim 10 wherein
lock means are provided to hold said gate in closed
position.

15. A hopper outlet according to claim 10 wherein
when said gate is in closed position lock means engage
said pinion to hold said gate in closed position.