Jan. 11, 1955 E. O. LUNDE 2,699,126

AUTOMATIC VALVE FOR CONTROLLING THE FLOW OF AIR TO PNEUMATIC OPERATING MECHANISM IN RAILWAY DUMP CARS

Filed July 7, 1949 3 Sheets-Sheet 1

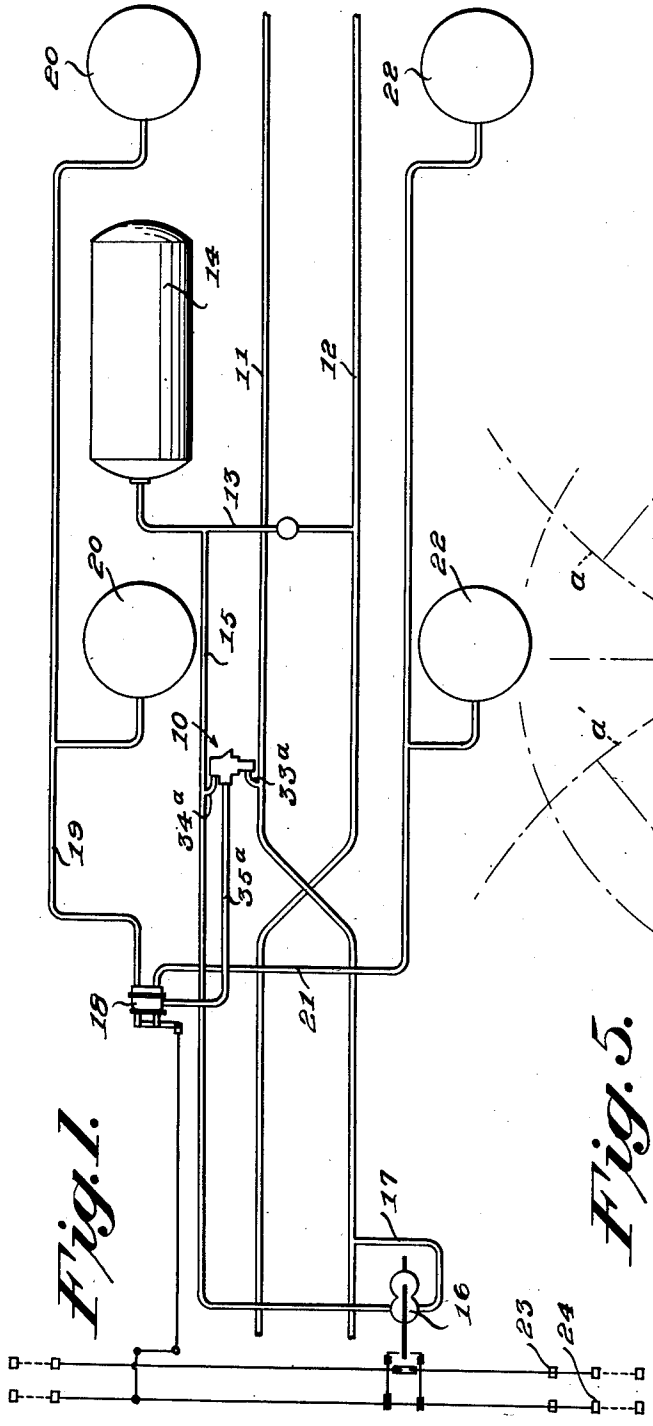


Fig. 1.

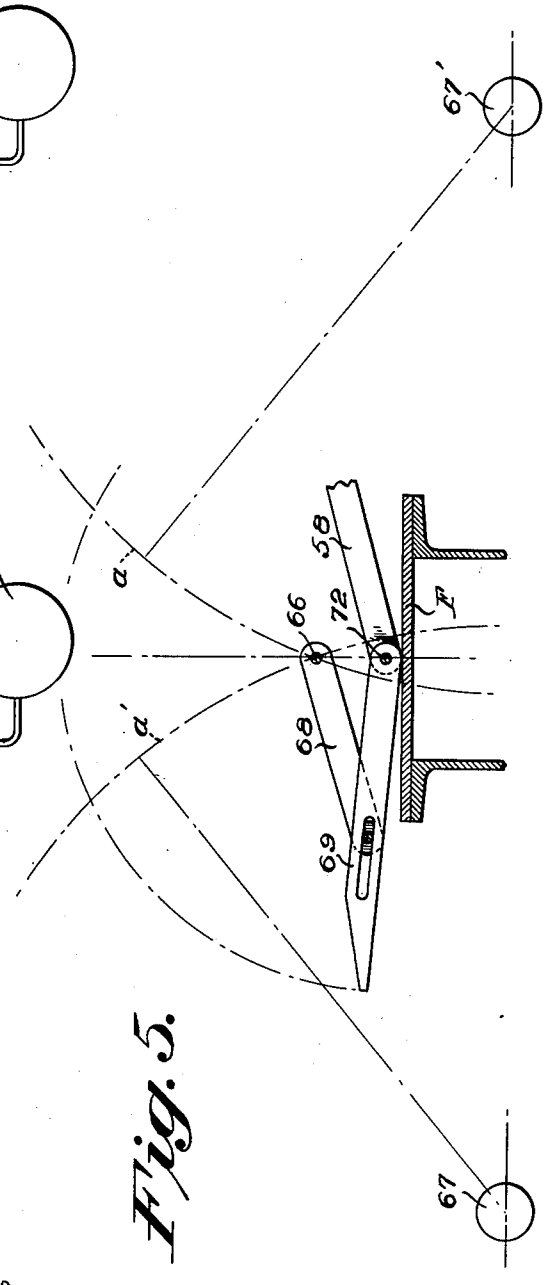


Fig. 5.

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Filed July 7, 1949 3 Sheets-Sheet 2

Fig. 2.

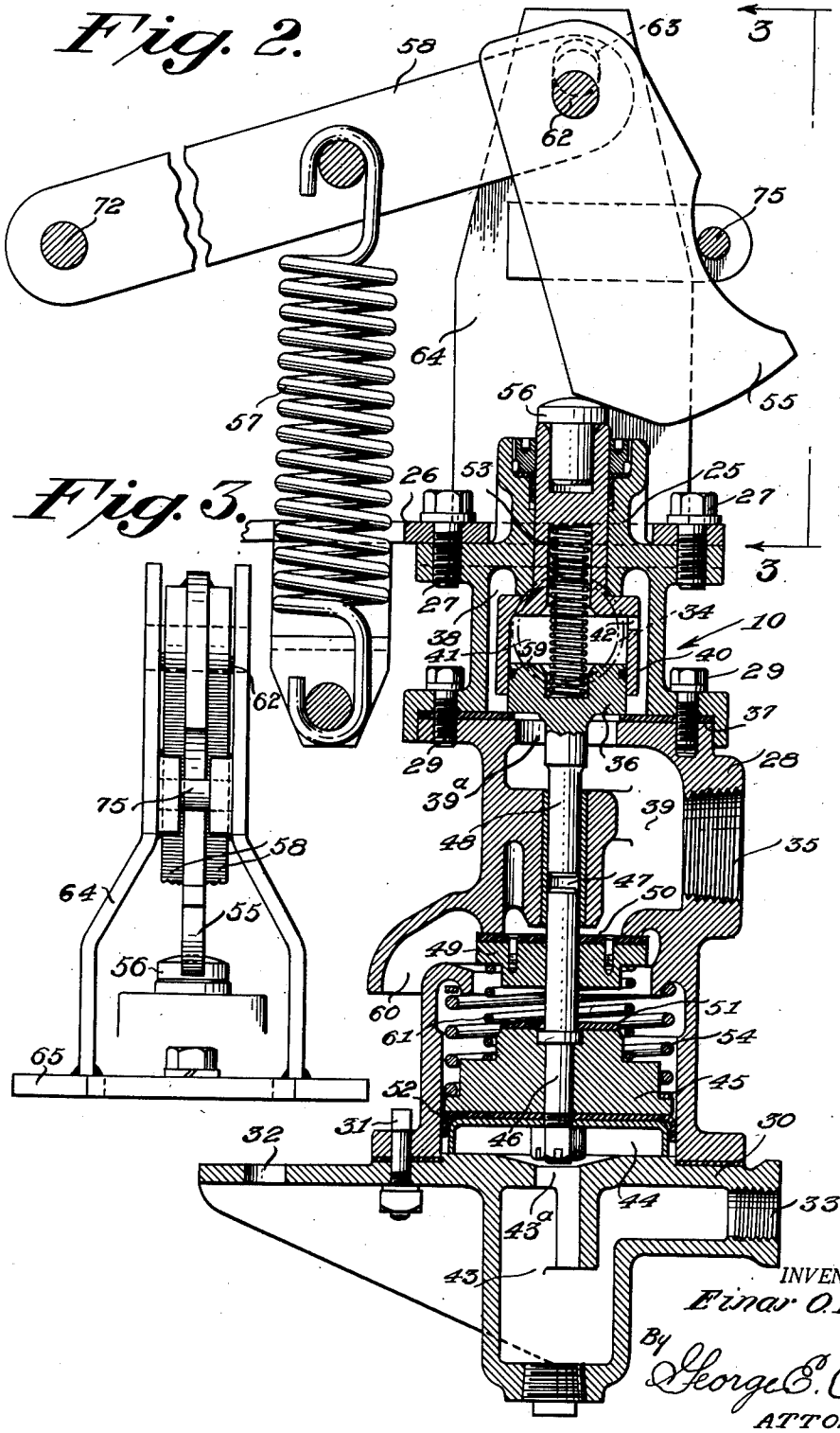


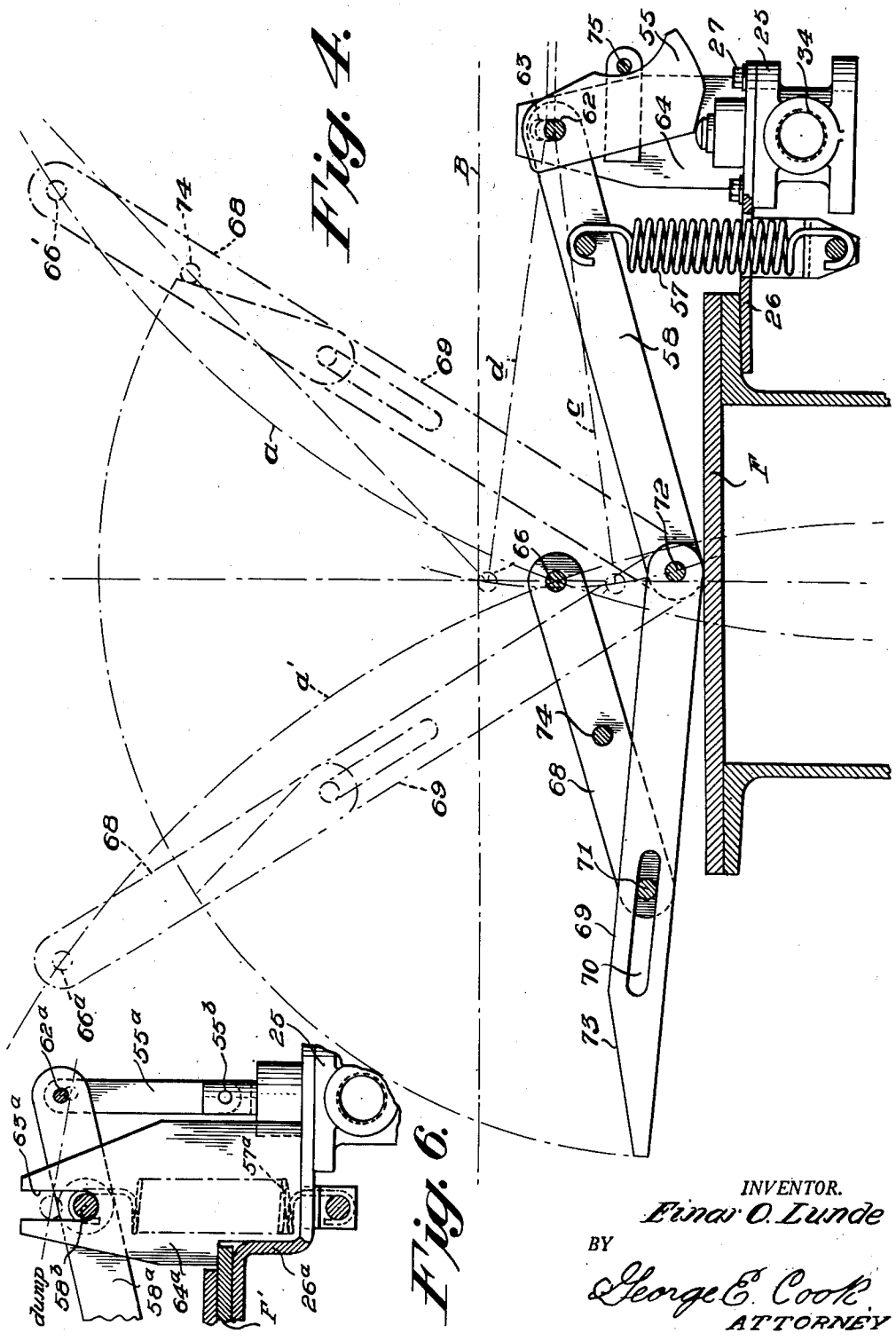
Fig. 3.

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AUTOMATIC VALVE FOR CONTROLLING THE FLOW OF AIR TO PNEUMATIC OPERATING MECHANISM IN RAILWAY DUMP CARS

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Application July 7, 1949, Serial No. 103,476

9 Claims. (Cl. 105—273)

This invention relates to an automatic valve for controlling the flow of air to pneumatic operating mechanism in railway dump cars.

The invention more particularly pertains to an improved automatic valve adapted for operative disposition in a railway dump car pneumatic control system wherein an automatic valve is disposed between an operating air conduit and a directional valve which determines the flow or air to pneumatic cylinders at one or the other side of a dump car.

The automatic valve is operative to provide flow of air to the directional valve through air pressure from the operating conduit.

In structures of this kind, the automatic valve is constantly in communication with an air supply reservoir, and if no provision is made to close the communication in any way between the automatic valve and directional valve or the automatic valve and reservoir, air will be supplied to the operating dump cylinders throughout the entire range dumping operation.

In structures of this kind provision has heretofore been made to stop the flow of air to the cylinders by means of a separate cut-out cock operated automatically by a special linkage arrangement thereby requiring a part accessory to the automatic valve to perform this function.

A primary object of the present invention is to provide an improved automatic valve having inorcporated therein a cut-off valve automatically operative at a predetermined point in the range of car body dumping movement and automatically restorable for normal functioning of the automatic valve at the same point in said range of movement upon return of the car body from its dumping position.

Other objects of the invention are the provision of means operatively associated with the cut-off valve for effecting said automatic operation and also for controlling the valve in relation to its seat.

Other objects and advantages of the invention will become apparent in the course of the following detailed description, taken in connection with the accompanying drawings, wherein:

Fig. 1 is a more or less diagrammatic view showing the reservoir, dump cylinders and air conduits associated with a railway dump car, and which includes the improved automatic valve in accordance with the present invention.

Fig. 2 is a central vertical sectional view of the improved automatic valve in accordance with a preferred structural embodiment thereof.

Fig. 3 is an elevational view of the upper portion of Fig. 2 as observed in the plane of line 3—3 in the direction of the arrows.

Fig. 4 is a transverse vertical section through the central longitudinal frame member of a railway dump car and showing the linkage operatively associated with the automatic valve.

Fig. 5 is a fragmental view similar to Fig. 4 but on a smaller scale and showing in particular the trunnions about which the car body rocks to either side thereof in a dumping operation.

Fig. 6 is a fragmental view corresponding to the right hand portion of Fig. 4 and disclosing a modified form of cut-off valve operating means.

Referring now in detail to the drawings:

The railway car pneumatic dumping apparatus is fully disclosed in my co-pending application, Serial No. 77,655, filed February 21, 1949, now Patent No. 2,647,471, issued

August 4, 1953, and which is generally indicated herein in Fig. 1. Such apparatus generally embodies the automatic valve **10** having communication with the engineer controlled operating conduit **11**, the cylinder charging conduit **12** communicating through conduit **13** with the reservoir **14**, a conduit **15** extending from the reservoir and communicating with the automatic valve **10** and the manual control valve **16** which in turn communicates with the operating conduit **11** through the conduit **17**.

The said apparatus further includes a directional valve **18** for selective distribution of air to the dumping cylinders **20** at one side of the car through conduit **19** or to the dumping cylinders **22** at the other side of the car through conduit **21**, and the automatic valve **10** is in communication with the directional valve through conduit **35a**.

The apparatus further includes a manual control valve operating handle **23** and a directional valve operating handle **24** with interposed linkages as is fully disclosed in said co-pending application.

The manual control valve **16** is fully disclosed in said co-pending application and the directional valve **18** is fully disclosed in my co-pending application, Serial No. 82,810, filed March 22, 1949, now Patent No. 2,647,536, issued August 4, 1953, and the present application is more particularly concerned with the automatic valve **10** which is disclosed in operative association with the manual control valve **16** and directional valve **18** in said co-pending application, Serial No. 77,655.

The improved automatic valve as shown in Fig. 2 includes a top section **25** to which is secured a clip **26** by means of bolts **27**, and the said clip is adapted for suitable connection with the upper part of the central car frame member F, as is indicated in Fig. 4.

The valve further includes an intermediate section **28** to which said top section **25** is secured by bolts **29**, and a bottom section **30** to which said intermediate section is releasably secured by T-bolts **31**. The bottom section **30** includes a flange portion provided with an aperture **32** for receiving a suitable securing element (not shown) engageable with the lower portion of the frame member F.

The bottom valve section **30** is provided with a threaded inlet **33** for connection with a conduit **33a** in communication with the operating conduit **11**, the top section **25** is provided with an opening **34** which receives conduit **34a** which is in communication with conduit **15**, and the intermediate section **28** is provided with a threaded opening **35** which receives the conduit **35a** extending into communication with the directional valve **18**.

A main valve **36** normally engages a seat **37** which is disposed between sections **25** and **28** and retained by said bolts **29**. An air chamber **38** is provided in section **25**, and an air chamber **39** is provided in section **28** and which may have communication through an opening **39a** in the top wall of section **28**, but which are sealed from each other when the main valve **36** is in contact with seat **37**. The chamber **38** is in communication with conduit **34a** and the reservoir **14** and the chamber **39** is in communication with conduit **35a** and the directional valve **18**.

A cut-off valve **40** is shown in its normal open position and which is of inverted cup form and telescopically engages the main valve **36**.

It is to be noted that the chamber **38** is at all times under pressure of the air from the reservoir **14** and that it is at all times in communication with a chamber **41** within the cut-off valve **40** by means of a port **42** in the cylindrical wall of the cut-off valve **40**.

When the dumping operation is controlled from the locomotive, air under pressure is admitted to the operating line **11** through which it flows into chambers **43** and **44**, the former of which is in bottom section **30**, and the latter of which is disposed above said section and communicates with the former through an opening **43a** in the top wall of the bottom section.

The air pressure in chamber **44** will cause the piston **45** and its associated piston rod **46** to move upwardly until the clearance **47** is taken up, whereupon further movement of rod **46** will urge rod **48** upwardly and thereby lift the main valve **36** from its seat **37** thus permitting

passage of air under pressure from the chamber **38** into chamber **39**, and accordingly into the directional valve **18**, as well as to the selected dump cylinders **20** or **22**.

The movement of piston **45** is limited upon its engagement with the exhaust valve **49** and in which position the seats **50**, **51** and **52** serve to prevent any leakage of air to the atmosphere.

The pressure in the operating conduit **11** will hold the piston **45** and thus hold the main valve **36** in open position until the operating conduit pressure is sufficiently reduced to allow the closing springs **53** and **54** to return the valve **36** and piston **45** to their normal positions.

With the main valve **36** in open position, air under pressure will continue to flow into the dump cylinders **20** or **22** until the car body has been tilted to a point near the end of the maximum tilt provided. At this point, the linkage, later referred to, will rotate the cam **55** which through its engagement with button **56** will urge the cut-off valve **40** to its seat **37**.

This action will cut off the flow of air from the chamber **38** to the chamber **39** even though the main valve **36** is in open position.

As the car body returns to its normal position, the linkage referred to will accumulate sufficient slack such that the cam control arm spring **57** will act to return the cam **55** and the attached cam arm **58** to their original normal positions. This action will enable the cut off valve **40** to return to its normal open position and since the main valve **36** is still open, the air will again flow from chamber **38** into chamber **39** and into the directional valve **18** and dump cylinders **20** or **22**.

It is to be particularly noted that the chambers **38** and **41** which are in communication through port **42**, are under reservoir air pressure at all times.

This feature of maintaining air pressure in chamber **41** plus a slight assist from spring **53** provides the required energy for forcing the cut-off valve **40** to its open position after the cam **55** has been returned to the corresponding position. A sealing ring **59** is provided to aid in maintaining the air pressure in the chamber **41**.

As the air pressure in the operating conduit **11** becomes exhausted in order to return the car body to its normal position, the spring **54** will return the piston **45** to its normal position and the air in the dump cylinders will force the exhaust valve **49** to open so that the air may escape to the atmosphere through the exhaust port **60**. It should be noted that the exhaust valve **49** is held on its seat by a very light spring **61**. This feature will seal the chamber **39** from atmospheric conditions when the automatic valve is not in use but at the same time the spring **61** is of such capacity that a predetermined low pressure in chamber **39** will always effect opening of valve **49** so as to prevent any undesirable accumulation of air pressure in the dump cylinders due to leakage at the main valve **36**.

With respect to the cut-off valve **40**, it is essential that it have a positive sealing action while avoiding excessive pressure on the valve seat **37** to an extent as to effect damage thereof. Accordingly, the spring **57** in normal position has capacity to hold the fulcrum pin **62** in the position shown in solid lines in Fig. 2 while the cam **55** is rotating to an extent sufficient to cause the seating of the cut-off valve **40**. When the cam **55** has been rotated to the point where the valve **40** is seated, the additional rotation of the cam will cause the pin **62** to rise in the slot **63** provided in the support **64** thereby causing a slight extension of spring **57**. The amount of rise caused by cam **55** is predetermined and the spring **57** is designed so as to hold the pressure of valve **40** on its seat **37** within reasonable limits and still insure a positive seating of the valve.

The support **64** is shown in Fig. 3 as a view at right angles to that of Fig. 2, and such support includes a base **65** through which said bolts **27** extend and which carries the clip **26**.

The linkage for effecting operation of the cam **55** is operated upon rotation of the car body in one direction or the other about fulcrums adjacent opposite sides of the body, and such linkage is illustrated in Figs. 4 and 5.

As shown, a pin **66** is supported by the car body in a central vertical longitudinal plane thereof, and such pin is accordingly swingable in arcs *a* and *a'* about the fulcrums **67'** and **67** (Fig. 5), when the car body is being tilted by the cylinders **20** or **22** and the associated pistons connected with the car body.

Parallel links **68** have corresponding ends thereof pivotally connected to pin **66**, and the opposite ends of the links are connected to a link **69** which is provided with an elongated slot **70** in which a pin **71** carried by links **68** is disposed. The slot **70** is disposed adjacent one end of link **69** and the opposite end thereof is pivotally connected by a pin **72** to the end of the cam arm **58** opposite its connection with the cam **55**.

When the car body is being tilted, as to the right, the pin **66** will move to the position **66'** at which point the links **68** and **69** will be in alignment with the sloped end surface **73** of link **69** engaged with a pin **74** carried by links **68**. The links will act as one straight link from this point on to the end of travel of pin **66**, whereby the cam arm **58** will be actuated by the linkage with the resulting closing of the cut-off valve **40** due to rotation of the cam **55**.

When the car body is returning to its normal position, as soon as any slack occurs in the linkage, the cam arm spring **57** will cause the cam **55** to rotate to its normal position, thereby enabling the cut-off valve **40** to be automatically re-set wherein the cam engages a stop pin **75** carried by the support **64**.

As will be noted in Fig. 4, the pivotal connection **72** between link **69** and cam arm **58** is movable to different vertical positions beneath the bottom B of the car floor. The dot-and-dash line *c* indicates the position of arm **58** when the cut-off valve is closed and the dot-and-dash line *d* indicates the position of arm **58** at the dumping position of the car body. The linkage described is effective also when the car body is dumped to the left wherein pin **66** will be in the position **66^a** when the links **68** and **69** are aligned.

While the cut-off valve operating means has above been disclosed as embodying a cam, the invention is not necessarily limited thereto inasmuch as other means may be disposed between the arm **58** and the cut-off valve for operating same without departing from the fundamental features of the instant invention.

Thus in Fig. 6 is illustrated another of several possible deviations from the cam structure of Fig. 4.

As indicated in Fig. 6, the support **64^a** is connected to the center car frame member F' by means of a clip **26^a**. According to this embodiment, arms **58^a** extend beyond the support **64^a** and the arm is pivotally connected as at **62^a** to the upper end of a link **55^a** whose lower end is pivotally connected as at **55^b** to the upper end of the cut-off valve stem.

In this modified embodiment the arms **58^a** are provided with a floating pivot pin **58^b** which is normally held at the bottom of a slot **63^a** opening through the top of the support **64^a**, as by means of a spring **57^a** corresponding to the spring **57** in Fig. 4. In this figure the dot-and-dash line indicates the dump position and is so indexed on the drawing.

The operation of this form of the cut-off valve operating means is similar to that of Fig. 4, the link **55^a** in Fig. 6 operating the cut-off valve in place of the cam **55** in Fig. 4 and the spring **57^a** having the same function as spring **57** in Fig. 4.

While I have disclosed my invention in accordance with a single specific structural embodiment thereof, such is to be considered as illustrative only, and not restrictive, the scope of the invention being defined in the sub-joined claims.

What I claim and desire to secure by U. S. Letters Patent is:

1. In a railway dump car having a body swingable about a trunnion adjacent each side thereof, pneumatic operating means for swinging said body toward either side thereof including an operating cylinder adjacent each side, a directional valve for selectively controlling the flow of air to the cylinders, an automatic valve structure having a chamber in communication with an air supply reservoir and a chamber in communication with said directional valve, a main valve controlling communication between said chambers, and an operating air conduit communicating with the automatic valve structure and operative upon said main valve to establish communication between said chambers for flow of air to said directional valve; the improvement which comprises a cut-off valve in said automatic valve structure for controlling communication between said chambers, and means operative upon swinging movement of the body for operat-

ing said cut-off valve when the body is near its point of maximum swing.

2. The structure according to claim 1 wherein said main valve is cylindrical and wherein said cut-off valve includes an inverted cup shaped member telescoping said cylindrical valve, and said cup shaped member being normally spaced from a valve seat between said chambers and engageable by said cylindrical valve, and said last means operating to move said cup shaped member into engagement with said seat to close communication between said chambers when said cylindrical valve is raised from its seat.

3. The structure according to claim 2 wherein said cut-off valve is normally maintained in open position by means of a spring, and a port in the wall of said cup shaped member for admitting air thereinto from said first chamber whose pressure assists said spring in maintaining the cut-off valve in open position.

4. An automatic valve structure for use with railway dump cars, having an air chamber for communication with an air supply reservoir, a second chamber below said first chamber for communication with a directional valve, a communicating opening between said chambers surrounded by a valve seat, a cylindrical main valve normally engaged with said seat for closing communication between said chambers, a piston disposed below said second chamber, means disposed between said valve and said piston for moving said valve from its seat upon movement of the piston, an air chamber beneath said piston adapted for communication with an operating air line whereby air pressure within said last chamber imparts movement to the piston, a cut-off valve in said first chamber including an inverted cup shaped member telescoped over said cylindrical valve and whose free edge is engageable with said valve seat, spring means normally holding said edge away from said seat, and means operable to move said edge of the cup shaped member into contact with said seat to close communication between said first two chambers when said cylindrical valve is in open position.

5. The structure according to claim 4 wherein said poston is normally retained in inoperative position by means of a relatively heavy spring disposed between same and an abutment in said valve structure, and an exhaust valve disposed beneath an opening in the bottom of second chamber and normally retained in engagement with a seat surrounding said opening by a relatively light spring disposed between the exhaust valve and said piston, and an exhaust port in a wall of said automatic valve structure for establishing communication between said second chamber and atmosphere upon depression of said exhaust valve against the action of said light spring.

6. In a railway dump car having a body swingable about trunnions at opposite sides thereof, operating pneumatic cylinders at each side of the car for swinging the body about one or the other of said trunnions, an air supply reservoir, a directional valve for selectively directing the air to the cylinders at one or the other side of the car, an automatic valve having a chamber in communication with said reservoir, a second chamber in communication with said directional valve, a main valve

controlling communication between said chambers, a cut-off valve telescoped over said main valve for controlling communication between said chambers at predetermined points in the range of swinging movement of the body about a trunnion, a cam operative to move said cut-off valve to chamber communication closing position, and lever means operative by said body in its swinging movement connected with said cam for operating same.

7. The structure according to claim 6 wherein said lever means comprises a pair of parallel links having corresponding ends pivotally connected to a fixed pin centrally of said body, a second link having an elongated slot adjacent one end, a pin supported by the other ends of said pair of links movably disposed in said slot, the other end of said last link being pivotally connected to one end of a cam bar, and the other end of said cam bar being connected with said cam.

8. In combination, a central longitudinal frame of a dump car swingable about a fulcrum disposed laterally of the frame, an automatic valve structure secured to said frame and including a vertically movable cut-off valve having an upwardly facing button, spring means operatively associated with said valve operative to move same to normal open position, and means connectible to said dump car and operatively associated with said button for closing said valve upon swinging movement of the car about said fulcrum, said means comprising a linkage including a pair of links having corresponding ends thereof pivotally supportable by the car body in a central vertical longitudinal plane thereof and a cam arm having one end thereof pivotally connected in said linkage for free vertical movement relative to said frame, a support projecting vertically upwardly from said valve structure and provided with a vertically elongated slot, a cam member secured to the other end of said arm and having a button engageable edge, a pivot pin extending through said cam member and supported in said slot, a spring having opposite ends thereof connected to said frame and said arm operative to normally maintain said pivot pin at the lower end of said slot, and said pivot pin being moveable upwardly in said slot upon engagement of said cam edge with said button in opposition to the action of said spring.

9. The structure according to claim 8 wherein said cam edge includes a camming portion and a portion concentric with said pivot pin, and a stop pin curved by said support engageable by said cam member for limiting its movement to inoperative position.

References Cited in the file of this patent

UNITED STATES PATENTS

940,815	Moore	Nov. 23, 1909
1,022,758	Seaver	Apr. 9, 1912
1,144,758	Desmond	June 29, 1915
1,489,138	Leclerc et al.	Apr. 1, 1924
1,884,458	Willenberg	Oct. 25, 1932
1,972,042	Flowers	Aug. 28, 1934
2,471,160	Matson et al.	May 24, 1949