G. H. BURROUGHS.

Feed Water Heaters and Feeders.

No. 195,975. Patented Oct. 9, 1877.

Fig. 1.

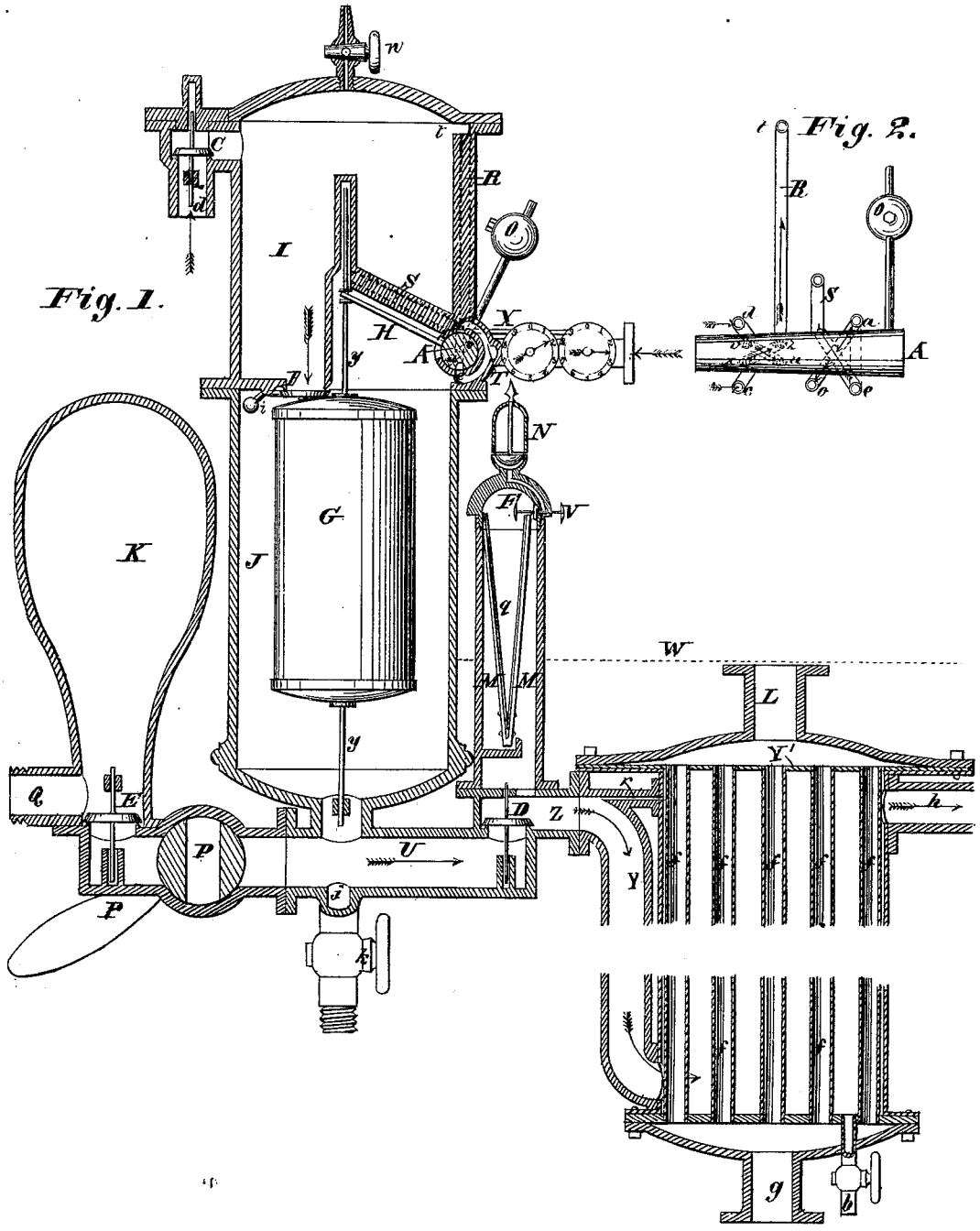


Fig. 2.




WITNESSES

Chas J. Cook

Le Blond Burdett

INVENTOR

Geo. H. Burroughs

By Knight Bros Attorneys

# UNITED STATES PATENT OFFICE.

GEORGE H. BURROUGHS, OF PRINCETON, NEW JERSEY.

## IMPROVEMENT IN FEED-WATER HEATERS AND FEEDERS.

Specification forming part of Letters Patent No. **195,975**, dated October 9, 1877; application filed December 16, 1876.

*To all whom it may concern:*

Be it known that I, GEO. H. BURROUGHS, of Princeton, in the county of Mercer and State of New Jersey, have invented a new and useful Improvement in Safety Feed-Pumps, of which the following is a specification:

The object of this invention is to furnish a convenient, efficient, and complete steam-pump, which shall supply steam-boilers with feed-water, (acting independently of engine and engineer,) shall supersede injectors and force-pumps and shall prevent accidents occasioned by impure and low water, and a large proportion of those which arise from the carelessness and incompetency of attendants.

It consists in the arrangement of the chambers, valves, and pipes which connect the parts one with another and with the boiler; in the combination of the said valve mechanism with the several parts and with the boiler, as hereinafter described; and in the devices (necessary to its completeness) for balancing the valve A, for heating and purifying the water, and for sounding an alarm in case of any stoppage or derangement of the apparatus.

Figure 1 of the accompanying drawings represents a vertical section of this feeding device. Fig. 2 represents the valve A in vertical cross-section perpendicular to that of Fig. 1.

Similar letters of reference indicate corresponding parts.

The boiler is supposed to stand to the right, out of the field of vision.

The following is a description of my invention: The cylindrical chamber I J is divided into two compartments—the upper one, I, for cold water. The lower one, J, is the pump proper. J contains a hollow float, G, filled with air. It carries a rod, *y*, which, by means of the lever H, actuates the valve A. C is a valve opening upward, and admitting the water from the tank or other source of supply. B is another valve opening downward, and so counterpoised by the ball *i* as just to remain closed. Another valve, D, admits the water to the boiler when the pressure upward through it is greater than that in the boiler. *n* and *k* are cocks for emptying the pump, or for filling it at the start.

To the right of the pipe Z is the heater and purifier L *g*. It is a cylinder, with numerous pipes, *f f f*, conveying the exhaust steam (or, if there be no exhaust steam, the requisite quantity of live steam) from top to bottom through the feed-water. These pipes *f f* are fastened into the circular boiler-plate *y'*, which extends horizontally outside of them far enough to allow it to accommodate itself to their expansion. *r* is a small orifice opening from the top of the pipe Z into the upper part of the heater.

The pipe *b*, with cock, is for the purpose of blowing off the collected sediment. The pipe *h* connects with the boiler below the water-line W.

T is the steam-pipe, which connects the pump with the upper part of the steam-space of the boiler. When this pipe nears the plug-valve A it divides into two branches—one, *a*, entering the plug above, (see Fig. 2,) and running downward and backward to its exit *o* into J. The other branch, *e*, enters the plug below, and, running upward and backward, opens through S into the top of the pump-chamber J. This arrangement gives a perfectly-balanced valve, whether closed or open, whatever be the pressure of the steam. By a similar arrangement, when this valve is reversed, and the passages *a* and *e* for the entrance of steam from the boiler are closed, the orifices *c* and *d* from the chamber J will open (*c* through *x* and *d* through *v*) into the pipe R and orifice *t*, and thus form a passage from the lower chamber J to the upper chamber I. This again gives a balanced valve under any pressure and in any position.

Connected with the valve A is a rod and ball, O, which holds the valve in check until sufficient force has accumulated to render its action quick and complete. Attached to this rod is a horizontal rod, X, which connects, by means of a ratchet-wheel and pinion, with the dials, on which the number of gallons passed through the pump is registered.

Immediately over the valve D is the safety-alarm *q*, to give notice in case of any derangement of the pump. In it are two compound bars, M M, of brass and iron or other metals. Above them is the valve F, which opens a passage to the whistle N. V is a handle, by which this valve may be occasionally opened from the outside to prevent its sticking.

To the left of the pump is the fire-nozzle Q

and air-chamber K, which can be brought into immediate use by opening the cock P.

The operation is as follows: Both chambers of the pump are to be filled along with the boiler before firing up; or the pump can be filled at any time from beneath through the cock *k* by opening the valve A and the cock *n*. The float G is now lighter than the surrounding water, and will rise. This will turn the valve A, so as to connect the tubes S and T, opening a passage for the steam from the boiler. The pump is now virtually a part of the boiler. The pressure is the same in each, and the water being higher in the former will, by its own weight, flow into the latter. This current will continue until the water in the pump has fallen to the line W. Then the weight of the float, overcoming the resistance of the ball O, will cause it to fall, shut off the steam from the boiler, and open a passage, R, between the upper chamber I and lower chamber J. This will at once equalize the pressure in I and J, and the weight of the water in I will open the valve B. It will dash down, condense the steam in J, and produce a vacuum. The water from the tank will rush in and fill the whole pump I and J, the contents of J becoming warmed by the condensed steam. As soon as quiet has been restored the valve B will close, the float G will rise again, and the action will be repeated. After passing the valve D, the water descends to the bottom of the heater and purifier L *g*. This is large enough to contain a quantity of water sufficient to supply the boiler for half an hour or more. It rises very gradually, becoming heated and depositing its sediment during its ascent. When the pure water reaches the pipe *h* its temperature is nearly or quite 212° Fahrenheit, and its gradual introduction into the boiler occasions no perceptible lowering of temperature there, and does not check the speed of the engine.

The safety-alarm *q* is ordinarily filled with water moderately warmed; but should any stoppage of the pump occur, and the water in it fall as low as the top of the pipe Z, the steam, entering through the orifice *r*, will take the place of the water in the alarm. The compound bars M M will curve with the increased heat, open the valve F, and blow the whistle N. This is a notice at once of derangement of the pump and of low water in the boiler.

I do not confine myself to the precise form and arrangement of any of the parts described, as various modifications may be made in many ways without infringing the essentials and integrity of this invention.

On steamships and locomotives the valves can be held in place by springs instead of gravity. An air-chamber may be inserted between I and J to prevent the overheating of the water in I. The whole apparatus may be packed to prevent the loss of heat. The pump may be used as a force-pump or fire-engine. In the latter case two pumps can be placed side by side, their valves A consisting of one round bar, so bored as to cause the pumps to work alternately. This would form a most efficient fire-engine. Such changes and adaptations are only modifications, not properly departures from my invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The chamber I, provided with a valve for admitting steam, in combination with chamber J and a valve for establishing communication between the two, as and for the purpose set forth.

2. The combination of chambers I J, valves A B, and float G, as and for the purpose set forth.

3. The chamber I, in combination with valve A, passage R, chamber J, and valve C, as and for the purpose set forth.

4. The combination of chambers I and J and valves B and A, communicating with both of said chambers, as and for the purpose set forth.

5. The combination of chambers I and J, float G, valve A, having lever H, and counterbalance O, as and for the purpose set forth.

6. The valve B and steam-passage R, in combination with chambers I J, valve A, lever H, counter-balance O, and float G, as and for the purpose set forth.

7. The valve A, having ports *u v x z*, the induction-pipes *a e i* S, and eduction-pipes *c d* R, as and for the purpose set forth.

8. The combination of chamber I, counterbalanced valve B, and valve C, as and for the purpose set forth.

9. The chamber J, float G, steam-pipe T, valve D, and heater L, as and for the purpose set forth.

10. The alarm consisting of compound bars M M, valve F, whistle N, and steam-passage *r*, as and for the purpose set forth.

G. H. BURROUGHS.

Witnesses:
JAMES THORINGTON,
CHARLES R. HENDRICKSON.