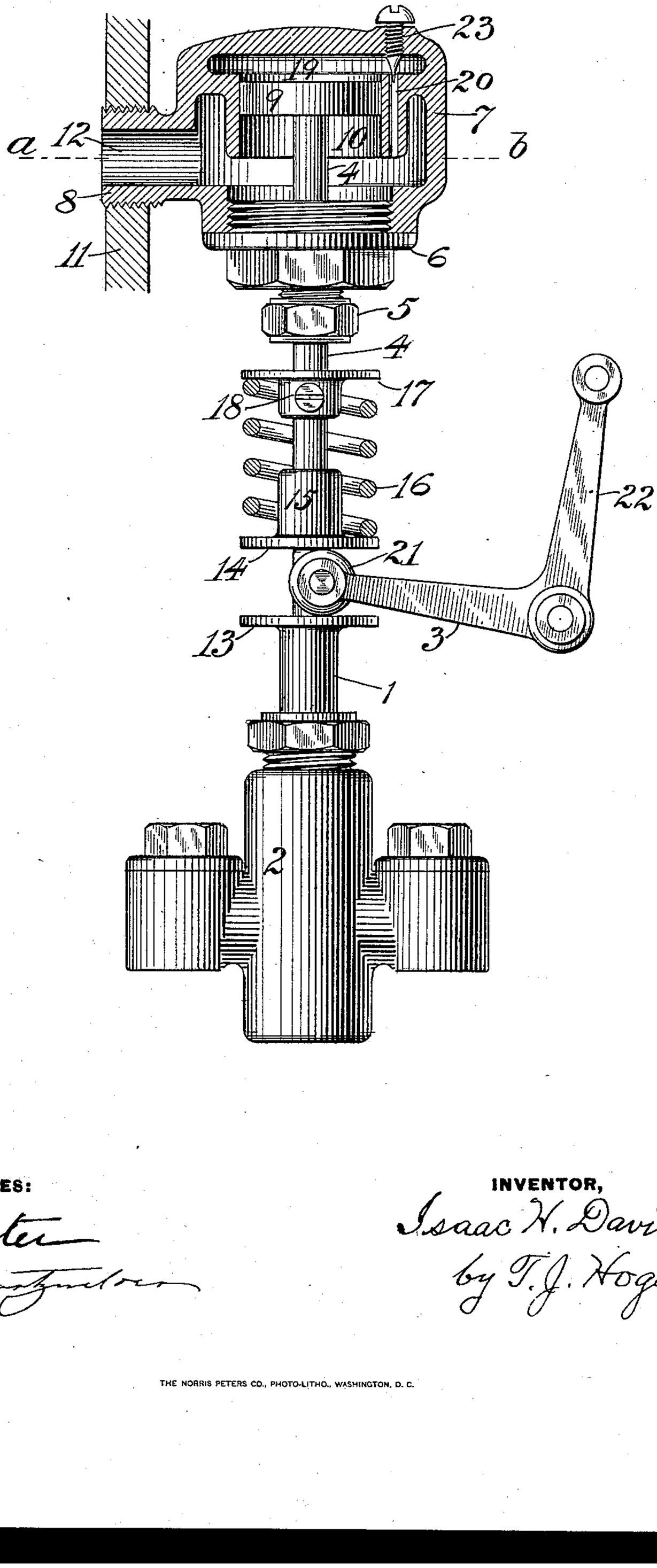
No. 661,853. Patented Nov. 13, 1900.

I. H. DAVIS.

FEED WATER REGULATOR.

(Application filed Nov. 27, 1899.)

(No Model.)



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ISAAC H. DAVIS, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO HENRY H. WESTINGHOUSE, OF PITTSBURG, PENNSYLVANIA.

FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 661,853, dated November 13, 1900.

Application filed November 27, 1899. Serial No. 738,328. (No model.)

To all whom it may concern:

Be it known that I, ISAAC H. DAVIS, a citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, have invented or discovered a certain new and useful Improvement in Feed-Water Regulators, of which improvement the following is a specification.

The object of my invention is to provide an improvement in supplying water to reservoirs or boilers; and to this end it consists in new and improved means for regulating the supply of water by and in accordance with variations in the height of the water in the reservoir or boiler, and means for supplying the water to the reservoir or boiler and in certain combinations and features of construction, as hereinafter set forth.

While my invention is specially intended for supplying and regulating the supply of water to reservoirs or boilers, it is equally applicable for the purpose of supplying and regulating the supply of any other liquid, and the regulating apparatus is adapted to control the supplying mechanism whatever the liquid supplied may be, and its principal feature consists in means whereby variations in the level of the liquid will cause the regulating device to be subjected to the action of the gas, steam, air, or vapor above the level of the liquid or to the action of the liquid itself, whereby the operation of the regulating device is changed or modified so as to vary the action of the supplying mechanism.

The accompanying drawing is a view, partly in section and partly in elevation, of a construction illustrating an application of my invention.

In the construction shown in the drawing, the plunger 1 of the feed-pump 2 is adapted to be operated by the movement of the arm 3 of a bell-crank lever, which may be oscillated by any preferred means, but which is preferably continuously in operation during the time that the boiler is in use. A rod 4, which is rigidly connected to the plunger 1, passes through a stuffing-box 5 on the cap 6 of a casing 7, which is attached to the boiler or water-column, and a piston 9, rigidly connected to the upper end of the rod 4, is fitted to work in a cylindrical bore 10 within the casing 7. The nozzle 8 is connected to the shell 11 of the boiler or water-column in such a position that the center line of the passage 12 will be on or about on the same level with the desired water-line in the boiler, (represented by the line *a b* in the drawing.) One end of the lever-arm is bifurcated and provided on each side with a roller 21, which is adapted to bear against a flange or shoulder 13 on the pump-plunger 1 and against a flange or shoulder 14 on a sleeve 15, which is fitted to slide on the rod 4. The flange 14 is held in contact with the rollers by means of a spring 16, which bears at one end against the flange 14 and at its other end against a flange 17, formed on a collar 18, which is rigidly fixed on the stem 4.

When the level of the water in the boiler is below the line *a b*, the steam in the boiler will have access to and be directly in contact with both sides of the piston 9, the space 19 above the piston 9 being then in open steam communication with the space below the piston through the small passage 20. The movement of the lever-arm 3 will then move the pump-plunger 1, rod 4, and piston 9 up and down a distance equal to the full movement of the end of the lever-arm 3 and corresponding to the full stroke of the pump-plunger, the tension of the spring 16 being such that it is not compressed by the pressure of the lever-arm on the flange 14 when the piston 9 is exposed on both sides to contact with steam which fills the space above and below the piston and is free to circulate through the passage 20.

When the pump-plunger is operating at full stroke, which corresponds to its maximum capacity, the supply of water to the boiler will be in excess of the consumption and the water-level in the boiler will rise until it reaches the line *a b* or a slightly-higher level, which will cause it to seal the lower end of the small passage 20. When this occurs, the downward movement of the piston 9 will cause water to flow through the small passage 20 into the chamber 19 above the piston, the flow being caused by the pressure of the steam in the boiler acting on the surface of the water in the boiler. On the upstroke the movement of the piston 9 is resisted by the water in the chamber 19, which cannot escape quickly

through the small passage 20, and this resistance to upward movement of the piston 9 and rod 4 causes compression of the spring 16 by the lever-arm 3, which moves the sleeve 5 upward on the rod 4. This compression of the spring permits the lever-arm 3 to make its full upward movement without moving the pump-plunger 1 through its full upstroke and the stroke of the plunger is shortened to the extent that the spring is compressed. The shortening of the stroke of the pump-plunger decreases the supply of water fed to the boiler and prevents the water-level from rising too high.

When the water-level falls below the desired height in the boiler, the passage 20 will be open at its lower end to the steam-space, the water above the piston will be discharged through the passage 20, and the piston 9 will be in contact on both sides with steam only and will be practically balanced, or nearly so, by steam-pressure. The steam will offer practically no resistance to the upward movement of the piston, and therefore, as the spring will not be compressed, the pump-plunger will be moved through its full stroke and the pump will be operated at its maximum capacity to feed water to the boiler.

The arm 22 of the bell-crank lever may be connected to some moving part of an engine which is supplied with steam from the boiler, so that the feed-pump will be in operation so long as the engine is running and will cease operating when the engine is stopped.

It will be seen that my invention provides means whereby a certain resistance is rendered effective to decrease the supply of water to the boiler when the water-level reaches or exceeds the desired height and whereby such resistance is removed to permit of an increase in the supply when the water falls below the desired or safe level.

For the purpose of regulating the degree to which the small passage 20 may be restricted I employ a small valve 23, which may be adjusted from the outside of the casing.

I claim as my invention and desire to secure by Letters Patent—

1. In a feed-water or other liquid regulator for reservoirs or boilers, the combination, with the liquid-supply pump, of a movable piston, which is adapted to be in direct contact, on both sides, with steam or other gaseous fluid or vapor in the boiler or reservoir when the liquid-level is below a certain height, and which, when the liquid is at a higher level, is in contact, on one side, with the liquid in the reservoir or boiler, and means whereby the liquid acts to vary the length of the stroke of the pump.

2. In a feed-water or other liquid regulator for reservoirs or boilers, the combination, with the liquid-supply pump, of a piston connected thereto, a chamber or space on one side of the piston, and a small or restricted passage through which the chamber communicates with the interior of the reservoir or boiler and means whereby the length of the stroke of the pump is varied by the resistance to the movement of the piston.

3. In a feed-water or other liquid regulator for reservoirs or boilers, the combination, with the liquid-supply pump, of a piston connected thereto, a chamber, or space, on one side of the piston, and a small or restricted passage connecting the chamber with the interior of the reservoir or boiler and so located that the chamber may be charged with the steam or air or other gas or vapor, which is above and in contact with the liquid, when the level of the liquid is below a certain height, or with liquid when the level of the liquid is above a certain height and means whereby the liquid acts to vary the length of the stroke of the pump.

4. The combination, with the water or other liquid supply pump of a reservoir or boiler, of a piston connected thereto which is adapted to be exposed on both sides to the steam, air or vapor in the reservoir or boiler when the liquid-level is below a certain height, and which, when the liquid in the reservoir or boiler reaches or exceeds a certain height, is adapted to be acted on directly by liquid from the reservoir or boiler and means whereby the length of the stroke of the pump is varied according to the resistance to the movement of the piston.

5. The combination, with the water or other liquid supply pump of a reservoir or boiler, of a piston which is adapted to be moved by a movable part of the liquid-supply pump, and which has communications from its opposite sides to the interior of the reservoir or boiler, and means whereby the length of the stroke of the pump may be varied by the resistance to the movement of the piston.

6. The combination, with the feed-pump of a reservoir or boiler, of a piston connected therewith, which is in contact with the steam, air or gas in the reservoir or boiler when the water or other liquid is below a certain level, and means whereby water or other liquid may be supplied to one side of the piston to resist its movement and to vary the length of the stroke of the pump.

7. The combination with a feed-pump for a reservoir or boiler, of a piston adapted to be operated simultaneously therewith, which is connected to a movable part of the pump, and which is adapted to be exposed on its opposite sides to contact with the steam, air or gas in the reservoir or boiler when the water-level is below a certain height, and on one side to contact with the liquid in the reservoir or boiler when the water-level reaches or exceeds a certain height, and a restricted passage through which liquid may pass to and from the reservoir or boiler to one side of the piston, and means whereby the length of the stroke of the pump may be varied by the resistance to the movement of the piston.

8. The combination, with a feed-pump for reservoirs or boilers, of means for actuating

the pump, a regulating device which is adapted to be acted on by water or other liquid in the reservoir or boiler to resist the operation of the pump, and a spring the compression of which is adapted to be varied so as to vary the stroke of the pump.

9. The combination, with a feed-pump for reservoirs or boilers, of a rod connected to the piston or plunger of the pump, actuating means for the pump, a spring through which the actuating means moves the rod, a piston exposed to the fluid in the reservoir or boiler, a chamber on one side of the piston, and a small or restricted passage through which the chamber communicates with the reservoir or boiler.

10. The combination with the feed-pump of a reservoir or boiler, a chamber connected at its lower end to the interior of the reservoir or boiler, a piston connected to the pump and adapted to reciprocate vertically in said chamber, and a small passage from the lower to the upper side of the piston whereby the liquid will be forced through the small passage and retard the movement of the piston when the level in the reservoir or boiler rises to the level of the opening to said small passage.

11. In a feed-water or other liquid regulator for reservoirs or boilers, the combination, with the liquid-supply pump, of a movable piston, which is adapted to be in direct contact with steam or other gaseous fluid or vapor in the boiler or reservoir when the liquid-level is below a certain height, and which, when the liquid is at a higher level, is in contact with the liquid in the reservoir or boiler, and means whereby the liquid acts to vary the length of the stroke of the pump.

In testimony whereof I have hereunto set my hand.

ISAAC H. DAVIS.

Witnesses:
MARCUS B. MAY,
H. H. WESTINGHOUSE.