No. 671,374. Patented Apr. 2, 1901.

R. J. FLINN.

AUTOMATIC BOILER FEEDER.

(Application filed May 28, 1900.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

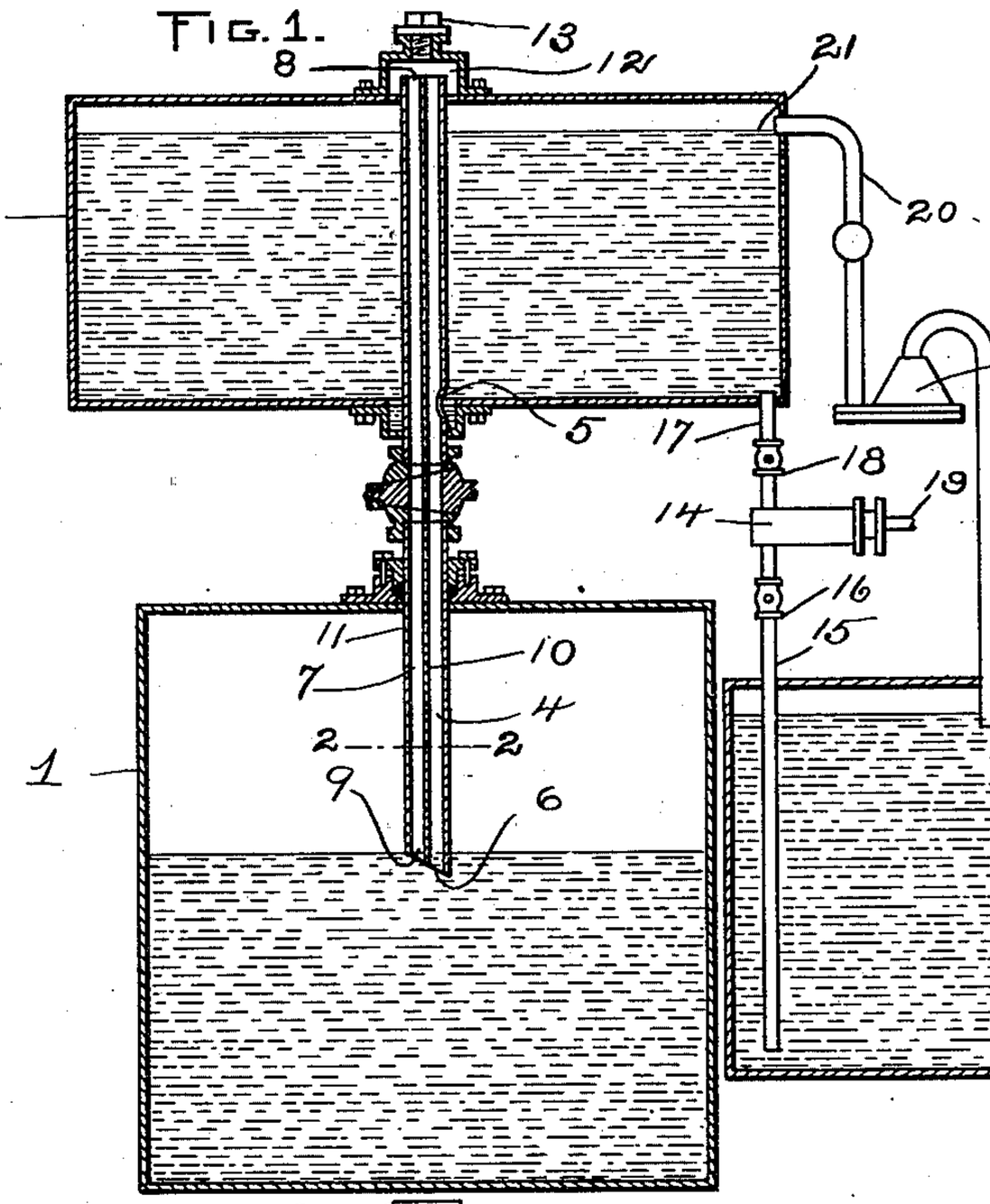

FIG. 2.

FIG. 3.

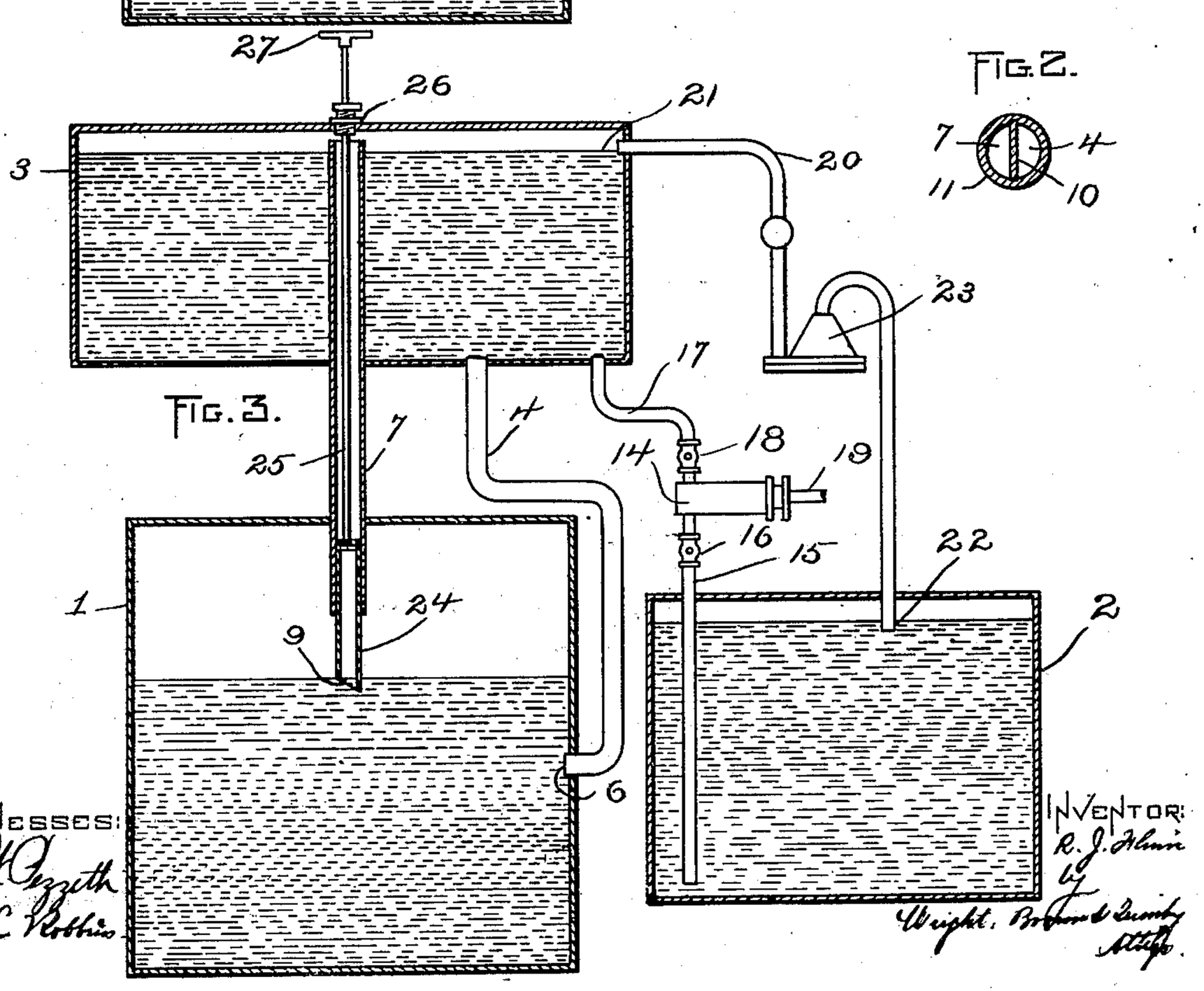

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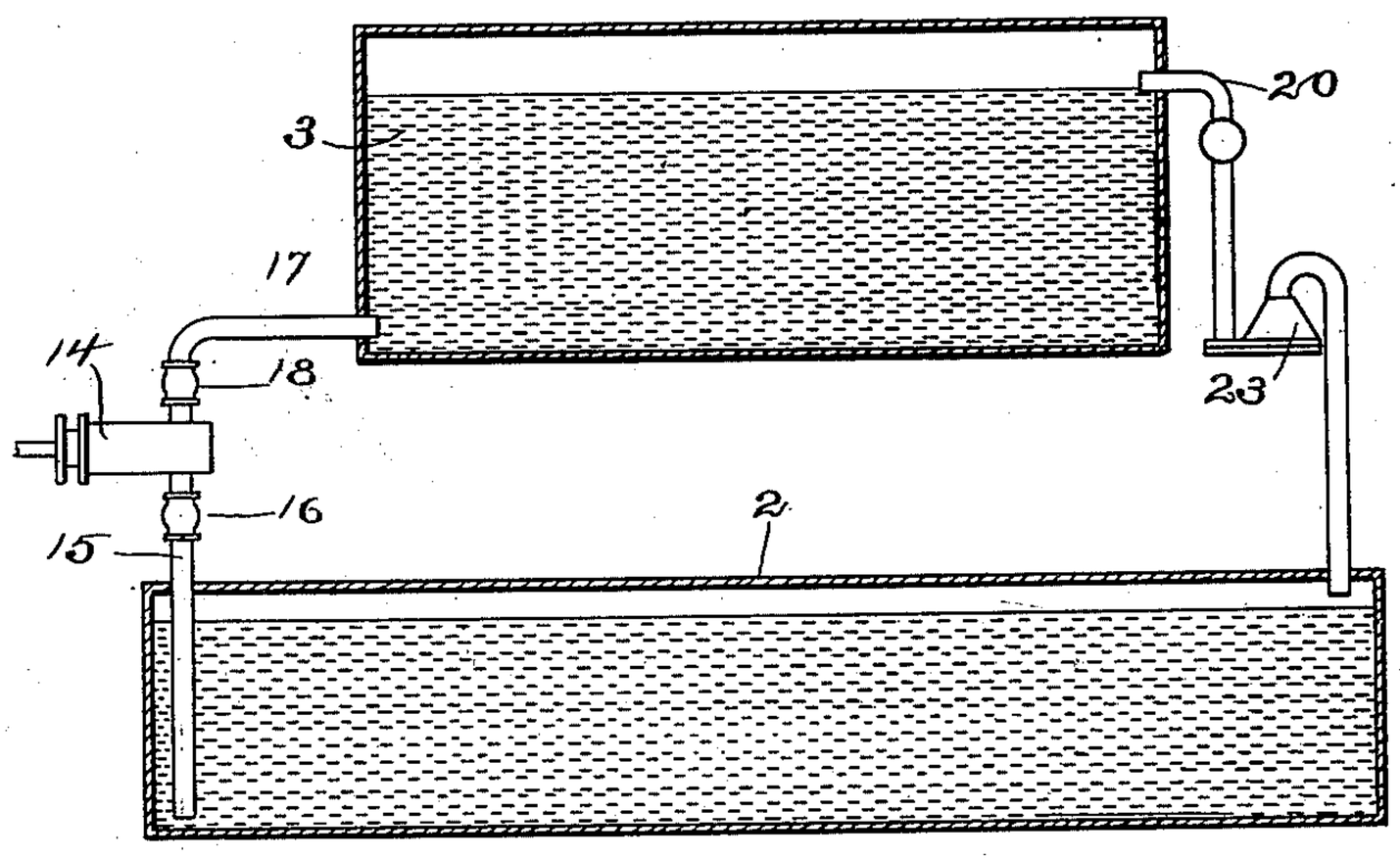
FIG. 4.



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UNITED STATES PATENT OFFICE.

RICHARD J. FLINN, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO THOMAS F. FLINN, OF BROOKLYN, NEW YORK.

AUTOMATIC BOILER-FEEDER.

SPECIFICATION forming part of Letters Patent No. 671,374, dated April 2, 1901.

Application filed May 28, 1900. Serial No. 18,219. (No model.)

To all whom it may concern:

Be it known that I, RICHARD J. FLINN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Automatic Boiler-Feeders, of which the following is a specification.

This invention relates to devices for automatically maintaining the water in a steam boiler or generator at a practically-constant level irrespective of the varying amount of loss which may take place by evaporation.

The invention consists in the improvements which I shall now proceed to describe and claim.

Of the accompanying drawings, Figure 1 represents a sectional diagrammatic view showing an embodiment of my invention. Fig. 2 represents a section on line 2 2 of Fig. 1. Fig. 3 represents a sectional view showing a modification and also showing an adjustment for varying the level in the boiler. Fig. 4 represents a sectional view showing another modification.

The same reference characters indicate the same parts in all the figures.

Referring at first to Figs. 1, 2, and 3, 1 represents a steam boiler or generator, which may be of any desired pattern and is provided with suitable means for heating it to vaporize the water or other liquid of vaporization.

2 is a main feed-tank constructed of sufficient capacity to contain a supply of feed-water for a relatively long period of use, and 3 is an elevated auxiliary feed-tank.

4 is a conduit connecting the elevated tank 3 with the boiler 1 and having an inlet 5 in the lower part of the tank and an outlet 6 located in the boiler at or below the desired minimum water-level.

7 is a conduit also connecting the tank 3 and boiler 1 and having an outlet 8 in the upper portion of the tank and an inlet 9 at its lower end, within the boiler 1, said inlet being located at the desired minimum level.

The conduits 4 and 7 may be formed by inserting a partition 10 in a single pipe or tube 11, as shown in Fig. 1, or they may be separate pipes, as shown in Fig. 3.

At 12, in the upper end of the tank 3, is an opening normally closed by a plug 13 and adapted to be used for the purpose of filling the system with water.

14 is a pump whose suction-pipe 15 connects with the lower part of the main feed-tank 2 and is provided with a check-valve 16, opening toward the pump. 17 is the delivery-pipe from said pump, entering the auxiliary feed-tank 3 and having a check-valve 18, which opens toward the tank. The piston-rod 19 of the pump may be actuated in any suitable manner.

20 is an overflow-conduit having an inlet 21 in the upper part of the auxiliary tank 3 and an outlet 22 in the main tank 2.

23 is a steam-trap interposed in conduit 20 and adapted to pass water through said conduit, but prevent the passage of steam. Said trap may be of any well-known type.

The operation is as follows: Assuming that the apparatus is unfilled, the plug 13 is removed and a hose or pipe is inserted in the opening 12 and water introduced thereby. This water flows into the boiler 1 through the opening 5 in the conduit 4 and rises in the boiler to the level of the lower end 9 of conduit 7. The water continues to rise in the tank 3 until it reaches the level of the inlet 21 of overflow-conduit 20. Passing through said conduit and the trap 23 the water fills the main tank 2. The opening 12 is then closed. The water in the boiler 1 will rise only a short distance above the point 9, because of the resistance of the air above the water to being compressed. When the system has been filled, the opening 12 is closed and heat is applied to the boiler 1. The air above the water-line expands and forces the water which is above the level 9 back into the tank 3. When steam is formed, a circulation takes place between the boiler and the tank 3, a mixture of steam and water (as indicated by my experiments) ascending through the conduit 7 and solid water descending through conduit 4. The circulation continues as steam is being raised until the temperature of the water and pressure of steam are nearly the same in the tank 3 and boiler 1. The pressure of the steam in the tank is always somewhat less than the pressure in the boiler on account of the head of water in the tank and in the conduit 4. The steam-pressure in the

tank, plus the pressure of this column of water, balances the pressure in the boiler. When the water-level in the boiler falls below the point 9, bubbles of steam ascend through the conduit 7 into tank 3, thereby disturbing the pressure-balance by slightly increasing the pressure in the tank and causing a small quantity of water, enough to again seal conduit 7, to descend into the boiler through the conduit 4. This action is repeated at such short intervals that the circulation is practically continuous. The tube 11 is preferably beveled at its lower end, with the highest point on the side of the conduit 7. Being beveled, only a portion of said conduit 7 is unsealed when the water-level in boiler 1 falls, and the portion uncovered gives an opening of just sufficient size to admit the proper quantity of steam to the tank 3. If the steam is rapidly withdrawn from the boiler, the opening will be larger than when less steam is being used, the opening being automatically adjusted by the slow or fast fall of water in the boiler. The water in the boiler can fall only a short distance below the point 9, since otherwise it would give an increased opening at 9, more than would be sufficient to admit the proper amount of steam to tank 3. The water cannot be at a higher level than 9, since otherwise the conduit 7 would remain sealed and the supply of steam to tank 3 would be cut off, in which case the steam-pressure in tank 3 would fall owing to condensation, which in general is constantly taking place, and the superior pressure in the boiler would force the water which was above the level 9 back into the tank. Thus it will be seen that the water in the boiler is automatically maintained at practically a constant level, this being true irrespective of the amount of steam which is being used by the engine or other apparatus connected with the boiler or the level of water in the tank 3. In operation I prefer to supply a slight excess of water to the tank 3 over the amount necessary to make up the losses by evaporation. The pump 14 is therefore given a capacity or run at a speed slightly in excess of that required for feeding the boiler. The excess of water which has passed through the pump overflows through the conduit 20 and is returned through the trap 23 back into the main tank 2, said trap acting in the usual manner to permit the passage of water but prevent the passage of steam. An injector might be substituted for the pump 14.

Fig. 3 represents a modification in which the water-pipe 4 and the steam-pipe 7 enter and leave the tank 3 and boiler 1 at different localities. The same principle of operation, however, exists in this construction as in that previously described. Fig. 3 also shows a device at the lower end of conduit 7 for varying the level at which the water is maintained in the boiler 1. The device, as shown, consists of a short tube section or sleeve 24, which telescopes within the main upper part of conduit 7 and is provided with an operating-rod 25. Said rod may extend through a stuffing-box 26 in the upper wall of tank 3 and be provided outside of said tank with a handle 27. By sliding the sleeve 24 up or down the level at which conduit 7 is sealed, and hence the working level of the water in boiler 1, may be varied. The construction, comprising the tube 11 and partition 10, as shown in Fig. 1, is simpler and better than that shown in Fig. 3, becauses it dispenses with certain joints. The partition 10 may be suspended or located more or less loosely in the tube 11, since it is only necessary for it to divide the circulation of the water and steam, providing for a down current of the water and an up current of the bubbles of steam.

It will be seen that the tank 3 in Fig. 1 is an elevated steam and water receptacle, into which a supply of water in excess of feed requirements is forced and which is connected with a feed-tank by means of an overflow-conduit so related to the tank 3 as to maintain a predetermined water-level therein with a steam-space above the water, there being a steam-trap interposed in the overflow-conduit to permit the passage of water from the elevated receptacle but prevent the passage of steam. The receptacle 3 might be the boiler itself, as represented in Fig. 4, in which 2 is a feed-tank, 3 is a steam and water receptacle or boiler, 14 a feed-pump for transferring water from tank 2 to receptacle 3, said pump delivering a quantity of water slightly in excess of that required to make up the evaporating losses, and 20 is an overflow-conduit connecting receptacle 3 with tank 2 and having a steam-strap 23.

My invention is particularly adapted for use in automobile vehicles or with any boiler where the heating-surface and evaporation in the boiler are large and the water capacity is small. In these boilers, as ordinarily fed, although the feed-pump may deliver a uniform amount of water per revolution of the engine, the quantity of steam required for a revolution constantly fluctuates, according to the grade and roughness of the roadway. Consequently the water-level in the boiler is subject to continual fluctuation, falling when the load on the engine is heavy and rising when the load is light. Without some form of automatic water-regulator a great deal of the attention of the driver is taken up with regulating by hand the supply of water to the boiler, and many accidents, such as burned boilers when the water gets too low and disabled engines when the water gets too high, have happened because of negligence in attending to the feeding of the boiler. With my improved regulator the water is maintained at a constant and economical level independently of the quantity furnished by the feed-pump. The water-level requires no attention from the driver for a relatively long period of time, depending on the capacity of the main reservoir. This is of much importance, especially when driving through a

crowded street, when the driver's whole attention is given to the guidance of the vehicle.

When my invention is applied to automobiles, it will be desirable to employ a form of steam-trap at 23 which is not subject to derangement by changes of level or inclination in the trap. A differential trap, such as that shown in Letters Patent No. 647,654, granted to me April 17, 1900, is the best type known to me for fulfilling this requirement.

It will be observed that the elevated feed-tank (shown in Fig. 2) insures a supply of water to the boiler for a relatively long period independently of the feed-pump. Hence the failure of the pump to work will have no effect, so long as there is any water in the feed-tank.

In the construction shown in Fig. 4 the boiler or receptacle 3 is not necessarily elevated above the feed-tank, as the boiler and tank may be on the same level, if desired, or the feed-tank may be above the boiler, the relative positions of the boiler and feed-tank being immaterial, so long as the trap is below the point where the outlet-pipe joins the boiler.

I claim—

1. The combination of a supply-tank, a steam and water receptacle, means to force the water from said tank into said receptacle, an overflow-conduit connecting the receptacle with the tank, and so related to the receptacle as to maintain a predetermined water-level therein with a steam-space above the water, and a steam-trap interposed in said overflow-conduit and adapted to permit the passage of water therethrough but prevent the passage of steam.

2. The combination of a steam boiler or generator, an elevated auxiliary feed-tank having a feed and steam connection with the boiler, whereby the level in the boiler is maintained practically constant by automatic gravity renewal from said tank, a main feed-tank, means to force the water from the main tank into the auxiliary tank, an overflow-conduit connecting the auxiliary tank with the main tank, and a steam-trap interposed in said overflow-conduit.

3. The combination of a steam boiler or generator, a feed-tank having a conduit connection with the boiler for the passage of feed-water from the tank to the boiler, and a second conduit connection therewith for the passage of steam from the boiler to the tank, the latter connection terminating in the boiler below the top thereof, and determining the water-level in the boiler, and a telescopic adjustment in said connection to vary the vertical position of the said terminus.

4. The combination of a steam boiler or generator, a feed-tank having a conduit connection with the boiler for the passage of feed-water from the tank to the boiler, and a second couduit connection therewith for the passage of steam from the boiler to the tank, the latter connection terminating in the boiler below the top thereof, and determining the water-level in the boiler, and a telescopic adjustment for the lower end of said second connection, whereby the vertical position of its terminus may be varied.

5. The combination of a steam boiler or generator, and an elevated feed-tank having a steam and feed conduit connection with the boiler, the steam connection terminating in a steam-inlet within the boiler below the upper end thereof, and adapted to establish a minimum water-level within the boiler, the said steam-inlet being inclined, and adapted to be opened in different degrees according to the level of the water in the boiler.

In testimony whereof I have affixed my signature in presence of two witnesses.

RICHARD J. FLINN.

Witnesses:
C. F. BROWN,
A. D. HARRISON.