

W. SHEDLOCK.
FEED WATER HEATER AND PURIFIER.

No. 520,084.

Patented May 22, 1894.

Fig. 1.

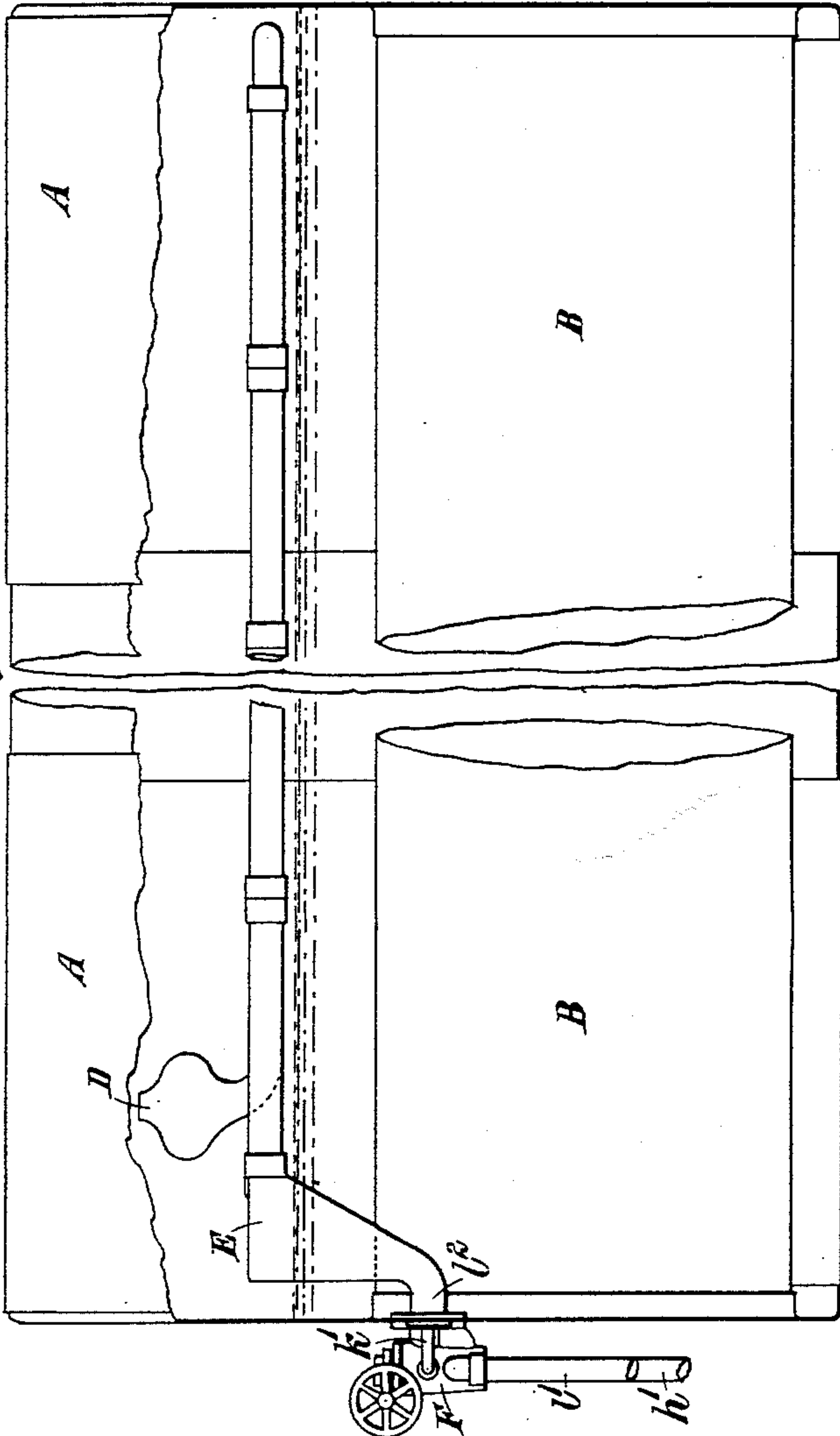


Fig. 2.

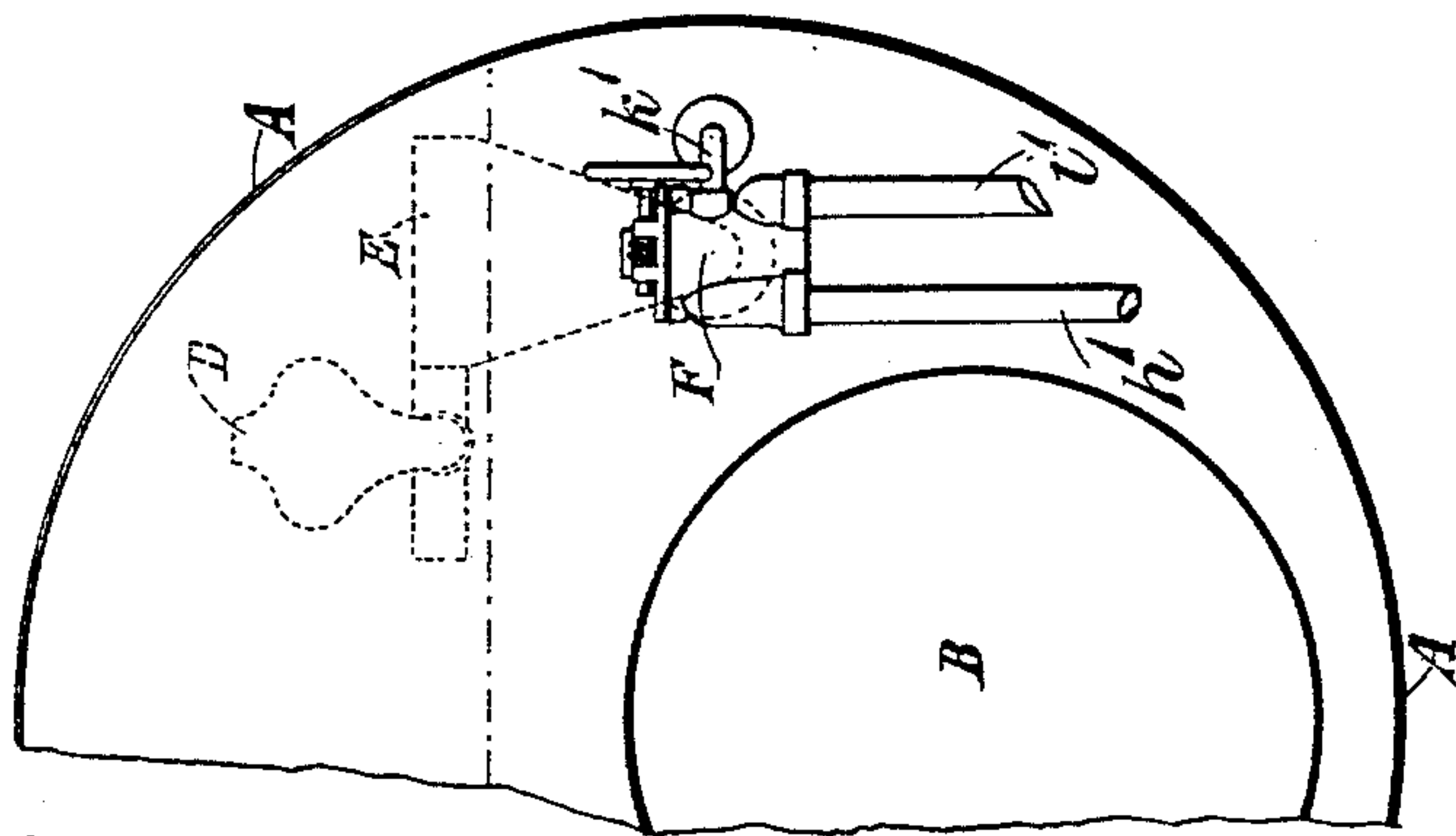
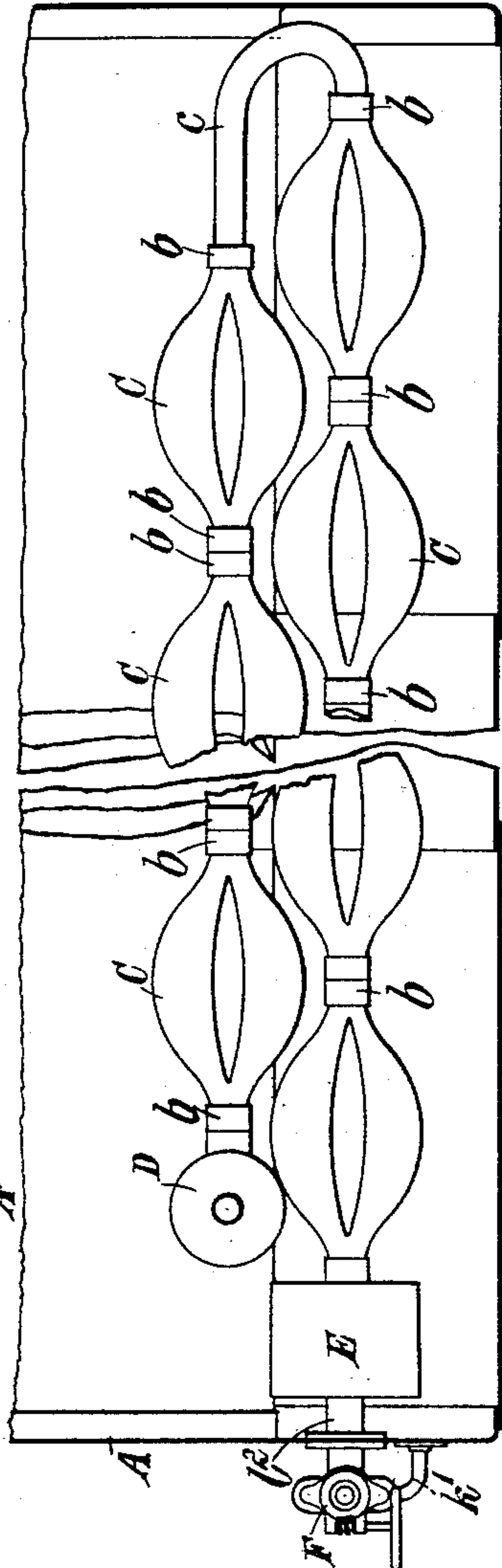


Fig. 3.



Witnesses.

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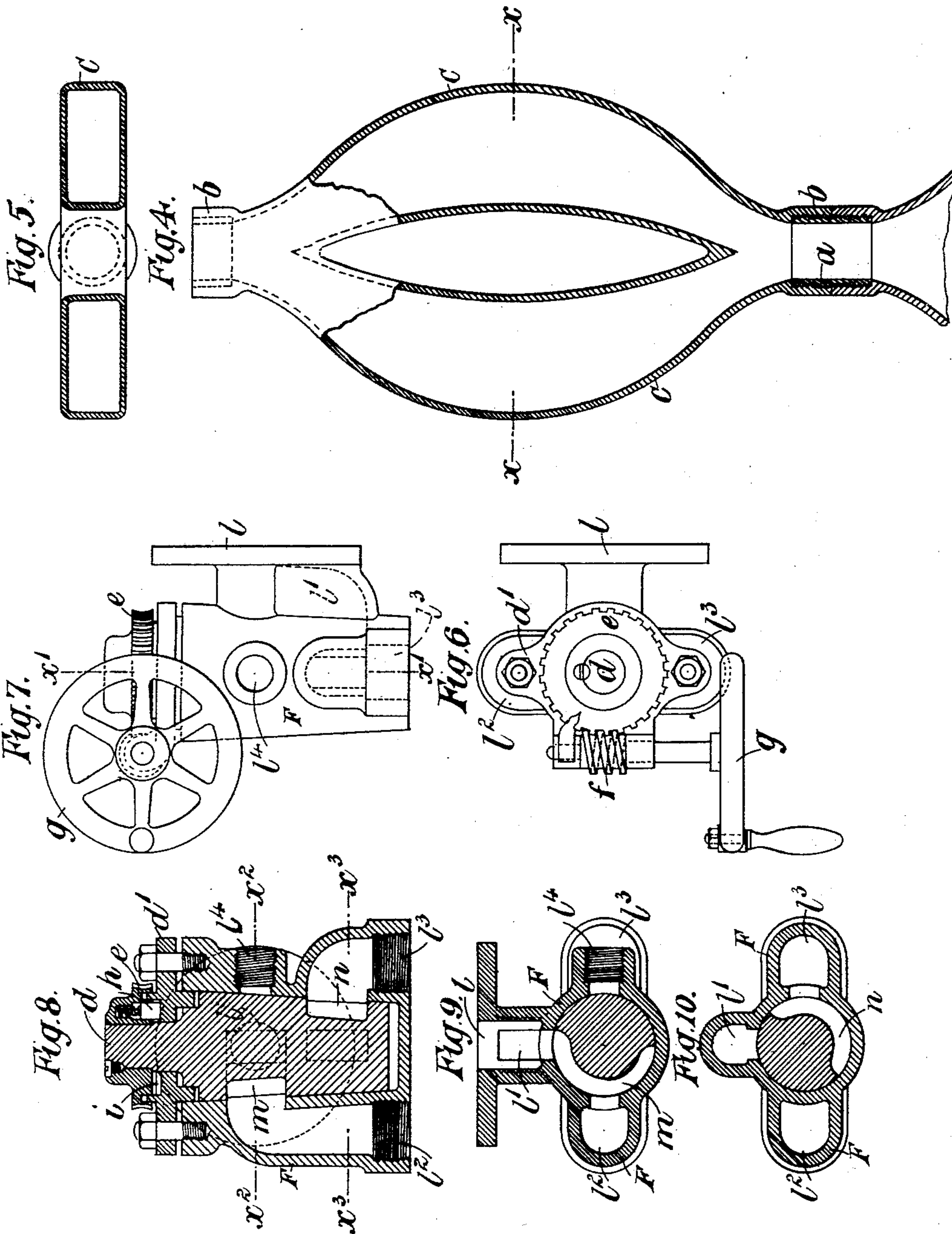
(No Model.)

2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

WILLIAM SHEDLOCK, OF LONDON, ENGLAND.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 520,084, dated May 22, 1894.

Application filed March 7, 1893. Serial No. 465,050. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SHEDLOCK, engineer, a citizen of the United States of America, residing in London, England, have
5 invented Improvements in Feed-Water Heaters and Purifiers, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional side elevation; Fig.
10 2 an end elevation, and Fig. 3 a plan, partly in horizontal section, showing a Cornish boiler with my improved apparatus applied thereto. Fig. 4 is a plan, partly in horizontal section, of a part of a series of depositing chambers
15 hereinafter described; Fig. 5 a transverse section on the line x, x , Fig. 4. Fig. 6 is a plan, and Fig. 7 a side elevation of an improved rotary valve or cock for controlling the action of the apparatus. Fig. 8 is a vertical section
20 on the line x', x' , Fig. 7. Fig. 9 is a horizontal section on the line x^2, x^2 , Fig. 8, and Fig. 10 is a horizontal section on the line x^3, x^3 , Fig. 8.

Like letters indicate corresponding parts
25 throughout the drawings.

A is the boiler; B is the internal flue or furnace-tube thereof.

C, C are the depositing chambers.

My invention has for its object the purification of water by the separation therefrom
30 of salts and other impurities so as to render it fit for use in steam boilers and for other industrial purposes.

My said invention relates more particularly
35 to water-purifying apparatus of the kind or class wherein the water supplied from any convenient source is fed into and through a depositing chamber or chambers which are arranged in the upper part or steam-space of
40 a boiler so that they will be subjected to the highest possible temperature therein, and the water passing through them will thus be raised to the necessary degree of heat to insure the deposition in the said chambers of
45 the salts and other impurities contained in the water, and consequently pure water will be delivered at the outlet end of the said chamber or chambers. This apparatus is also applicable for the removal of any oil or grease
50 which may be introduced with the feed water and will attach itself to the hot upper plates of the said chamber or chambers.

My said invention consists partly in the construction of the apparatus with a series of vessels or chambers C, C of suitable form, 55 preferably consisting of two tubes or passages connected at either end with a single narrow neck for connection with an adjacent chamber, as shown in the drawings these vessels or chambers are arranged in the upper part 60 or steam-space of the boiler A, and are joined to each other by suitable connections such as the nipples a , sockets b and pipe c , so that the water to be purified, which is pumped or otherwise forced through the apparatus, shall 65 pass through each vessel or chamber in turn before being discharged at the outlet D. The connecting necks or passages being considerably smaller in transverse sectional area than the depositing chambers, as more clearly 70 shown in Figs. 4 and 5, the water will pass through the said vessels or chambers at a low velocity, and consequently the salts and other impurities will be the more readily deposited, and will not be so liable to be carried along 75 with the water into the boiler. The said impurities are removed from the said vessels or chambers by arresting the entrance of water to the apparatus and then allowing steam to enter at D and blow through the said vessels 80 or chambers whereby the matter deposited therein is swept out.

My said invention also partly consists in the combination with the depositing chamber or chambers, of one or more reservoirs E connected with the inlet end of the said chamber or chambers, and extending downward into the water space of the boiler, into which reservoir or reservoirs hot water from the boiler can be admitted as hereinafter described. The said reservoir or reservoirs, are 90 moreover, connected at their lower end with the feed-pipe.

My said invention also partly consists in an improved method of working a water-purifying apparatus of the kind or class above mentioned, whereby I obviate the liability to collapse of the depositing chamber or chambers and other inconveniences due to the condensation of steam and the consequent formation of a vacuum or partial vacuum therein 95 when water at a comparatively low temperature is fed into the same after steam has been blown through the said chamber or chambers 100

to sweep out the deposited matter therefrom. For this purpose, after blowing through the said chamber or chambers with the steam, and before again admitting the feed-water to the same, I open communication between the water-space of the boiler and the said chamber or chambers or the aforesaid reservoir connected therewith, I thus permit the hot water from the boiler to enter the said chamber or chambers or reservoir and rise therein to the level of the water in the boiler, so that, when the feed-water is again admitted to the said chamber or chambers or reservoir, it will mix with the hot water therein and will, therefore, not condense the steam in the said chamber or chambers.

It is evident that, instead of using the aforesaid reservoir, I can, if desired, simply connect the depositing chamber or chambers with the feed-pipe by means of a pipe of suitable dimensions into which hot water can be admitted when required for the purpose above specified each pipe being placed either inside or outside the boiler.

My said invention further consists in an improved rotary valve or cock which is so constructed that the operations of shutting off the supply of water, opening a passage for the discharge of the deposited matter by the steam, subsequently closing this passage and opening communication between the water-space of the boiler and the depositing chamber or chambers or the reservoir, and then closing such communication and again admitting the feed-water to the said chamber or chambers or reservoir, can all be successively effected by turning the plug of the said valve or cock in one direction. For this purpose I find it advantageous to construct the said rotary valve or cock as shown in Figs. 6, 7, 8, 9, and 10, in which *F* is the valve-casing; *d* is the plug which is held in its seat in the said casing by a gland *d'*, and is provided with a worm-wheel *e* geared with a worm *f* arranged to be rotated by means of the hand-wheel *g*. To permit the rotation of the plug *d* in one direction while preventing its rotation in the reverse direction, the worm-wheel *e* is provided with a pawl or detent *h* which engages with a circular rack *i* formed on the upper surface of the gland *d'*. The valve casing *F* is formed with ports or passages *l*, *l'*, *l²*, *l³*, and *l⁴*. The ports or passages *l*, *l'* are in communication with the reservoir *E*. The port or passage *l²* is in communication with the feed-pipe, the port or passage *l³* with the blow-off pipe, and the port or passage *l⁴* with the water-space of the boiler. The plug *d* is provided with two ways or passages *m* and *n*; the way or passage *m* is adapted to establish communication either between the ports or openings *l*, *l²* so that the feed-water will be forced into the reservoir *E*, or between the ports or passages *l'*, *l⁴* to permit hot water from the boiler to enter the reservoir *E*. The way or passage *n* is adapted to establish communication between the ports or passages *l'*,

l³ to permit the discharge of the deposited matter from the chambers *C* through the blow-off pipe. When the plug *d* is in the position shown, the way or passage *m* connects the port *l²* with the port *l* thus admitting the feed-water to the boiler. When it is desired to remove the deposited matter from the chambers *C*, the plug *d* is partially rotated so as to close the port *l²* and thus shut off the supply of water and then open communication between the port *l'* and the port *l³* through the passage *n*, thus allowing the steam to sweep out the deposited matter from the chambers *C*, *C*. On further rotating the plug *d*, the port *l³* is closed and the port *l* is put into communication with the port *l⁴* through the passage *m*, thus allowing hot water from the boiler to enter the reservoir *E*. On still further rotating the said plug, the port *l⁴* is closed and the port *l* is again put into communication with the feed-pipe through the passage *m* and port *l²*.

The automatic device for governing or controlling the operation of the apparatus insures regularity in the feeding of the water to the depositing vessels or chambers and the discharge of the deposited matter therefrom, and also insures the admission of hot water to the reservoir *E* before the feed is again turned on, the aforesaid plug being rotated at such a speed as to insure the perfect performance of the various operations. The said apparatus is if desired, fitted in a casing provided with a recording apparatus with a view to recording the intervals at which and the number of times it has been operated.

It is obvious that I can use other suitable valves or cocks in place of the above described device for regulating or controlling the action of the apparatus in the manner above specified.

What I claim is—

1. The combination of a steam boiler, a reservoir located in the water space thereof, a tubulous or closed depositing chamber in the steam space of the boiler, connected at one end to the reservoir, and opening at its other end into the steam space of the boiler, connections between the reservoir, a feed pipe, a blow off pipe and the water space of the boiler, and means for opening and closing said connections.

2. The combination of a steam boiler, a reservoir located in the water space thereof, a tubulous or closed depositing chamber having alternately enlarged and contracted areas throughout its length in the steam space of the boiler, connected at one end to the reservoir, and opening at its other end into the steam space of the boiler, connections between the reservoir, a feed pipe, a blow off pipe and the water space of the boiler, and means for opening and closing said connections.

3. The combination of a steam boiler, a reservoir located in the water space thereof, a tubulous or closed depositing chamber in the

steam space of the boiler, connected at one end to the reservoir, and opening at its other end into the steam space of the boiler, connections between the reservoir, a feed pipe, 5 a blow off pipe and the water space of the boiler, and a water controlling device connected between the reservoir, the water space of the boiler, the feed water supply and the blow off, which upon being operated consecu- 10 tively opens the reservoir to the blow off, then the reservoir to the water space of the boiler, and then the reservoir of the feed water supply.

4. In a water purifying apparatus, a de- 15 positing chamber composed of a series of sections, each section consisting of two passages, having their largest areas at their central parts and their adjacent ends opening into the narrow neck which constitutes the coup- 20 ling connection to the next section.

5. The combination, with a steam-boiler, a depositing chamber in the steam-space thereof, and a reservoir, connected with the inlet end of the said chamber, of a control-

ling valve or cock constructed with a rotary 25 plug, and with ports or passages whereby in the rotation of the said plug water to be purified is first admitted to the said reservoir and chamber, then steam is allowed to blow 30 through the said chamber, and then first hot water from the boiler and then more water to be purified are admitted to the said reservoir, substantially as, and for the purposes, above specified.

6. In a water-purifying apparatus, a con- 35 trolling valve or cock constructed with a rotary plug having ways or passages m, n , and with ports l, l', l^2, l^3, l^4 , which plug is provided with means whereby it may be rotated in one direction but is restrained from rotation in 40 the reverse direction, substantially as, and for the purposes, above specified.

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