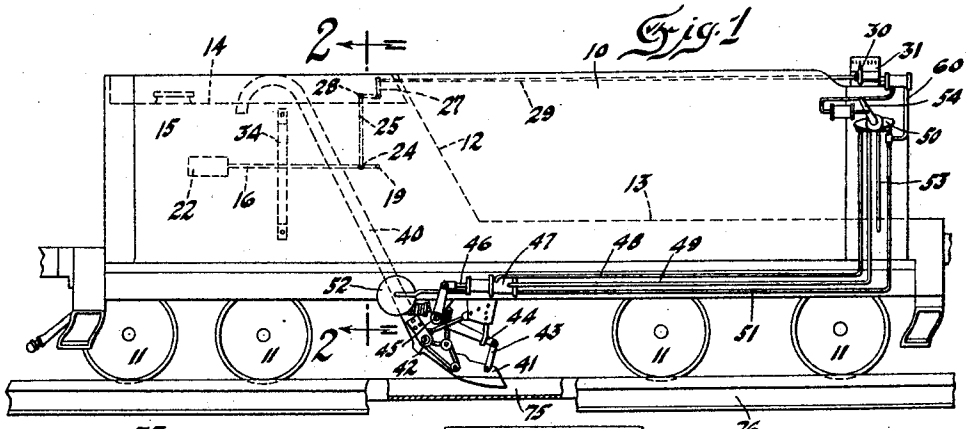
Dec. 31, 1929. J. C. DUDLEY 1,741,618

WATER LEVEL INDICATOR AND AUTOMATIC SCOOP CONTROL FOR LOCOMOTIVE TENDERS

Filed Aug. 25, 1928

Fig. 1



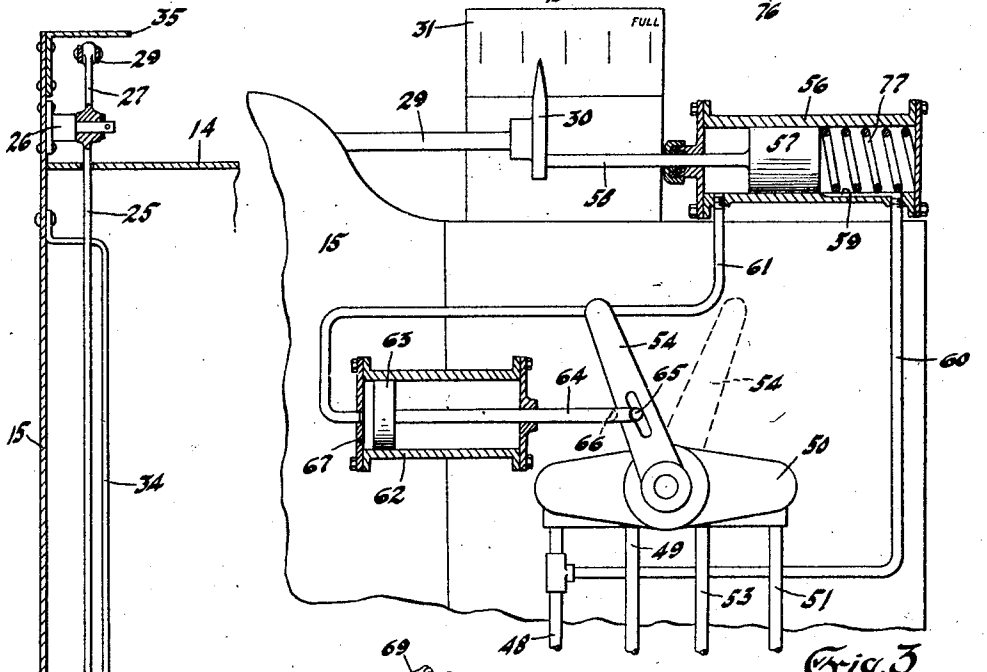


Fig. 3

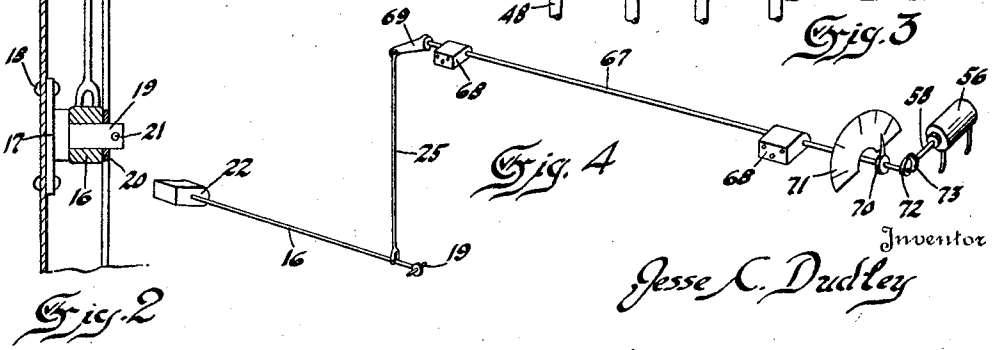


Fig. 4

Fig. 2

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UNITED STATES PATENT OFFICE

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WATER-LEVEL INDICATOR AND AUTOMATIC SCOOP CONTROL FOR LOCOMOTIVE TENDERS

Application filed August 25, 1928. Serial No. 302,134.

This invention relates to apparatus for use in connection with the tenders of locomotives and particularly to apparatus for use in connection with the water carried thereby, the principal object being the provision of a new and novel means for automatically indicating the level of the water in the water tank portion of the tender.

Another object is to provide a float controlled water level indicator for locomotive tenders which will not be affected by low temperatures.

Another object is to provide a float controlled water level indicator for locomotive tenders in which no packing to prevent the escape of water is necessary about any of the indicator parts.

Another object is to provide automatically actuated power means for raising the water scoop of a locomotive tender when a predetermined level of water is present in the water tank.

Another object is to provide, in combination with the water scoop of a locomotive tender, manually operated means for placing the water scoop in lowered or operative position and automatically actuated power means for placing the scoop in raised or inoperative position when a predetermined amount of water has been forced into the tank by the scoop.

Another object is to provide automatically actuated means for placing the scoop control valve of a locomotive tender in raised scoop position when a predetermined amount of water has entered the water tank of the tender.

A further object is to provide a combined water level indicator and automatic control for scoop valves of locomotive tenders.

The above being among the objects of the present invention, the same consists in certain features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawing, and then claimed, having the above and other objects in view.

In the accompanying drawing which illustrates a suitable embodiment of the present inventions, and in which like numerals refer to like parts throughout the several different views,—

Fig. 1 is a more or less diagrammatic side view of a locomotive tender provided with a water scoop and control therefor as in conventional constructions, and further provided with a water level indicator and automatic control for the scoop control valve.

Fig. 2 is an enlarged fragmentary sectional view taken on the line 2—2 of Fig. 1 illustrating a preferred method of supporting part of the water level indicating mechanism on the tender.

Fig. 3 is an enlarged more or less diagrammatic view of the mechanism employed for moving the scoop control valve to raised scoop position when the water tank is filled with water.

Fig. 4 is a diagrammatic perspective view illustrating a modified form of water level indicator and scoop control mechanism.

It is conventional practice for railroads to equip the tenders of locomotives employed on long runs with scoops for picking up water from pans or troughs while the locomotive is traveling at its normal speed. These pans or troughs are positioned between the tracks and are usually of such length that sufficient time is given to completely fill the water tank of the tender while passing over the same. As far as I am aware the only method used at the present time to tell when the water tank is full of water so as to indicate when to raise the scoop, is by waiting until the water overflows the top of the tender. This practice is in itself very dangerous for it is a frequent occurrence when two trains are passing each other at the time such water is overflowing the tender of one of them for the water to be thrown against the other train with such force as to break the windows thereof, often injuring the passengers, and it has been known to strike the steps and other parts of the train passing with such force as to tear the same from such trains. That this is possible is readily apparent when seen that each of such trains may be traveling a mile a minute and that the flow of water picked up by such scoops is necessarily great during the rela-

tively small interval of time during which the large locomotive tanks must be filled.

Furthermore, if the water does not overflow the tender in passing over a water trough, it is necessary to determine if there is sufficient water in the tender to last until the locomotive reaches the next water station so that if there is not, proper precaution may be taken to avoid damage from that cause. At the present time the method of determining this is for the fireman to crawl back over the coal and visually inspect the level of the water by looking into the tank. With the large tenders in use on the locomotive hauling fast passenger trains the coal is piled high and it makes it very unsafe to crawl over the top of the coal pile while the locomotive is running at high speed. The present invention aims to eliminate this method of determining the level of the water in the tender and the dangers attendant thereto.

Various mechanisms have been suggested for indicating the level of water in a locomotive tender but as far as I am aware all of these have taken the form of a glass tube connected with the water tank at the top and bottom thereof so that the level of the water in the tank is disclosed by the level of the water in the tube. This form of indicating means is satisfactory in warm countries or during the summer months in the temperate zones, but under the influence of freezing temperatures they become inoperative and hence are impractical. Other mechanisms have been suggested but none, so far as I am aware, are so constructed as to prevent freezing of the water coming into contact therewith from impairing its operation. In the present invention I provide a construction which accurately discloses the level of the water in the tank of a locomotive tender and upon which freezing temperatures have no effect whatsoever.

The present invention further contemplates the provision of means whereby the water scoop is automatically raised when the water in the tank during the filling of the same reaches a predetermined level. I am aware that heretofore it has been suggested to directly connect the water scoop of a locomotive tender with a float mechanism whereby when the water reaches a predetermined level, the scoop is raised. It is apparent, however, that such a construction is entirely impractical and is not and never has been used to my knowledge. It has been found necessary to employ power means to raise and lower the water scoop of a locomotive tender and the means universally used at the present time comprises an air cylinder, the piston of which is connected to the scoop and the application of compressed air to which is governed by a manually controlled valve.

In accordance with the present invention, I provide automatically actuated means, in combination with this valve, whereby when the valve is moved to a position to lower the water scoop, it is automatically moved to a position to cause lifting of the water scoop when a predetermined level of water is reached in the water tank. This means comprises an air cylinder having a piston operatively cooperating with the conventional scoop control valve, and the entrance of air to this cylinder is controlled by valvular means which is in turn controlled by a float mechanism in the water tank. Thus, by this phase of the present invention the conventional scoop control valve may be manually placed in position to allow the scoop to pick up water and when a predetermined level of water is reached in the water tank, the mechanism is automatically moved to place the scoop control valve in raised scoop position. Furthermore, by a suitable arrangement of the parts, I am enabled to employ the water level indicator above described in the dual capacity of a water level indicator and as a means for moving the scoop control handle operating mechanism to a position to move the scoop control handle to inoperative or raised scoop position.

In accordance with the present invention, I show in the accompanying drawing a locomotive tender indicated generally as 10 in Fig. 1 and which is provided with wheels 11. The interior of the tender 10 is provided with a vertically extending transverse wall 12 connected to a bottom wall 13 to thus provide storage space for coal, the space being accessible from the front or right hand end and as viewed in Fig. 1 in accordance with conventional practice. This space may, of course, be replaced by a tank or other suitable oil storage space where such tender is employed with an oil burning locomotive. The water storage space is provided below and to the rear of the walls 12 and 13 respectively, and extends upwardly at the rear as far as the top sheet 14 between the side sheets 15.

An arm 16 is pivotally supported upon a member 17 secured to one of the side sheets 15 by means of rivets 18 or other suitable means, the member 17 being provided with a pin 19 upon which one end of the arm 16 is pivotally mounted and maintained in a position axially of the pin 19 by suitable means such as the washer 20 and pin 21. The arm 16 extends rearwardly from the pin 19 and at its rear end is provided with a suitable float 22 which may be on any suitable construction. The arm 16 is of sufficient length so that the float 22 may travel the entire distance between the top sheet 14 and the bottom of the tank. Pivotally secured to the arm 16 between its ends as at 24 is a rod 25 which extends upwardly therefrom and projects through the top sheet 14. The pin member 26 suitably

secured to the side sheet 15 above the top sheet 14, as indicated in Fig. 2, has pivotally mounted thereon a bell crank 27 and the upper end of the rod 25 is pivotally connected as at 28 to the horizontally extending arm of such bell crank. The upwardly extending arm of the bell crank 27 is suitably secured to a rod 29 which extends forwardly therefrom and terminates adjacent the front end of the tender, and such forward end is provided with a pointer such as 30. A dial 31 is suitably mounted at the front end of the tender in co-operative relationship with respect to the pointer 30.

The action of this mechanism will be apparent. As the level of the water in the water tank drops, the float 22 will be carried downwardly therewith, causing the arm 16 to turn in a counter-clockwise direction about the pin 19 as viewed in Fig. 1 and will move the vertically extending rod 25 downwardly. As the rod 25 moves downwardly it will cause the bell crank 27 to turn in a counter-clockwise direction and will draw the rod 29 and the pointer 30 rearwardly, the pointer 30 moving over the face of the dial 31 indicating the position of the float 22 in the water tank and therefore the level of the water in such tank. Conversely, when the water is introduced into the tank, the float 22 will rise and the pointer 30 will move forwardly on the dial 31 in accordance therewith, thus indicating the level of the water in the tank on the dial 31. This portion of the present invention may be adapted to any of the conventional tender constructions without any further additions, and in such case when the scoop is lowered the position of the pointer 30 relative to the dial 31 may be watched and when it has moved to full tank position, the scoop may be raised by the conventional means by manual operation of the scoop control valve, and thereby raise the scoop before the water overflows the tank.

When locomotive tenders pass around a curve, the centrifugal force acting on the water tends to throw it to that side of the tank on the outside of the curve, and for the purpose of preventing undue movement of the water from this cause, so-called "splash plates" (not shown) extending vertically off the water tank and along the length of the same are generally employed. Due to the same reason unless some means were provided to prevent it, the force of this movement of the water acting on the float 22 might damage the various parts of the water level indicating mechanism. In order to prevent this, I prefer to provide means for guiding the float arm 16 in its vertical movement and which guiding means will serve to resist lateral movement of the float 22. This may be simply taken care of as indicated in Figs. 1 and 2 by securing a relatively heavy strap member 34 to the side sheet 15 midway between the pin 19 and float 22, the strap 34 extending vertically and in a position to bear against the float arm 16. It may also be noted that in order to prevent possible damage to the rod or shaft 29, I prefer to position the various parts of the mechanism so that the rod or shaft 29 lies beneath and in the protection of the usual angle bar 35 provided along the upper edges of the side sheets 15.

Although the float control mechanism above described may be employed as a visual indicating means for warning the engineer or fireman of a locomotive as to the proper time to manually actuate the scoop control valve in order to lift the water scoop, I prefer to further utilize the same for automatically actuating the scoop control valve and thereby cause lifting of the scoop at the proper time without the aid of human agency. For this purpose, the mechanism described below may be employed at very little additional cost.

The water scoop with its actuating cylinder and control valve shown in the accompanying drawing is of the conventional construction now employed on substantially all locomotive tenders equipped with water scoops, and for that reason a brief description only of the same without going into detail will be necessary for those skilled in the art. A discharge pipe 40 which extends below the bottom of the tender passes upwardly through the same through the top sheet 14 and is reversely bent at its upper end so as to again project through the top sheet 14 and discharges downwardly immediately below the same. To the lower end of the pipe 40 is connected the water scoop 41 by a flexible connection so as to permit pivotal movement of the scoop 41 about the pin 42 through which it is supported from the tender. The free end of the scoop 41 is connected by a link 43 to one end of the bell crank 44 pivotally mounted at 45. The upper arm of the bell crank 44 is connected to the rod 46 of a piston acting in the cylinder 47. The cylinder on either side of the piston therein is connected by the pipes 48 and 49 to a control valve indicated generally as 50 in Figs. 1 and 3. A third pipe 51 connects the valve 50 with a compressed air tank 52 carried by the tender and which is maintained under pressure by a suitable connection (not shown) to an air compressor located on the locomotive. A fourth pipe 53 is connected to the control valve 50 and serves to conduct the air exhausted from the cylinder 47 to a point adjacent the ground. This construction is exactly in accordance with conventional practice and the operation is the same. When the handle 54 of the valve is moved in a counter-clockwise direction, as viewed in the drawing, air from the tank 52 passes through the pipe 51 through the valve and thence through the pipe 48 to the cylinder 47 and moves the piston therein so as to turn the bell

crank 44 in a clockwise direction against the force of the various counterbalance springs to lowered position so that the scoop may be received in a trough such as 75 between the rails 76, the valve 50 permitting the escape of the air on the opposite side of the piston through the pipe 49 and pipe 53. When the tank has filled with water the handle is turned in a clockwise direction. This releases the air from the rear side of the cylinder 47 through the pipe 48 and pipe 53 and directs air from the tank 52 through the pipe 51 through the pipe 49 into the cylinder 47 and causes the bell crank 44 to be moved in a counter clockwise to lift the scoop 41.

In accordance with the present invention I mount a cylinder 56 adjacent the dial 31. The cylinder 56 is provided with a piston 57 having a piston rod 58 projecting rearwardly out of the same. The cylinder 56 is positioned with its axis parallel to the path of movement of the rod 29 and in a position permitting engagement of the rear end of the piston rod 58 with the pointer 30 which may be enlarged to insure proper engagement between itself and the piston rod 58. The forward portion of the interior wall of the cylinder 56 is provided with an interior groove 59 which is connected by a pipe 60 to the pipe 48 between the valve 50 and the cylinder 47. The rear end of the cylinder 56 is connected by a pipe 61 to a cylinder 62, the axis of which extends in the direction of the plane of movement of the handle 54 of the control valve 50. Within the cylinder 62 is positioned a piston 63 provided with a piston rod 64 which extends forwardly and which is slidably connected as at 65 to the handle 54 by means of a slotted connection. The groove 59 in the cylinder 56 is of greater length than the piston 57 so that when the piston 57 has been moved to a predetermined point in the cylinder 56, air on the forward side of the piston 57 may pass through the groove 59 to the rear side of the piston 57 and escape through the pipe 61 to the cylinder 62, the air acting on the rear face of the piston 63 moving it forwardly and thus moves the valve to raised scoop position. A coil spring 77 held under compression between the piston 57 and the forward end of the cylinder 56 serves to constantly urge the rod 58 towards contact with the pointer 30. The diameter of the cylinder 56 and piston 57 is kept sufficiently small as to prevent any substantial influence of the pressure from the pipe 48 acting thereon on the float 22. Furthermore, the position of the cylinder 56 with respect to the pointer 30 is so arranged that until the pointer 30 has moved to substantially full tank position, the piston 57 will not be bridged by the groove 59.

The operation of this part of the construction is as follows: Considering the water tank partly empty so that the pointer 30 assumes a position such as is indicated in Fig. 2 and the handle 54 is in its inoperative position, such as is indicated by dotted lines in Fig. 2, and considering that the locomotive is passing over a water trough, the handle 54 is moved by hand to the position indicated in full lines in Fig. 2. Any air that may be trapped between the rear face of the piston 63 and the rear wall of the cylinder 62 may escape during such movement through a bleeder opening such as 67 provided in the rear wall of the cylinder 22. This movement of the handle 54 as previously described permits air from the tank 52 to pass through the pipes 51 and 48 to the cylinder 47 and place the scoop 41 in lowered position so as to catch the water in the trough 75 and force it through the pipe 49 to the water tank, and in passing air to the pipe 48 it also passes air to the forward side of the piston 57 through the pipe 60. As the level of the water in the water tank rises, the float 22 moves upwardly and moves the pointer 30 forwardly, and the pointer 30 in moving forwardly acting through the rod 58 moves the piston 57 forwardly. As the water in the water tank approaches its allowable high limit, the piston 57 bridges the groove 59 and permits air to escape around it, which air passes through the pipe 61 and into the cylinder 62 and acting against the piston 63 moves the handle 54 in a clockwise direction back to the inoperative position indicated by the dotted lines Fig. 2, thus shutting off the flow of air through the pipe 48 to the cylinder 47 and permitting the escape of the air trapped therein, and permitting the flow of air through the pipe 49 to the cylinder 47 to cause the scoop 41 to be lifted. Thus the level of the water in the water tank of the tender acting on the float 22 controls the piston valve 57 so as to admit air to the cylinder 62 and thus cause automatic movement of the control handle 54 to raise the scoop when the water tank has become filled. This obviates any possibility of the water overflowing the tender and insures positive action of the water scoop 41.

It may be noted at this point that although I show the pipe 60 connected to the pipe 48 it may, if desired, be connected to the pipe 51 with equally successful results, and in such case, as the air pressure would constantly be acting on the forward side of the piston 57 the spring 77 could be dispensed with. However, in order to obviate possibility of application of the brakes due to sudden release of the air pressure in the supply tank if the pipe 60 should break, I prefer to connect the pipe 60 to the pipe 48, as shown, so that the only time the pipe 60 is under pressure is when the control handle 54 is moved to the left while the scoop is in lowered position and the tank is being filled.

It is not necessary to employ the pointer 30 and dial 31 when using this automatic means

for lifting the scoop 41, but inasmuch as very little additional expense is involved in employing the dual features of the float control mechanism, it is preferable. It will also be apparent that the particular form of mechanism shown between the float control mechanism and the scoop control valve is subject to various modifications, that being shown being more or less diagrammatic and indicative of a suitable construction, without departing from the spirit of the present invention. Other obvious changes may be made such as for instance, instead of employing the slotted connection between the control valve arm 54 and piston rod 64, the piston rod 64 may be cut off as at 66 in Fig. 2 so that it will merely bear against the arm 54. It will also be apparent that the particular type of float mechanism shown for controlling the position of the piston 57 may be varied without departing from the present invention, and such a variation may take the form illustrated in Fig. 4.

In the construction illustrated in Fig. 4 the float arm 16, float 22 and rod 25 are employed as previously described. However, instead of providing the axially movable rod member 29 at the top of the tender connected to the rod 25 by the bell crank 27, I provide a rotatable shaft or rod member 67 which may be suitably supported in bearing members 68 secured to the side sheet 15 above the top sheet 14 and which is provided with an arm 69 to the outer end of which the rod 25 is pivotally connected, so that vertical movement of the float 22 will cause rotational movement of the shaft 67. The forward end of the rod 67 in this case is provided with a pointer 70 moving over a semi-circular dial 71 for indicating the level of the water, and instead of the pointer 70 cooperating with the piston rod 58 as in Fig. 2, the shaft 67 may be provided with a cam such as 72 acting against a tappet member 73 carried by the piston rod 58 in order to impart axial movement to the piston rod 58. The cylinder 56 in this construction must, of course, be mounted perpendicularly to the axis of the shaft 67 in order that movement of the cam 72 will impart the correct movement to the piston rod 58. These and other formal changes may be made in the specific embodiment of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

What I claim is:

1. In a locomotive tender, in combination with the scoop control valve thereof, a cylinder provided with a piston operatively connected to said valve, and means governed by the level of the water in the water tank of said tender for controlling the application of pressure to said cylinder in order to actuate said valve.

2. In a locomotive tender, in combination, a water tank, a scoop operatively connected to said water tank, a piston operatively connected to said scoop, a source of fluid pressure, a valve for controlling the application of said pressure to said piston for raising or lowering said scoop, a lever on said valve, a second piston operatively connected to said lever, valvular means for controlling the application of pressure to said second piston, and means controlled by the level of water in said tank for actuating the last mentioned valvular means.

3. In a locomotive tender, in combination, a water tank, a water scoop, pressure actuated means for moving said scoop, a valve for controlling the application of pressure to said means, a second pressure actuated means for moving said valve, a second valve for controlling the application of pressure to said second pressure actuated means, and means controlled by the level of water in said tank for moving said second valve.

4. In a locomotive tender, in combination, a water tank, a water scoop control valve manually movable to lowered scoop position, a cylinder, a piston in said cylinder operatively associated with said valve, valvular means for controlling the application of pressure to said cylinder, a float in said tank, and means connecting said float and said valvular means whereby the latter is moved to admit pressure to said cylinder when the water in said tank reaches a predetermined height.

5. In a locomotive tender, in combination, a water tank, a scoop operatively connected to said water tank, a piston operatively connected to said scoop, a source of fluid pressure, a valve for controlling the application of said pressure to said piston for raising or lowering said scoop, a lever on said valve, a second piston operatively connected to said lever, valvular means for controlling the application of pressure to said second piston, and means controlled by the level of water in said tank for actuating the last mentioned valvular means, the last mentioned means including means for visually indicating the level of water in said tank.

6. In a locomotive tender, in combination, a water tank, a water scoop control valve, visual water level indicating means, pressure actuated means for moving said valve, valvular means for controlling the application of pressure to said pressure actuated means, and a float in water tank operatively connected to both said indicating means and said valvular means.

7. In a locomotive tender, in combination, a water tank. a water scoop control valve, pressure actuated means for moving said valve, valvular means for controlling the application of pressure to said pressure actuated means, a float in said tank, a connection between said float and said valvular means including a movable shaft, a pointer carried by said shaft

and movable therewith, and a stationary dial co-operating with said pointer to provide visual indicating means for the water in said tank.

8. In a locomotive tender, in combination with the water tank thereof, a vertically movable water scoop operatively connected to said tank, a cylinder provided with a piston operatively connected to said scoop for controlling the position thereof, a valve, an air supply pipe connected to said valve, a second pipe connecting said valve with said cylinder on one side of said piston whereby movement of said valve to admit air to said second pipe will raise said scoop, a third pipe connecting said valve with said cylinder on the opposite side of said piston whereby movement of said valve to admit air to said third pipe will lower said scoop, a second valve mechanism connected to said third pipe, a second cylinder connected with said second valve mechanism, a piston in said second cylinder co-operating with the first valve to control the position thereof, and a float mechanism in said tank co-operating with said second valve mechanism to control the passage of air through the same to said second cylinder.

9. In a locomotive tender, in combination with the water tank and scoop control valve thereof, means movable by the variation of water level in said tank, power means for moving said valve, and automatically actuated means co-operating between the first mentioned means and said power means for moving said valve to one extremity of its movable positions upon the presence of a predetermined water level in said tank.

10. In a locomotive tender, in combination, a water tank, a scoop for feeding water to said tank during movement of said tender, power means for raising and lowering said scoop, a valve for controlling said power means, and automatically actuated power means controlled by the level of water in said tank for moving said valve to scoop raising position upon the presence of a predetermined water level within said tank.

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