J. E. PURSER.

STEAM TRAP.

APPLICATION FILED MAR. 10, 1910.

988,385.

Patented Apr. 4, 1911.

5 SHEETS—SHEET 1.

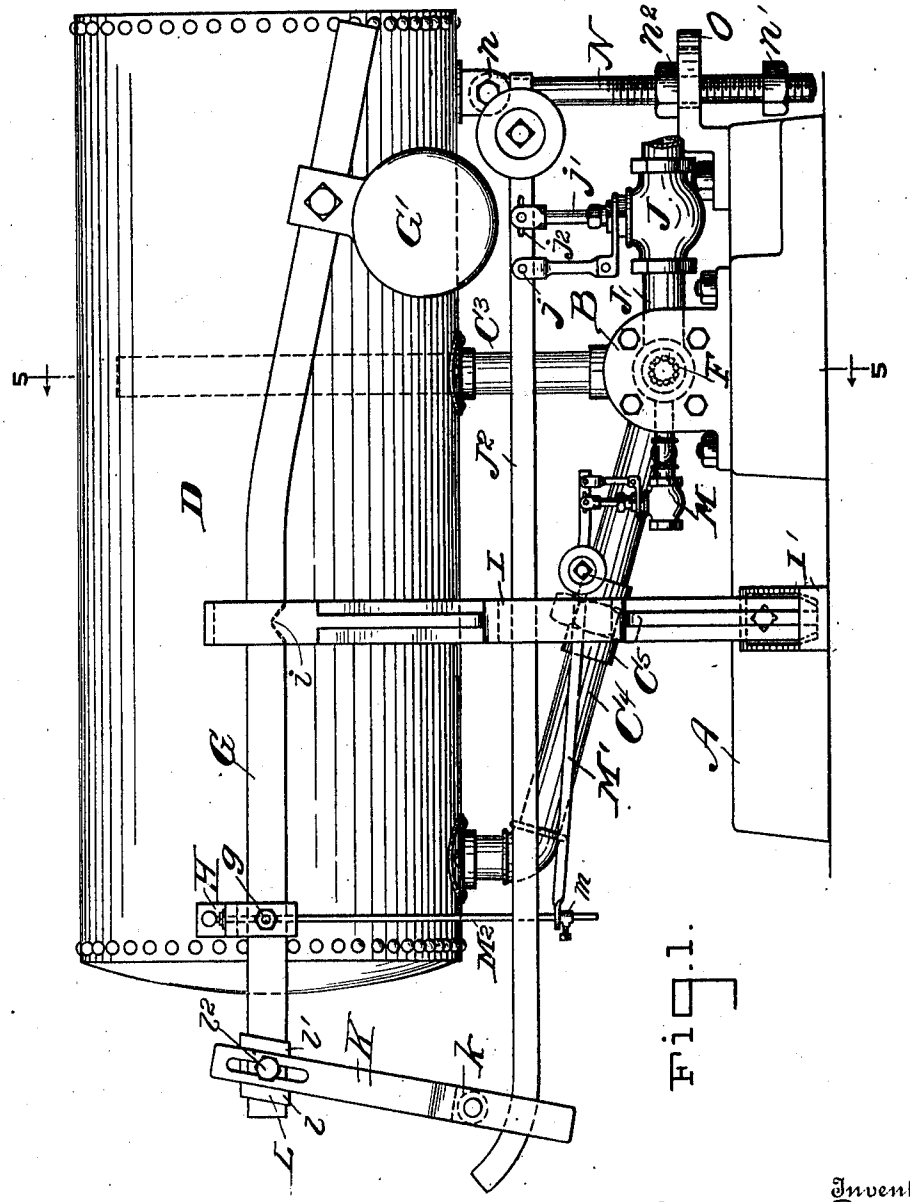

Fig. 1.

Witnesses
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5 SHEETS—SHEET 2.

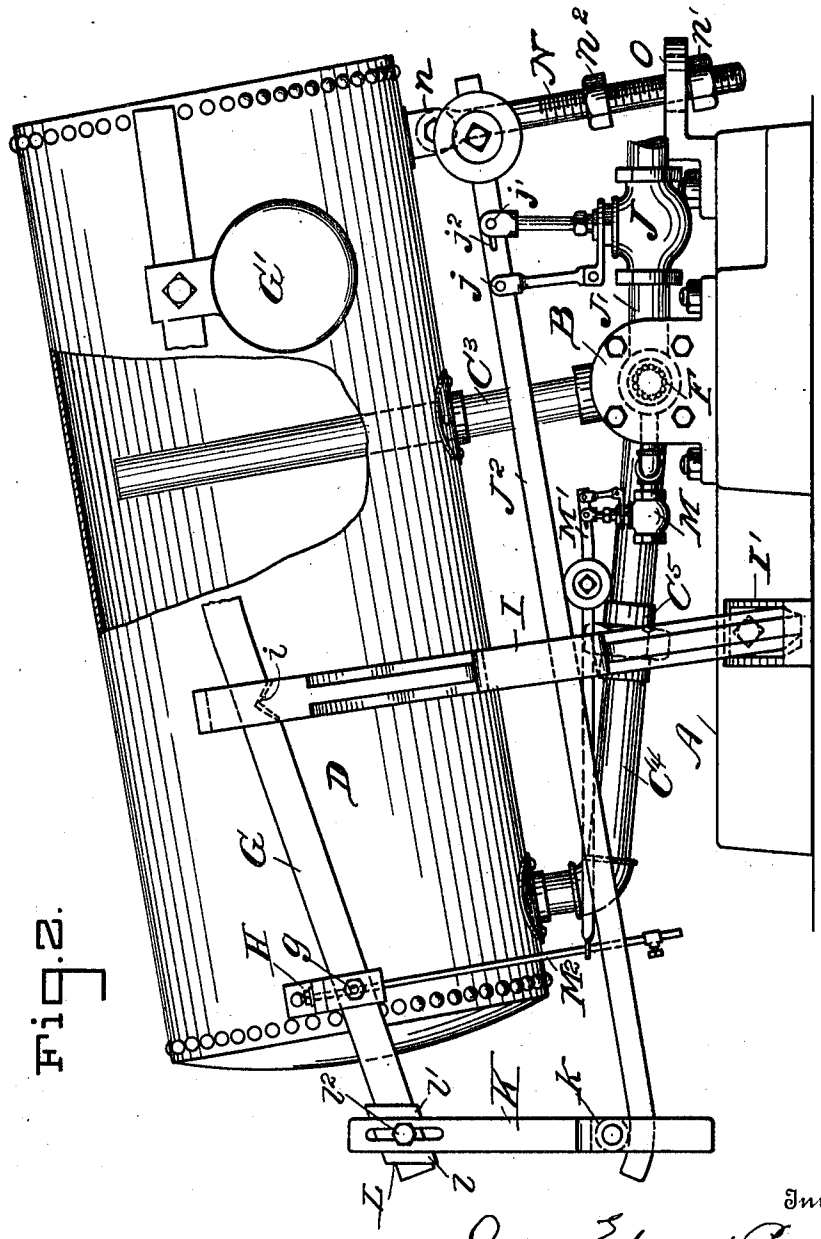

Fig. 2.

Witnesses

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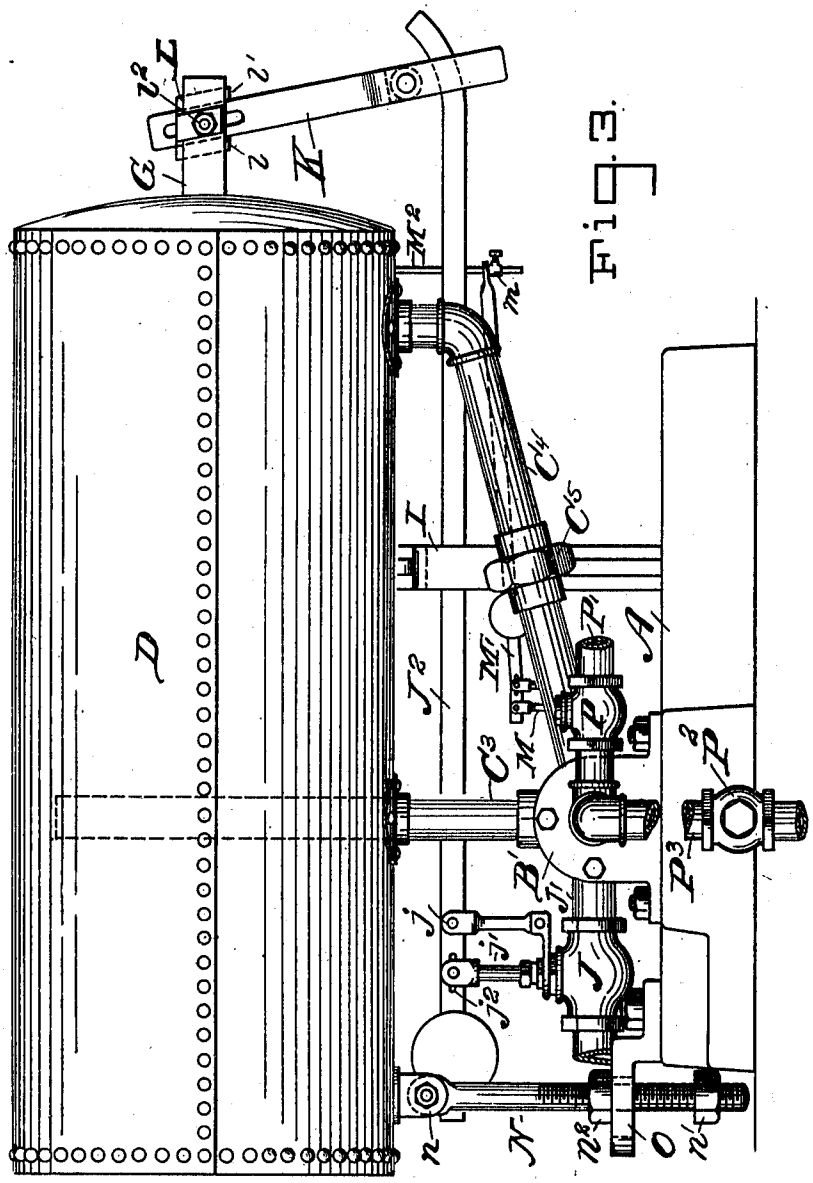
5 SHEETS—SHEET 3.

Fig. 3.



Witnesses

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5 SHEETS—SHEET 4.

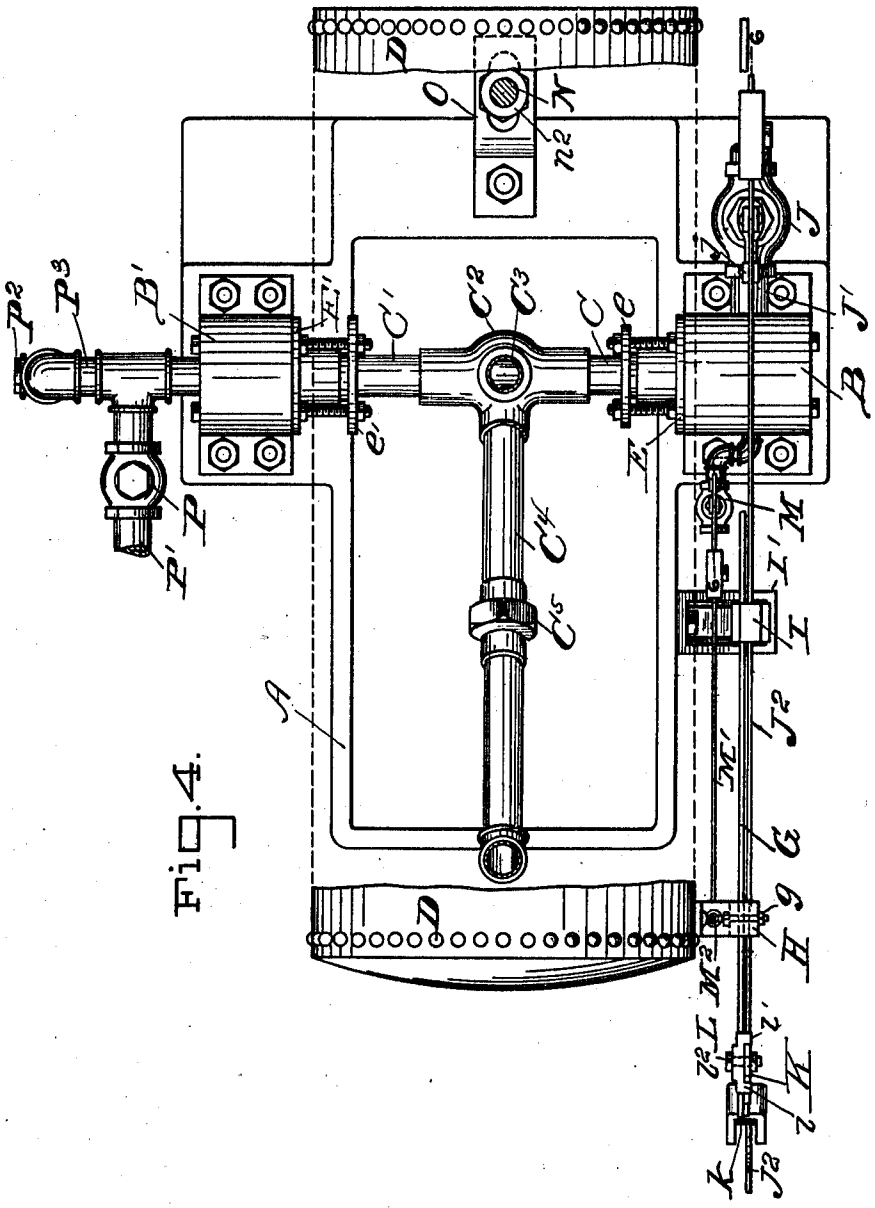

Fig. 4.

Witnesses
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5 SHEETS—SHEET 5.

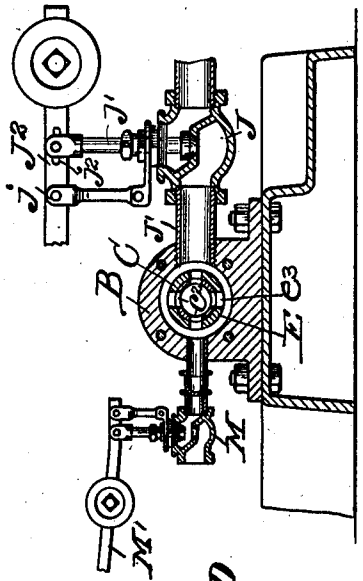

Fig. 6.

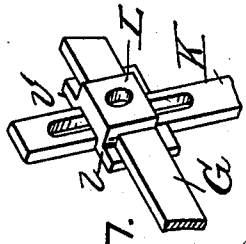

Fig. 7.

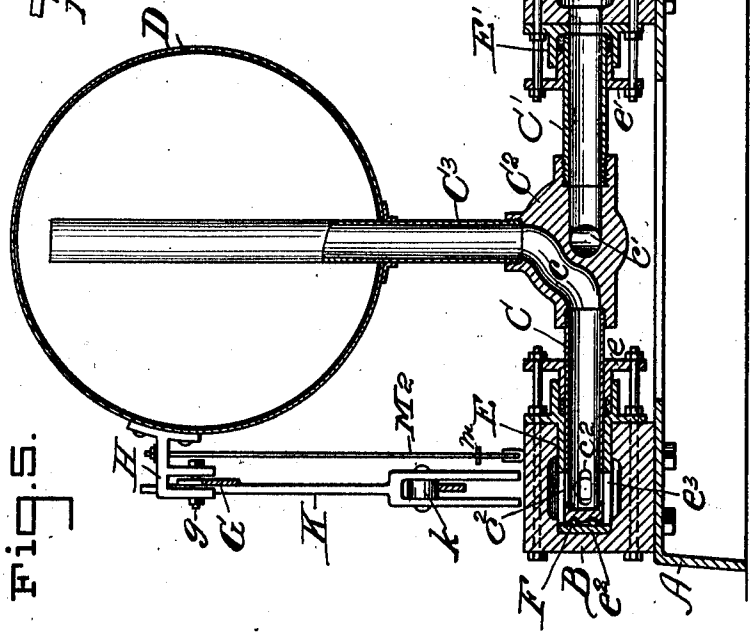

Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

JAMES EDWARD PURSER, OF WINDSOR, ONTARIO, CANADA, ASSIGNOR TO HERBERT J. MOREHEAD, OF DETROIT, MICHIGAN.

STEAM-TRAP.

988,385. Specification of Letters Patent. Patented Apr. 4, 1911.

Application filed March 10, 1910. Serial No. 548,514.

To all whom it may concern:

Be it known that I, JAMES EDWARD PURSER, a subject of the King of Great Britain, residing at Windsor, county of Essex, Province of Ontario, Canada, have invented a certain new and useful Improvement in Steam-Traps, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to an improvement in steam traps, shown in the accompanying drawings and more particularly pointed out in the following specification and claims.

The object of my invention is an improvement in the general construction of traps of the tilting type,—the purpose of which is to produce a more effective and efficient apparatus, to reduce the cost of manufacture, and the cost of assembling the parts.

One feature of the present invention consists in providing means whereby the valve controlling the admission of steam to the tank may be fully opened through the action of the tank in tilting. The arrangement of the weighted lever,—serving to hold the tank in its normal position,—being such that the movement of the same is greater than that of the tank. It will thus be seen that the lever operating the steam valve, which is connected by a rod with the tank supporting lever, is thereby adapted to open the steam valve to a greater extent than has heretofore been possible in traps of this type.

Another feature of the invention consists in providing ball bearings at one end of the trunnion on which the tank is mounted to reduce the friction of that end of the trunnion resulting from the sudden admission of boiler pressure to the tank,—the arrangement also providing for the admission of steam at the end of the trunnion to balance said pressure.

Another feature of the invention consists in providing an adjustable rod to limit the movement of the tank whereby the degree of its tilting movement may be controlled.

Another feature is the bracket member secured to the side of the tank to which is pivoted the weighted lever designed to support the tilting tank in its normal position, and to which the rod for operating the air vent valve is engaged.

Other advantages and improvements will hereafter appear.

In the drawings accompanying this specification: Figure 1 is a side elevation of the trap in its normal position. Fig. 2 is a side elevation of the trap with parts broken away, showing it in the position occupied when discharging condensation back to the boiler. Fig. 3 is a side elevation of the trap in its normal position, looking toward the side opposite to that shown in Fig. 1,—the view indicating the pipes leading from the heating or condensing system to the trap and from the trap to the boiler. Fig. 4 is a plan view of the apparatus with a portion of the tilting tank broken away to disclose the construction and arrangement of the parts lying directly below the same. Fig. 5 is a cross-sectional view on line 5—5 of Fig. 1, looking in the direction indicated by the arrows, the rocking fulcrum of the weighted lever for supporting the tank being removed that the parts lying directly back of it may be disclosed. Fig. 6 is a detail sectional view on line 6—6 of Fig. 4, through the air valve, steam valve, and the chambered bearing;—with which they are connected. Fig. 7 is a detail perspective view of the casting mounted upon the lever for supporting the tilting tank, to which the arm engaging the steam valve lever is attached.

As is well known return traps of this type are mounted above the boiler and connected therewith by suitable piping, being also connected with the heating system or other condensing surface so as to deliver the condensation into the tilting tank,—the latter being supported normally in a horizontal position to receive the water by a weighted lever provided for the purpose. Upon the condensation accumulating in the trap sufficiently to overcome the action of the weighted lever, the trap is forced to tilt; this action opens the valve controlling the admission of steam from the boiler to the tilting tank. The pressure in the tank and that in the boiler being now equalized by the admission of steam to the tank, the condensation accumulated in the tank is free to flow by gravity back to the boiler. When the water in the tank has been discharged, the weighted lever again becomes active and forces the tilting tank back to its normal position

which action closes the steam valve and opens an air vent, whereby the pressure remaining in the tank is exhausted leaving the water, or condensation, again free to enter the tank. Suitable check valves are provided between the boiler and trap, and between the trap and heating system, which alternately close against the boiler pressure, and the heating system, in accordance with the position of the tilting tank, as will be hereafter explained.

I will now indicate the several parts by reference letters.

A is a base plate of suitable form upon which are bolted chambered bearings B and B′.

C and C′ are trunnions supported in the bearings B and B′ and engaged to a hub C^2 from which rises a steam pipe C^3. A passage c is provided in the hub to connect the trunnion C with said pipe.

D is a tilting tank mounted at one side of its center of gravity upon the steam pipe C^3, a connecting section of pipe being provided, projecting upwardly in the tank to a point relatively near its top.

C^4 is a water pipe leading from the hub C^2 upwardly on an angle and connected with the forward end of the tank. To facilitate the ready connection of this pipe with the tank and hub, it is formed in two sections joined together by a coupling C^5.

c' is a passage in the hub C^2, connecting the pipe C^4 with the tubular trunnion C′.

E′. E′, are brass bushings for the trunnions C and C′ being bolted to their respective chambered bearings B and B′. Integral with the bushings are stuffing boxes, cooperating with the glands e and e' in turn adapted for adjustment by the bolts engaging the bushing to the bearings, whereby a tight joint is secured between the chambered bearings and the trunnions. The bushing E is provided with an end wall e^2, which serves as a race for the ball bearing F. The end of the trunnion C being closed and provided with a circular channel, forms the opposite race for the ball bearing. The trunnion C is provided with radial ports c^2, opening into the chambered portion of the bearing B. The bushing E is also provided with radial ports e^3 whereby communication is established between the chambered bearing B and the trunnion. The radial ports in the bushing extend to a point adjacent to the end of the trunnion, thereby admitting steam between the end of the trunnion and bushing to assist in equalizing the pressure.

G is a weighted lever one end of which projects beyond the end of the tank, being pivoted at g to the bracket H secured to the tank. G′ is a weight adjustably secured to said lever.

I is a swinging leg serving as a fulcrum for the weighted lever G, being supported at its lower end in a socket I′ bolted to the side of the base plate. The swinging leg at its top is slotted for the passage of the weighted lever at which point it is provided with a knife edge i designed to enter a corresponding notch in the lever.

J is a steam valve governing the admission of steam from the boiler to the tank through the pipe J′ connected with the chambered bearing B.

J^2 is a weighted lever fulcrumed to an arm j mounted upon the casing of the valve J.

j' is a valve stem pivoted to the weighted lever by a bolt projecting through the slot j^2 in said lever.

K is an adjustable arm connected to the end of the weighted lever G by a casting L mounted thereon and provided with guide lugs l and l' between which said arm is adjustably secured by a bolt l^2 engaging the lever G through a slot in the arm K. The arm K at its lower end is forked and between its tines is journaled a friction roll k designed to bear upon the weighted lever J^2, when the tank is tilted as shown in Fig. 2.

M is a relief valve connected by a nipple and suitable elbows with the chambered bearing B. M′ is a weighted lever for actuating said valve.

M^2 is a rod suspended from the bracket H, its lower end projecting through an aperture provided in the end of the lever M′.

m is a stop sleeved on the rod M^2, and adapted to be secured to the latter. By adjusting the stop the weighted lever M′ may be actuated to a greater or less extent upon the tank returning to its normal position.

By referring to Fig. 6 of the drawings, it will be seen that when the steam valve J is open the relief valve M is closed, and vice versa.

To govern the degree to which said tank may be tilted an adjustable stop rod N is provided secured to the tilting tank at one end by a jointed or pivotal connection n. To the base is attached a forked casting O designed to receive between its tines the screw-threaded rod N.

n' and n^2 are nuts having a screw-threaded engagement with the rod N, being spaced apart to receive between them the tines of the casting O. By adjusting these nuts, the limit of movement allowed the tank is controlled.

P is a check valve in line with the pipe P′ leading from the heating system or other condensing surface to the tank.

P^2 is a check valve in line with the pipe P^3 leading from the tank to the boiler.

Having indicated the several parts by reference letters, the construction and operation of the trap will be readily understood.

As is well known, the trap should be mounted approximately four feet above the water level of the boiler, and connected with

the heating system and with the boiler by suitable piping.

In its normal condition the tank is supported in a horizontal position as indicated in Fig. 1, the condensation is now free to enter the tank through the pipe P′, past the check valve P, through the trunnion C′ and pipe C^4 to the tank. When the weight of the water accumulated in the tank overcomes the action of the weighted lever G, the tank will tilt. This action causes the friction roll carried by the arm K to bear upon the weighted lever J^2, thereby opening the steam valve J, at the same time releasing the weighted lever M′ of the relief valve M, by which means the latter is seated. Immediately upon the steam valve being opened, boiler pressure is admitted to the tank by way of the pipe J′ through the chambered bearing B; from thence through the ports of the trunnion C, through the trunnion to the pipe C^3, and by it to the tilting tank above; thereby equalizing the pressure in the tank with that in the boiler. The pressure in the tank being equal to that in the boiler, the condensation in the tank is free to pass by gravity out through the pipe C^4, through the passage c', the trunnion C′ connected with the chambered bearing B′, and thence through the pipe P^3, past the check valve P^2 to the boiler. It will be seen that upon the admission of steam to the tank that the check valve P will close against the heating system thereby preventing the entry of water to the tank until the tank resumes its normal position and also preventing the passage of boiler pressure to the heating system,—it being understood that the pressure in the heating system is nominal compared with that of the boiler. Owing to the sudden admission of boiler pressure to the tank, it has been found that the trunnions on which the tank is mounted are apt to bind in the bearings due to the end thrust resulting from the admission of boiler pressure. To relieve the friction I have provided a ball bearing at the end of the trunnion and have also provided for the admission of steam between the end wall of the bushing and the trunnion for the purpose of equalizing the pressure on the trunnions. Immediately upon the water in the tank being discharged into the boiler, the weighted lever G again becomes active returning the tank to its horizontal or normal position. This action closes the steam valve J, its weighted lever J^2 becoming active when relieved of the pressure of the arm K. As the tank D assumes its normal position, it lifts the rod N secured to the bracket H attached to the side of the tank. This action lifts the weighted lever M′ controlling the relief valve M by opening which the tank is quickly freed of any remaining pressure contained therein, thereby putting it in condition to again receive the condensation from the heating system. Upon the tank assuming its horizontal or normal position, the check valve P is opened to the pressure of the heating system. The condensation is now free to pass to the tank, while the check valve P^2 closes, due to the boiler pressure, which is thereby cut off.

As heretofore constructed, the bearings for the trunnions have formed an integral part of the base plate,—the base being chambered to afford a passage for steam and water connections. This construction has been found objectionable in machining and assembling the parts it being much more costly to machine and particularly difficult to properly aline the bearings in order to insure freedom of movement of the trunnions. The present construction provides for independent chambered bearings,—the parts being relatively small are easy to machine and the construction is such that they may be assembled by causing the trunnions to enter their open side walls when it is a comparatively easy matter to properly aline the parts and secure the bearings to the base.

In order to control the degree of movement accorded to the tilting tank, a jointed screw-threaded rod N is provided,—the tank being free to move a distance corresponding to the space between the adjustable nuts n' and n^2 mounted thereon.

By the present construction I am enabled to provide a greater valve movement than has heretofore been possible in traps of this type,—it having been customary to directly connect the means governing the raising of the steam valve lever with the tank thus limiting the movement of the lever to the degree of movement afforded by the tank. In the present construction the tank is supported in its normal position by a weighted lever independent of the same, and not by a weight attached to the end of the tank or by a weighted lever which simply serves to return the tank to its normal position, and performing no other function.

It will be seen by reference to the drawings that by a peculiar arrangement of the parts in the present construction, I am enabled to secure a greater degree of movement of the lever governing the opening of the steam valve, than would be possible if said lever was operated directly by the tilting tank.

Having thus described my invention, what I claim is:—

1. In a steam trap, a tilting tank, means for separately leading both condensation and steam to the tank, a weighted lever pivoted to the tank and fulcrumed to provide a movement of the end of the lever relatively greater than that of the tank in tilting, a valve governing the admission of steam to the tank, a lever controlling the operation

of said valve, and means carried by the first named lever for actuating the steam valve lever upon the tilting of the tank.

2. In a steam trap, a tilting tank, tubular trunnions communicating with and supporting the tank and through which steam and condensation may pass to the tank, one of the trunnions having a closed end, chambered bearings for said trunnions, an annular bushing inclosing the trunnion which has a closed end and provided with radial slots to establish communication between the corresponding chambered bushing and the trunnion which has the closed end, a ball bearing between the end wall of the bushing and the closed end of the trunnion, and an automatically controlled valve for admitting steam to the tank through said trunnion.

3. In a steam trap, a tilting tank, tubular trunnions communicating with and supporting the tank and through which steam and condensation may pass to the tank, chambered bearings for said trunnions, one of said trunnions having a closed end, an annular bushing inclosing the trunnion which has a closed end, the bushing and the trunnion having openings for registration to establish a cut-off communication between the trunnion which has a closed end and the corresponding bushing, and an automatically controlled valve for admitting steam to the tank through said tubular trunnion.

4. In a steam trap, a tilting tank, a base plate upon which said tank is supported, a bracket bolted to one end of said tank, a weighted lever pivoted in said tank bracket, one end of said lever projecting beyond the end of the tank, a swinging fulcrum bar for said lever provided with a knife edge adapted to enter a corresponding notch formed in the lever, a recessed member carried by the base to support the lower end of the swinging fulcrum bar, a valve controlling the admission of steam to the tank, a weighted lever for operating said valve, an arm secured to the projecting end of the first named lever adapted to actuate the steam valve lever, a relief valve adapted to be opened when the steam valve is closed and vice versa, said relief valve also provided with a weighted lever, and an arm engaging said relief valve lever actuated by the movement of the tank and provided with an adjustable stop whereby said relief valve may be opened when the tank is returned to its normal position.

5. In a steam trap, means for separately leading both condensation and steam to the trap, a tilting tank supported upon trunnions, a base plate, bearings for the trunnions mounted upon the base plate, one of the bearings having a closed end wall, a ball bearing between the end of one of the trunnions and the closed end wall of the bearing supporting the trunnion, whereby the friction due to the lateral thrust of the trunnion may be relieved, and an automatically operated valve controlling the admission of steam to the tank.

6. In a steam trap, means for separately leading both condensation and steam to the trap, a tilting tank supported upon tubular trunnions adapted for the passage of steam to the tank and condensation to and from the tank, the trunnions supported in suitable bearings, a base plate carrying bearings to receive the trunnions, one of the bearings having a closed end wall, a ball bearing between the closed end wall of one of said bearings and the end of the trunnion to reduce the friction due to lateral thrust of said trunnion in admitting steam to the tank, an automatically operated valve governing the admission of steam through one of the trunnions to the tank, and a pair of check valves; one of which is in line with the pipe for leading condensation to the other trunnion, the other of said check valves being in line with the pipe leading from said last named trunnion to a boiler.

7. In a steam trap, a tilting tank, tubular trunnions supporting the tank through which steam and condensation may pass to said tank, chambered bearings for said trunnions secured to a base plate, the base plate, an annular bushing inclosing the end of one of said trunnions provided with radial slots for the passage of steam to the trunnion, a stuffing box for insuring a tight joint between the trunnion and bearing, a ball bearing between the end wall of the bushing and the closed end of the trunnion, and an automatically controlled valve for admitting steam to the tank through said tubular trunnion, substantially as described.

8. In a steam trap, a base plate, bearings mounted on the base plate, trunnions having communication with the tank and supported in said bearings and through which trunnions steam and condensation may pass to said tank, a weighted lever provided with a knife edge adapted to engage the weighted lever, an automatically operated valve governing the admission of steam through one of the trunnions to the tank, and a pair of check valves, one in line with the pipe for leading condensation to the other trunnion, and the other of said check valves being in line with the pipe leading from the said last named trunnion to the boiler.

9. In a steam trap, a tilting tank supported upon trunnions, the trunnions, a base plate carrying bearings for said trunnions, a bracket bolted to the tank, a weighted lever pivoted in said bracket adapted to support the tank in its normal position, a swinging fulcrum leg for said lever, its lower end supported by the base plate, an automatic valve for controlling the admission of steam

to the tank, a relief valve, a lever for actuating said relief valve, and a rod suspended from the bracket provided with an adjustable stop to engage the lever of the relief valve whereby the latter may be actuated upon the tank being returned to its normal position.

10. In a steam trap, a tilting tank, tubular trunnions supporting the tank through which steam and condensation may pass to said tank, one of said trunnions being closed at its end and provided with radial ports for the passage of steam, chambered bearings for said trunnions secured to a base plate, the base plate, means for admitting steam between the end of the bearing and the closed end of the trunnion whereby the pressure may be balanced relieving the end thrust on the bearing due to the admission of steam to the tank, a stuffing box for insuring a tight joint between the trunnion and bearing, and an automatically controlled valve for admitting steam to the tank through said tubular trunnions, substantially as described.

11. In a steam trap, a tilting tank, means for separately leading condensation and steam to the tank, a valve governing the admission of steam to the tank, a lever controlling the operation of said valve and a weighted lever pivoted to the tank and fulcrumed to provide a movement of the end of the lever relatively greater than that of the tank in tilting and having connection with the lever which controls said valve to effect a full opening of the steam valve under the influence of the tilting action of the tank.

In testimony whereof, I sign this specification in the presence of two witnesses.

JAMES EDWARD PURSER.

Witnesses:

GRACE E. WYNKOOP,

SAMUEL E. THOMAS.