

July 19, 1932.

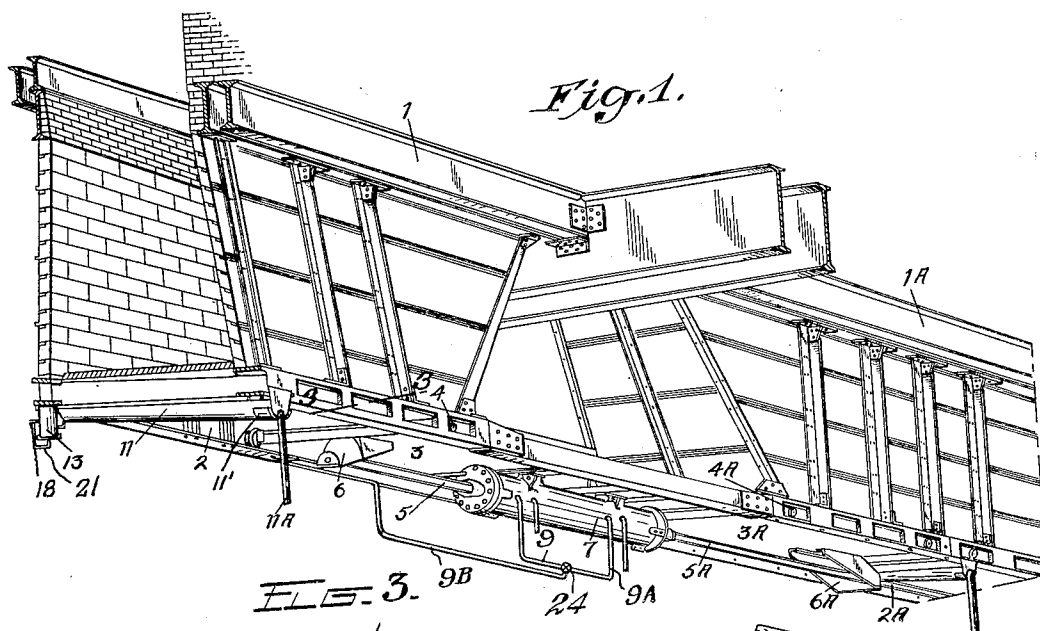
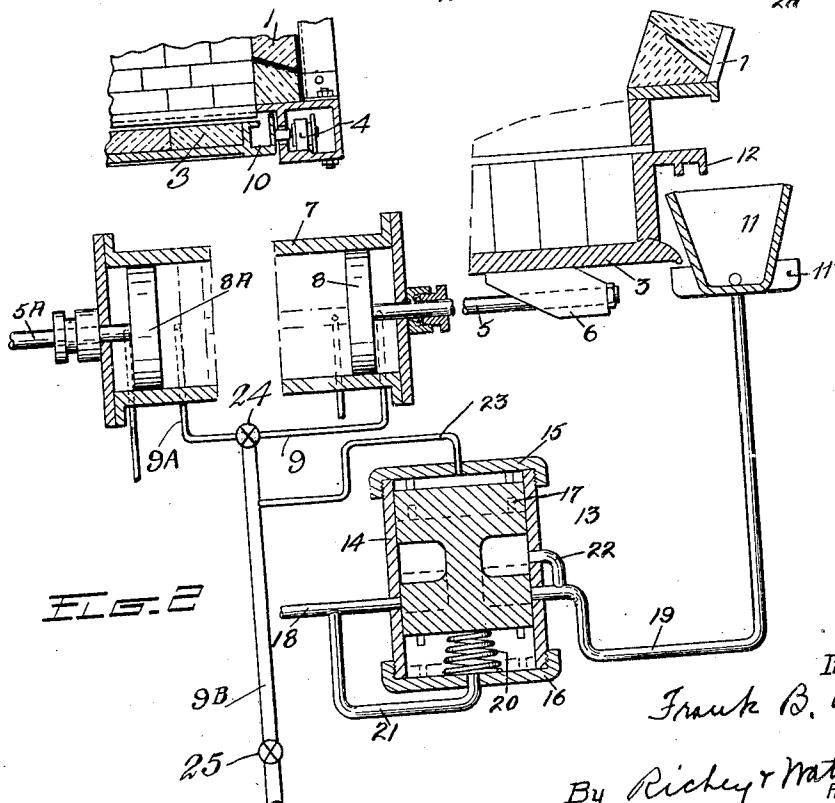
F. B. ALLEN

1,867,794

HOPPER

Filed Feb. 25, 1926

2 Sheets-Sheet 1



Inventor

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July 19, 1932.

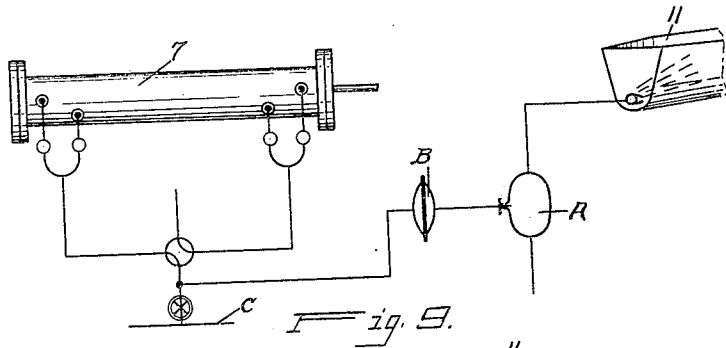
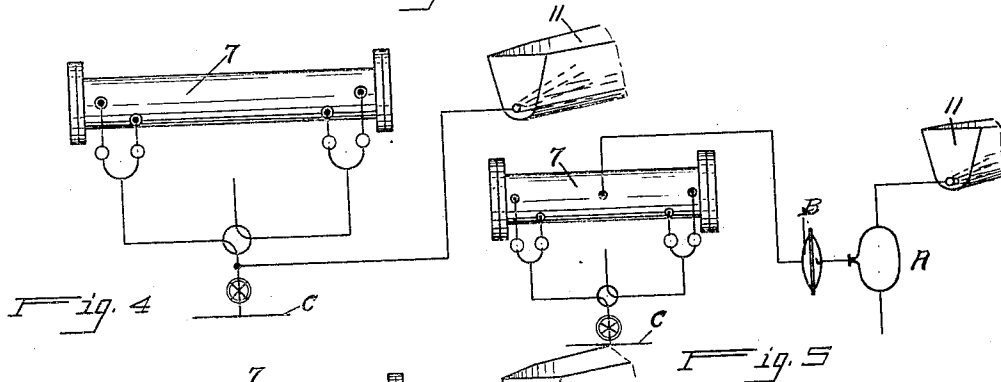
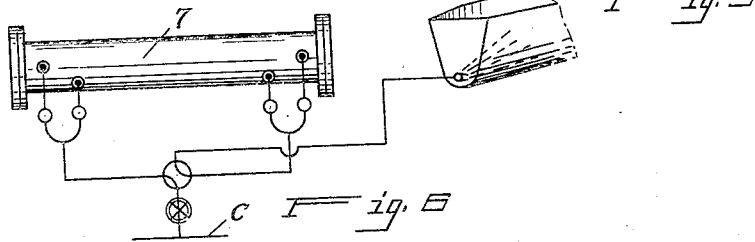
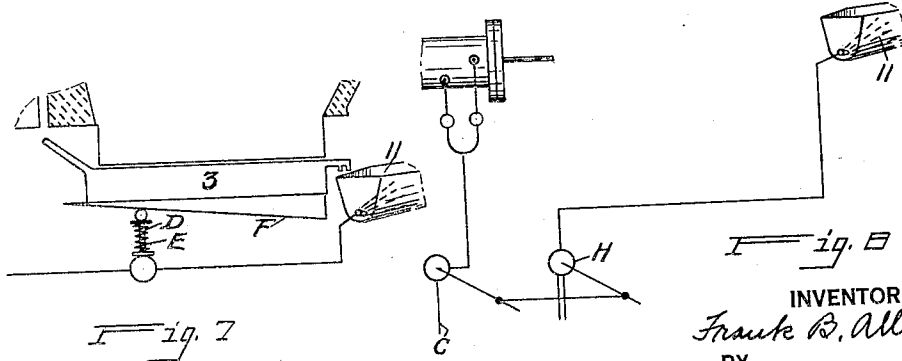
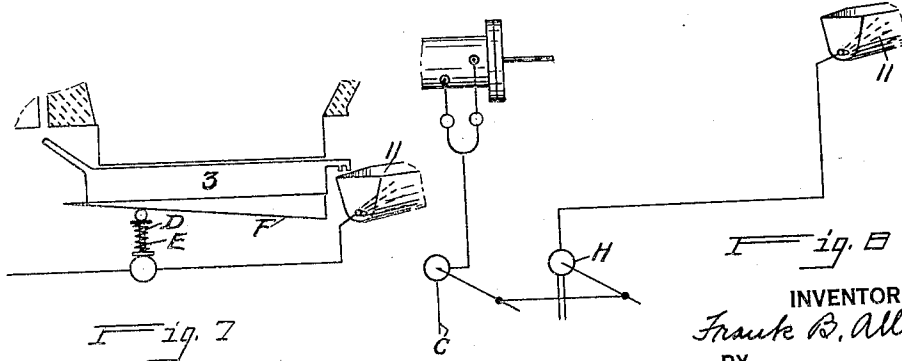
F. B. ALLEN

1,867,794

HOPPER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

FRANK BERRY ALLEN, OF LOWER MERION TOWNSHIP, MONTGOMERY COUNTY, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE ALLEN-SHERMAN-HOFF COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

HOPPER

Application filed February 25, 1926. Serial No. 90,628.

This invention relates to hoppers provided with bottom discharge openings and with means for collecting and discharging liquid passing through said openings.

In particular this invention relates to such hoppers having a liquid collecting trough for receiving the liquid passing through the bottom discharge opening, and means for automatically removing solid material from the trough. It is particularly suitable for hoppers delivering ashes from boiler furnaces after the ashes have been cooled with water.

In hoppers having discharge openings and into which liquid is brought in considerable quantities, it is desirable to collect the liquid which passes through the discharge opening to prevent the same from escaping from and spraying or falling beneath the hopper.

Heretofore hoppers have been provided with a stationary trough connected across one end of each discharge opening and other troughs carried by the door which closes the opening. When such a hopper contains finely divided material, it frequently happens that some of the material is carried by the liquid into the liquid collecting troughs of the door when the door is in closed position and thence is discharged into the stationary trough. This material is not particularly objectionable as it is easily removed. However, when the door is moved, and especially when it is being closed through a falling stream of solid material, it often tends to force both large and small particles of the solid material into the stationary trough. This material partly or wholly fills the trough and so impedes the movement of liquid therealong or decreases the liquid-carrying capacity thereof. Moreover, this solid material is often difficult to remove from the trough.

An object of this invention is, therefore, to provide a stationary liquid trough which will not become clogged with solid material.

Another object is to provide a trough with automatic means for flushing the same to remove any solid material which may have become deposited therein.

Another object is to provide means which will effectively flush the trough and still be

economical in consumption of flushing water or other fluid.

The invention contemplates an automatically controlled supply of flushing water or other medium, which will effectively carry away any particles of solid matter which find their way into the trough and which will be automatically shut off except during the periods when the solid material is normally delivered to the trough.

In the accompanying drawings—

Fig. 1 is a fragmentary perspective view of two hoppers equipped with one embodiment of the present invention;

Fig. 2 is a diagrammatic representation of the controlling means shown in Fig. 1 taken from the opposite side of the apparatus;

Fig. 3 is a transverse section taken along the line 3—3 of Fig. 1;

Figs. 4 to 9 inclusive are diagrammatic representations of modified arrangements for controlling the admission of the flushing medium to the trough.

In the figures are shown two adjacent hoppers 1 and 1A provided with bottom discharge openings 2 and 2A, respectively, closed by doors 3 and 3A. The doors are provided with rollers 4 and 4A which ride upon shoulders at the bases of the hoppers and piston rods 5 and 5A are secured to the doors by brackets 6 and 6A. Cylinder 7 is supported between the doors and in the cylinder are pistons 8 and 8A which are attached to the piston rods 5 and 5A, respectively. Conduits 9 and 9A open into opposite ends of cylinder 7 for the admission of fluid under pressure by which the piston 8 is operated. The conduit 9 opens into the cylinder 7 approximately at the end thereof and the inlet from conduit 9A to the cylinder 7 is spaced from the end thereof a distance slightly greater than the thickness of the piston 8A so that fluid admitted through conduit 9A can operate piston 8. When fluid under pressure is admitted through conduit 9, piston 8 will be forced toward the opposite end of the cylinder pulling door 3, by means of piston rod 5, and thus opening discharge opening 2. A fluid supply pipe 9B is shown for supplying fluid to the conduits 9 and 9A.

When fluid is admitted through conduit 9A, the piston 8 will move in the opposite direction to close door 3. Passage of fluid through the conduits 9 and 9A to operate the cylinder 8 is controlled by the valve 24. This valve may be of any desired suitable type and when in one position is adapted to connect pipe 9 to the pressure supply from pipe 9B and pipe 9A to the atmosphere or other place of discharge. When valve 24 is in its other position it connects pipe 9A to the pressure line 9B and pipe 9 to discharge. Thus, by proper movement of valve 24, the piston 8 may be moved either in door opening or door closing direction. Admission of fluid to pipe 9B is controlled by the shut-off valve 25. Similar conduits are provided for piston 8A and it will be seen that either door may be opened while the other is closed, or that one door may be opened as the other is being closed. As the parts of each door are substantially identical, the invention will be clearly understood by a description of only one hopper, and the parts of hopper 1A will not be referred to further.

The door 3 is provided with water collecting troughs 10 disposed along the sides thereof and projecting over and discharging into the lateral extension 11' of a stationary trough 11 supported below and adjacent one end of discharge opening 2. The door is also provided with a forwardly extending ledge 12 to project over trough 11 when the door is closed and discharge the ash cooling liquid into the stationary trough. A drain pipe 11A is provided for carrying away the water and other material from the stationary trough to the place of disposal.

To prevent the stationary trough 11 from becoming clogged with pieces of solid material, means are provided to admit a stream of water under pressure to the trough for the purpose of flushing the same, and in order to conserve the water, the supply is controlled by automatic means hereinafter described, which turn on the supply only during the periods when there is greatest opportunity for solid material to find its way into the trough and turn off the water supply when the door is closed, or in other positions where there is comparatively little opportunity for solid material to enter the trough. One practical form of this control is illustrated in Fig. 2 and comprises a valve indicated generally at 13. The valve consists of a cylindrical casing 14 closed at the ends by heads 15 and 16. In the casing, a balanced valve 17 is mounted to reciprocate and admit water from the supply line 18 entering the side of the casing to the conduit 19 leading to the stationary trough. The valve plunger 17 is normally held at the top of the cylinder by a spring 20 and in this position closes the inlet from conduit 18. A pipe 21 admits fluid from conduit 18 to the bottom of the valve

cylinder so that the pressure of the flushing fluid helps close the valve. A second pipe 22 may be provided as shown to drain any fluid which passes the valve when closed into the trough. A pipe 23 communicates with the conduit 9B and admits water therefrom to the top of the plunger so that when the pressure is turned on through the valve 25 and the valve 24 to operate piston 8, the plunger is forced down and the flushing water supply pipe 18 placed in communication with the stationary trough to flush the same. Obviously, pipe 23 might be connected to cylinder 7 at any one or a plurality of points in place of the pressure supply line so that the valve would be actuated upon any desired movement of the piston. The pressure of the liquid flowing through the valve 25 and the pipe 9B and which is used to operate the pistons 8 and 8A is considerably greater than the pressure of the liquid which is supplied through pipe 18 to flush the trough 11. Whenever the valve 25 is opened, the high pressure of the liquid in pipe 9B will be exerted on the upper side of the valve 17 through the pipe 23. The strength of the spring 20 and the pressure of the liquid in pipes 18 and 21 is maintained sufficiently lower than the pressure in the pipe 9B so that whenever the valve 25 is opened the pressure acting on the upper side of the piston 17 will overcome the combined force of the pressure in pipe 18 and the spring 20 acting on the lower side of the piston, and move the piston 17 downwardly thus opening the passage to the pipe 19 and allowing the flushing water to enter the trough 11. Since substantially all solid material forced into the stationary trough is introduced when the door closes through a falling stream of solid material, it is desirable to admit the flushing liquid to the trough when the door is being closed, and by so doing the solid material is readily removed.

Figs. 4 to 9, inclusive, illustrate diagrammatically various arrangements for admitting flushing mediums to the trough. Fig. 9 illustrates a system similar to that shown in Figs. 1 and 2, but in which the valve A is controlled by diaphragm B which is actuated by the pressure from the pressure line C whenever this pressure is admitted to any part of the cylinder 7. The conduits which carry fluid under pressure for actuating both pistons of the cylinder have a common connection to the pressure line C, and the proper admission of fluid under pressure to cylinder 7 to actuate either piston in the desired direction is controlled by a valve in each conduit.

Fig. 4 is a modification similar to that shown in Fig. 9 except that part of the piston operating fluid is conducted directly to the trough to flush the same instead of being used to control a valve.

Fig. 5 is a view in which the pressure at the middle of cylinder 7 controls, through diaphragm B, a valve A for admitting flushing fluid.

Fig. 6 shows an arrangement in which the fluid being exhausted from cylinder 7 on movement of the piston therein is conducted directly to the trough.

Fig. 7 shows a mechanically operated valve in which a valve stem D is urged upwardly by a spring E and is depressed by a sliding cam surface F on the door 3.

Fig. 8 is a view showing two mechanically connected valves G and H, which are simultaneously operated, one (G) for admitting the fluid to the cylinder 7 and the other (H) to the trough 11.

Obviously, many other arrangements may be made which will automatically flush the trough during the periods when it receives most solid material, the drawings illustrating only a few of the many variations which may be made without departing from the spirit or scope of the invention, and I do not, therefore, wish to be limited to any specific mode of operation, but claim as my invention all modifications coming within the scope of the appended claims.

I claim:—

1. A hopper for receiving solid material and a liquid and provided with a discharge opening, a movable door for said opening, means carried by the said door to collect the liquid and discharge the same from the hopper, a trough for receiving the said liquid, and automatic means actuated upon a predetermined motion of said door for flushing such trough.

2. A hopper for receiving solid material and a liquid and provided with a discharge opening, a movable door for said opening, means carried by the door to collect the liquid and discharge the same from the hopper, a trough for receiving said liquid and automatic means for flushing said trough upon the opening of said door.

3. A hopper for receiving solid material and a liquid and provided with a discharge opening, a movable door for said opening, means carried by the said door to collect the liquid and discharge the same from the hopper, a trough for receiving the said liquid and automatic means for flushing said trough actuated upon the opening of the said door.

4. In combination with a hopper having a discharge opening a water collecting and directing door for the discharge opening, a trough, said door so arranged in its closed position as to discharge water into the trough, means for opening and closing the door, a source of water under pressure connected to said stationary trough to flush foreign material therefrom, and a valve controlling the flow of the said flushing water

and actuated by the means for opening said door.

5. A hopper for receiving solid material and a liquid, a closure for controlling the discharge of the solid material therefrom, a trough for receiving the liquid from the hopper, and automatic means actuated upon the opening of said closure for flushing said trough.

6. A hopper for receiving solid material and a liquid, a closure for controlling the discharge of the solid material therefrom, a trough for receiving the liquid from the hopper, and automatic means actuated upon the opening and closing of said door for flushing said trough.

7. A hopper having a discharge opening, a stationary trough adjoining the opening, a movable door for the opening adapted to direct liquid from the hopper into the trough, means including a fluid pressure supply for moving the door to close and open the opening, and means opened by fluid pressure derived from said supply for admitting fluid under pressure to the trough.

8. A hopper having a bottom discharge opening, a stationary trough adjoining the opening, a door disposed beneath the opening and when closed having a portion overlying the trough, means actuated by fluid pressure for moving the door into open and closed position with respect to the opening, means for conducting liquid under pressure into the trough to wash solids therefrom, a pressure actuated valve controlling the liquid conducting means, and common means for supplying fluid pressure to actuate said door moving means and said valve.

In testimony whereof I hereunto affix my signature this 24th day of February, 1926.

FRANK BERRY ALLEN.