

Nov. 6, 1934.

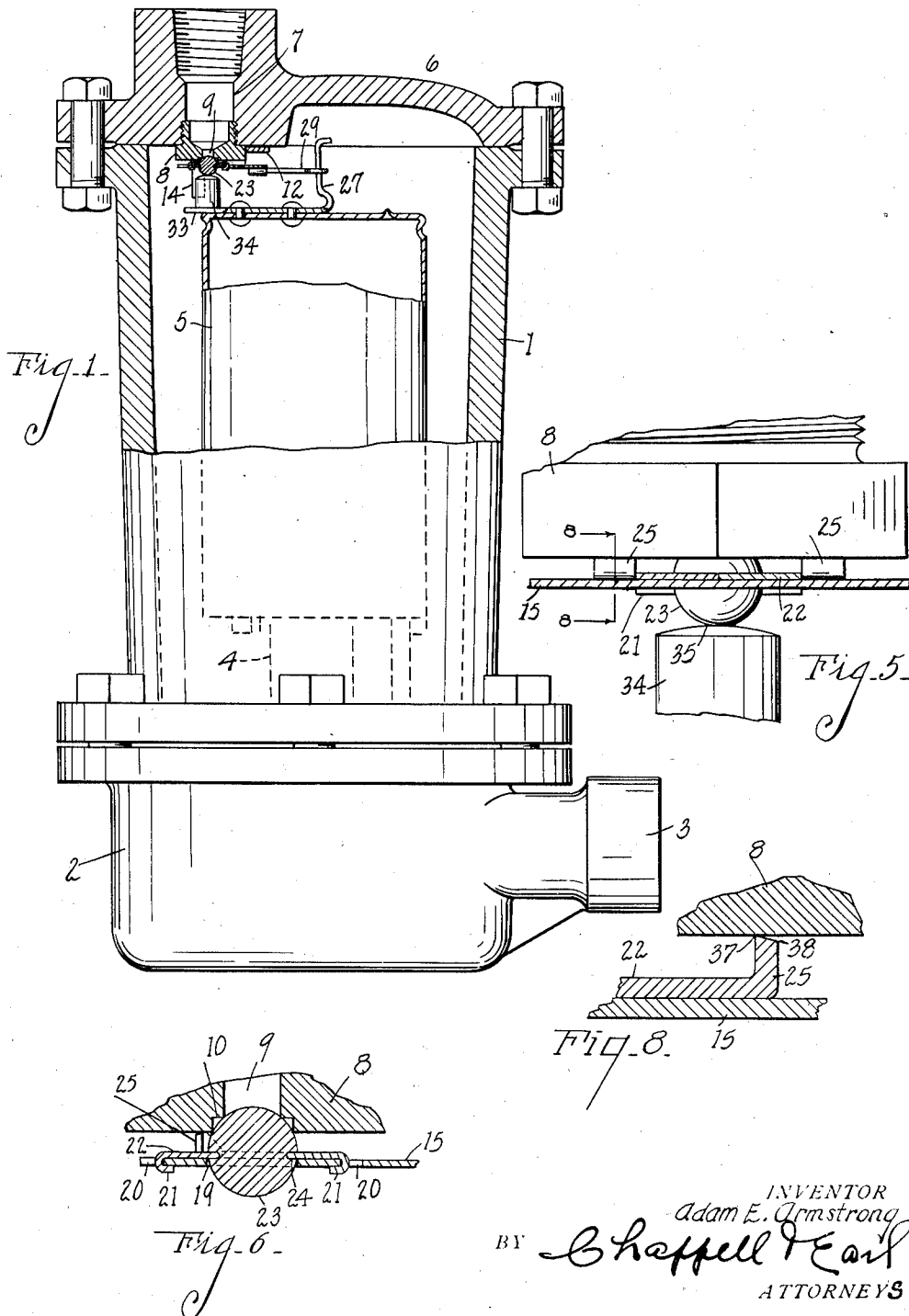
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VALVE MECHANISM

Filed June 15, 1933

2 Sheets-Sheet 1



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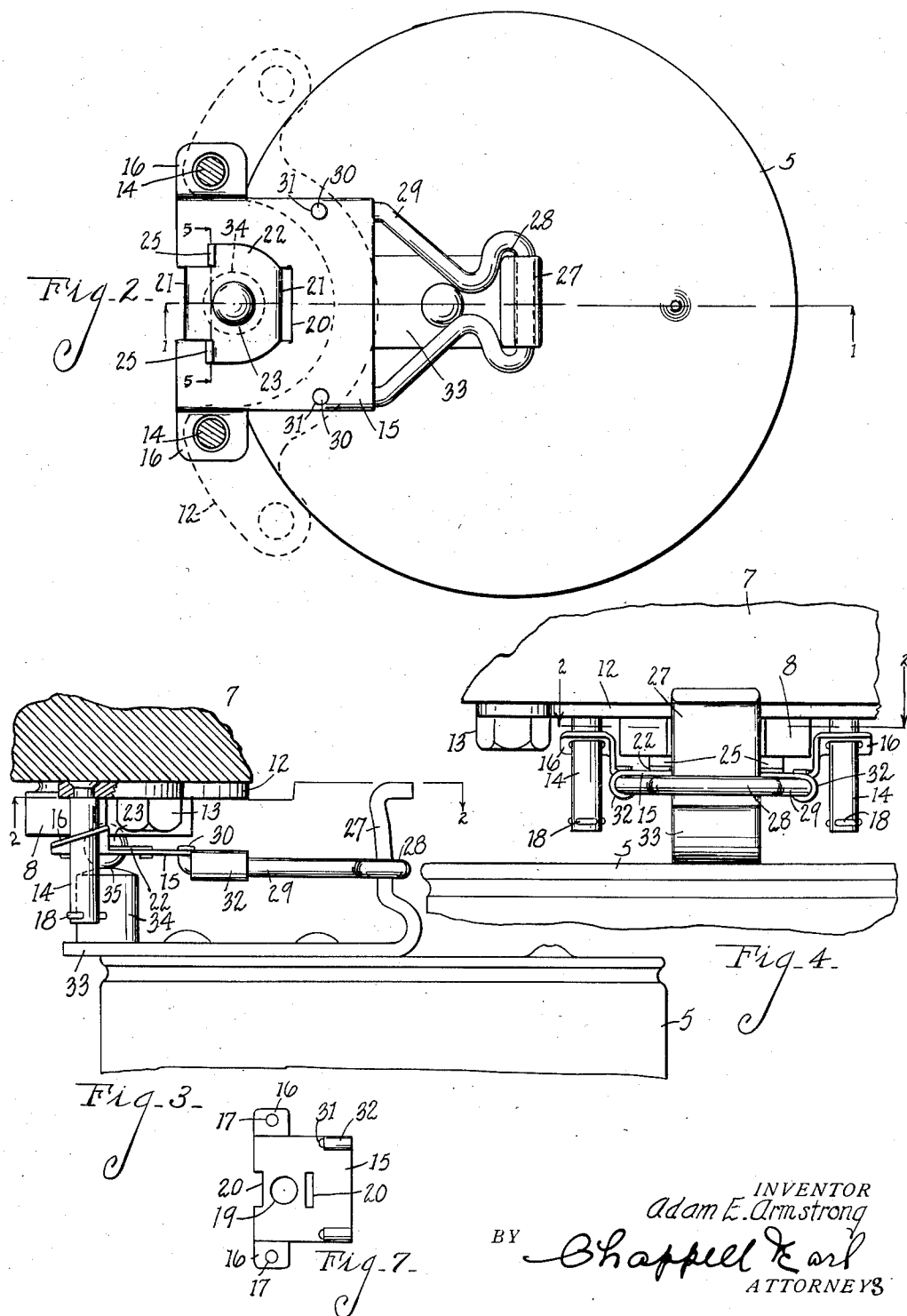
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UNITED STATES PATENT OFFICE

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VALVE MECHANISM

Adam E. Armstrong, Three Rivers, Mich.

Application June 15, 1933, Serial No. 675,927

16 Claims. (Cl. 137-103)

The main objects of this invention are:

First, to provide an improved valve mechanism for steam traps which is positive in operation even under high pressures and in comparatively small units.

Second, to provide an improved valve mechanism for steam traps in which the wear on the parts is minimized and the valve opens and closes without chattering or fluttering.

Third, to provide an improved valve mechanism for steam traps in which the parts are very simple and economical and easily assembled.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is defined and pointed out in the claims.

A structure which is a preferred embodiment of my invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a view in side elevation of a steam trap partially in vertical section on a line corresponding to line 1-1 of Fig. 2, the parts being shown with the valve in its closed position.

Fig. 2 is a fragmentary plan view partially in section on a line corresponding to line 2-2 of Figs. 3 and 4.

Fig. 3 is an enlarged fragmentary view partially in vertical section.

Fig. 4 is an enlarged fragmentary view looking from the left of Fig. 3.

Fig. 5 is an enlarged fragmentary view partially in section on a line corresponding to line 5-5 of Fig. 2.

Fig. 6 is an enlarged fragmentary section through the valve and its seat.

Fig. 7 is an inverted view of a portion of the valve plate or the valve lever.

Fig. 8 is an enlarged detail view of the valve lever on a line corresponding to line 8-8 of Fig. 5.

In the embodiment illustrated in the accompanying drawings, the float chamber 1 is provided with a separating chamber 2 having an inlet 3. The separating chamber is connected to deliver to the float chamber through a vertical central pipe 4 which projects centrally into the float chamber. The float 5 disposed within the chamber 1 is of the inverted bucket type. The top 6 of the float chamber is provided with a discharge 7 into which is threaded the valve seat member 8 having the discharge port 9 surrounded by the stepped valve seat 10.

As best shown in Figs. 2 to 4 inclusive, the plate-like bracket 12 is secured to the underside of the top by means of screws 13 disposed

on opposite sides of the valve seat member. The bracket is provided with depending studs 14 disposed on opposite sides and slightly to the rear of the valve seat to constitute vertical guides and supports for the valve carrying lever 15. This lever is provided with laterally projecting ears 16 disposed in a plane downwardly and rearwardly inclined relative to the arm of the lever, the ears having holes 17 therein pivotally and slidably embracing the studs 14. Stops 18 are provided at the lower end of the studs to limit the downward travel of the valve lever and retain it on the studs.

The valve lever, as best shown in Fig. 6, is provided with a circular valve receiving opening 19 and slots 20 disposed at the front and rear of the opening, the front being nearer the free end of the lever arm and the rear nearer the fulcrum. The slots 20 receive the securing lugs 21 of the valve clip or holder 22, the ball valve 23 having a peripheral groove 24 engaged by this clip. The groove 24 is preferably ground to a steel ball, a bearing ball of suitable size being found very satisfactory.

The retaining clip is of relatively thin sheet metal and has an opening into which the ball is snapped or the clip may be made up of parts. The fingers or lugs on the clips engaging the slots provided therefor, effectively secure the valve to the valve lever.

The valve lever is provided with upwardly projecting fulcrum members 25 which engage the face of the valve seat member constituting pivot points on which the valve lever swings during its initial opening movement as will be later more clearly pointed out.

The float 5 is provided with an upwardly projecting arm 27 projecting through the eye 28 in the portion 29 of the valve lever which is preferably formed of a piece of wire bent into a bail shape and conformed to form the eye, the arms terminating in upturned ends 30 disposed through holes 31, the arms being further secured by inwardly bent portions 32 of the valve plate or lever. The arm on the float slidably engages the eye, providing a limited lost motion connection for the float to the arm.

The body or bracket portion 33 of the arm 27 carries a thrust member 34 having a convex end 35 which engages the ball or spherical valve so that there is a direct seating thrust of the float on the valve when the float is in its upper position but tilting motion or movement of the float does not tend to displace the valve as the rounded or convex end of the thrust member

rocks in the rounded valve. This is of particular advantage in the initial seating of the valve as the agitation of the float, due to the agitation of the water in the float chamber, does not
 5 displace the valve and, further, the float is free to swing sidewise when it comes under the original impact as the float is lifted by the steam and the float may be swung laterally in the water within the float chamber which acts as a
 10 dashpot to relieve the parts of shock. The fit of the arm in the eye is such that this lateral swinging movement is permitted without transferring the motion to the valve.

The studs 14 are arranged at each side of the valve seat member but fairly close to a vertical plane through the center of the valve seat parallel to the plane of the centers of these studs. The fulcrum members 25 are also arranged close to this plane, their ends being preferably inclined downwardly and rearwardly of the lever arm as best shown in Fig. 8, the initial fulcrum point being at 37 and a second fulcrum point 38 being provided so that on the initial movement of the valve lever, a very strong leverage
 25 is had to lift the valve from its seat against the pressure within the float chamber, and promptly after the valve is "cracked", the pressure slightly relieved, the throw is somewhat increased until sufficient clearance is provided to release the valve, and the fall of the float allows the valve
 30 to drop down on the supporting studs 14 for very free discharge of the water and the valve is so far removed from the valve seat that it is not carried to its seat by the rush of water.
 35 However, as soon as the water has been exhausted to the point that steam flows into the bucket, the bucket is lifted, carrying the valve upwardly until it is substantially seated or carried to its seat or the pressure within the chamber will carry it to its seat, where it is held
 40 by the pressure either through the float or after the float has begun to fall until the valve is tilted on its fulcrum by the fall of the float.

45 The guide ears for the valve lever are so formed that clutching or gripping action is prevented throughout the movement of the valve and at the same time it is properly timed in its movement.

50 My improvements are highly desirable for embodiment in small traps, although also of value for use in large traps and traps for heavy duty or service. Structures embodying my invention are very positive in operation, very durable, and
 55 not likely to get out of repair.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiments of my invention without
 60 departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

Having thus described my invention, what I claim as new and desire to secure by Letters
 65 Patent, is:

1. The combination of a float chamber having an inlet at the bottom and a discharge at the top provided with a downwardly facing valve seat, an inverted bucket type float provided with
 70 a central upwardly projecting arm, depending studs disposed on opposite sides of said valve seat, a valve lever having ears disposed in a plane downwardly and rearwardly inclined relative to the lever arm and pivotally and slidably
 75 engaging said studs, said arm on said float hav-

ing limited sliding engagement with the outer end of said lever, said lever being provided with a fulcrum member having fulcrum points for successively engaging the top of the chamber at the side of the valve seat opposite that of said
 80 arm on said float at increasing distances from the seat on the opening of the valve, a spherical valve mounted on said valve lever to coact with said valve seat, and a thrust member disposed on said float at one side thereof and in approximate alignment with said valve seat to coact
 85 with said valve.

2. The combination of a float chamber having an inlet at the bottom and a discharge at the top provided with a downwardly facing valve seat, an inverted bucket type float provided with a central upwardly projecting arm, depending
 90 studs disposed on opposite sides of said valve seat, a valve lever pivotally and slidably engaging said studs, said arm on said float having limited sliding engagement with the outer end of said lever, said lever being provided with a fulcrum member engaging the chamber top at the side of the valve seat opposite that of said
 95 arm on said float, a spherical valve mounted on said valve lever to coact with said valve seat, and a thrust member disposed on said float at one side thereof and in approximate alignment with said valve seat to coact with said valve.

3. The combination of a float chamber having an inlet at the bottom and a discharge at the top provided with a downwardly facing valve seat, an inverted bucket type float provided with a central upwardly projecting arm, depending
 100 studs disposed on opposite sides of said valve seat, a valve lever having ears downwardly and rearwardly inclined relative to the lever arm and pivotally and slidably engaging said studs, said arm on said float having limited sliding engagement with the outer end of said lever, a spherical
 105 valve mounted on said valve lever to coact with said valve seat, and a thrust member disposed on said float at one side thereof and in approximate alignment with said valve seat to coact with said valve.

4. The combination of a float chamber having an inlet at the bottom and a discharge at the top provided with a downwardly facing valve seat, an inverted bucket type float provided with an upwardly projecting arm, depending studs
 110 disposed on opposite sides of said valve seat, a valve lever pivotally and slidably engaging said studs, said arm on said float having limited sliding engagement with the outer end of said lever, said lever being provided with a fulcrum member having fulcrum points for successively engaging the top of the chamber at the side of the valve seat opposite that of said arm on said float at increasing distances from the valve seat on the opening of the valve, a valve mounted on
 115 said valve lever to coact with said valve seat, and a thrust member on said float coacting with said valve.

5. The combination of a float chamber having an inlet at the bottom and a discharge at the top provided with a downwardly facing valve seat, an inverted bucket type float provided with an upwardly projecting arm, depending studs
 120 disposed on opposite sides of said valve seat, a valve lever pivotally and slidably engaging said studs, said arm on said float having limited sliding engagement with the outer end of said lever, said lever being provided with a fulcrum member engaging the chamber top at the side of the valve seat opposite that of said arm on said
 125 float.

float, a valve mounted on said valve lever to coact with said valve seat, and a thrust member on said float coacting with said valve.

6. The combination of a float chamber having an inlet at the bottom and a discharge at the top provided with a downwardly facing valve seat, an inverted bucket type float provided with an upwardly projecting arm, depending studs disposed on opposite sides of said valve seat, a valve lever pivotally and slidably engaging said studs, said arm on said float having limited sliding engagement with the outer end of said lever, a valve mounted on said valve lever to coact with said valve seat, and a thrust member on said float coacting with said valve.

7. The combination of a float chamber having an inlet at the bottom and a discharge at the top thereof provided with a downwardly facing valve seat, an inverted bucket type float, a valve lever support disposed adjacent said valve seat, a valve lever mounted on said support for vertical sliding and pivotal movement, said float having limited lost motion connection with the outer end of said valve lever, said lever being provided with a fulcrum member independent of said support having fulcrum points adapted to successively engage the top of the chamber at increasing distances from the valve seat as the lever is actuated to open the valve, a spherical valve mounted on said lever close to its fulcrum member, and a thrust member disposed on said float at one side thereof to engage the valve in approximate alignment with said valve seat.

8. The combination of a float chamber having an inlet at the bottom and a discharge at the top thereof provided with a downwardly facing valve seat, an inverted bucket type float, a valve lever support disposed adjacent said valve seat, a valve lever mounted on said support for vertical sliding and pivotal movement, said float having limited lost motion connection with the outer end of said valve lever, a spherical valve mounted on said lever, and a thrust member disposed on said float at one side thereof to engage the valve in approximate alignment with said valve seat.

9. The combination of a float chamber having an inlet at the bottom and a discharge at the top thereof provided with a downwardly facing valve seat, an inverted float bucket type, a valve lever support disposed adjacent said valve seat, a valve lever mounted on said support for vertical sliding and pivotal movement, said float having limited lost motion connection with the outer end of said valve lever, said lever being provided with a fulcrum member independent of said support, and a valve mounted on said lever close to its fulcrum member, said float acting to urge said valve to its seat when the float is in elevated position.

10. The combination of a float chamber having an inlet at the bottom and a discharge at the top thereof provided with a downwardly facing valve seat, an inverted float bucket type, a valve lever support disposed adjacent said valve seat, a valve lever mounted on said support for vertical sliding and pivotal movement, said float having limited lost motion connection with the outer end of said valve lever, and a spherical valve mounted on said lever, said float acting to urge said valve to its seat when the float is in elevated position.

11. The combination of a float chamber having a discharge provided with a downwardly facing valve seat, a float, a valve lever support disposed adjacent said valve seat, a valve lever mounted on said support for vertical sliding and pivotal movement, said float having limited lost motion connection with the outer end of said valve lever, said lever being provided with a fulcrum member independent of said support having successively engaging fulcrum points as the lever is actuated to open the valve, and a valve mounted on said lever close to its fulcrum member.

12. The combination of a float chamber provided with a downwardly facing discharge valve seat, a float, a valve lever mounted for pivotal and vertical sliding movement in a vertical plane close to the valve seat, a spherical valve mounted on said lever to coact with said valve seat, an arm on said float loosely engaging the end of said valve lever, and a thrust member on said float disposed at one side of the float to coact with said valve.

13. The combination of a float chamber provided with a discharge valve seat, a float having a thrust member, a lever loosely connected to said float, a ball valve mounted on said lever, and a support on which said valve lever is mounted for pivotal and vertical sliding movement, said thrust member being adapted to engage said ball valve opposite the valve seat and having a spherically curved convex face directly coacting therewith.

14. The combination of a float chamber provided with a discharge valve seat, a valve therefor, a float, and a lever mounted for sliding movement to and from the valve seat and having a fulcrum member operative when the lever is in valve seating position and having successively engaging fulcrum points effective during the initial opening movement of the valve lever prior to its sliding movement away from the valve seat, said float having a lost motion connection to the outer end of the valve lever and having a direct thrust engagement with the inner end of said lever when the float is elevated.

15. The combination of a float chamber provided with a discharge valve seat, a valve therefor, a float, and a lever mounted for sliding movement to and from the valve seat and having a fulcrum member operative when the lever is in valve seating position and effective during the initial opening movement of the valve lever prior to its sliding movement away from the valve seat, said float having a lost motion connection to the outer end of the valve lever and having a direct thrust engagement with the inner end of said lever when the float is elevated.

16. The combination of a float chamber provided with a discharge valve seat, a valve therefor, a float, and a lever mounted for sliding movement to and from the valve seat and having a fulcrum member operative when the lever is in valve seating position and having successively engaging spaced salient fulcrum points effective during the initial opening movement of the valve lever prior to its sliding movement away from the valve seat.

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