(No Model.) 2 Sheets—Sheet 1.

E. W. VANDUZEN.

WATER PURIFIER FOR STEAM BOILERS.

No. 292,076. Patented Jan. 15, 1884.

Fig. 1.

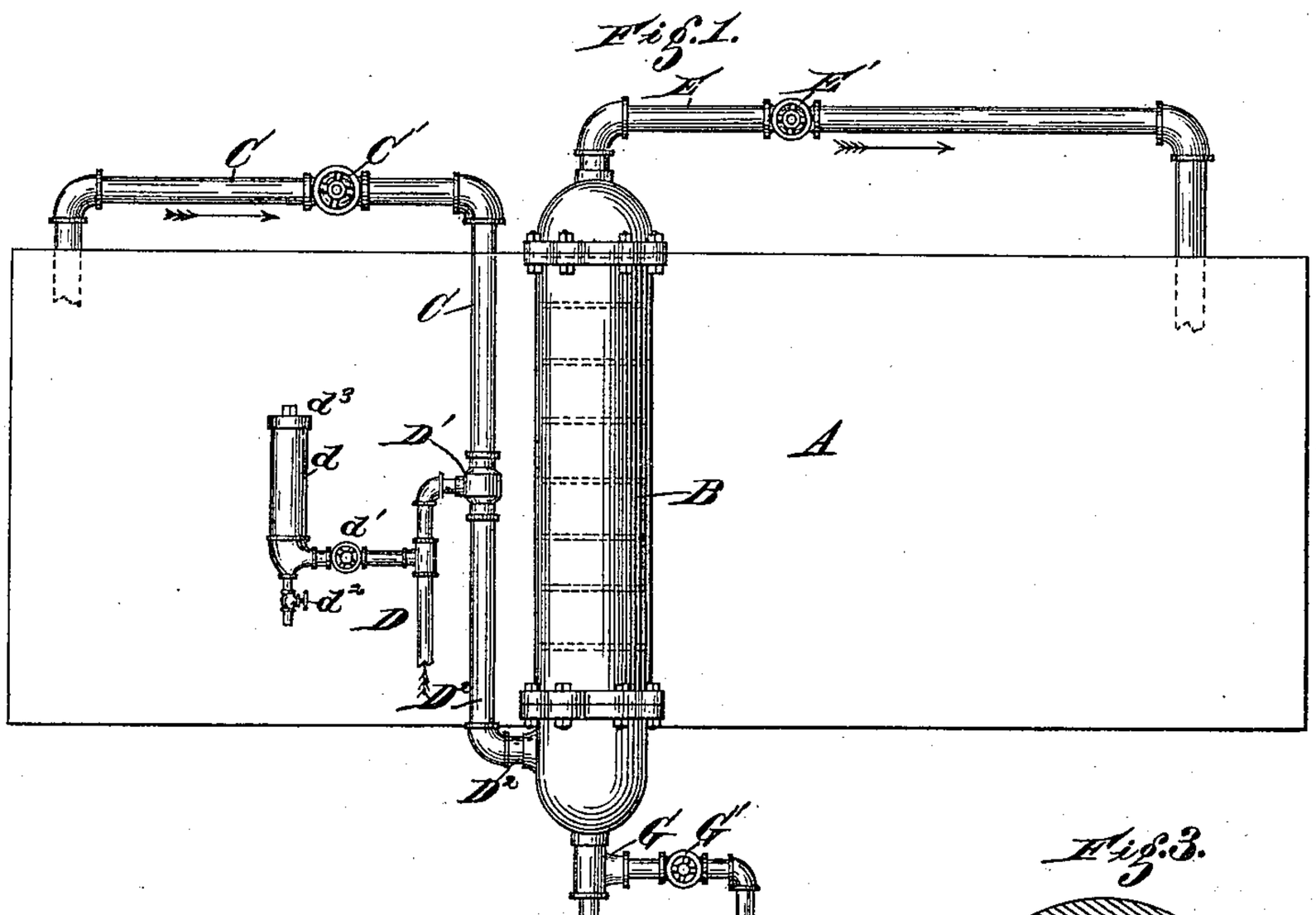


Fig. 3.

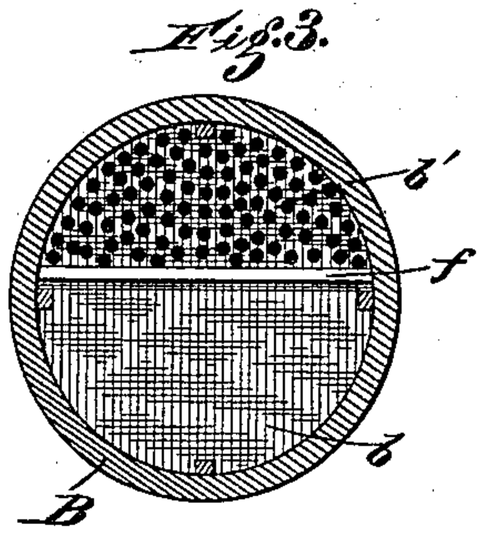


Fig. 4.

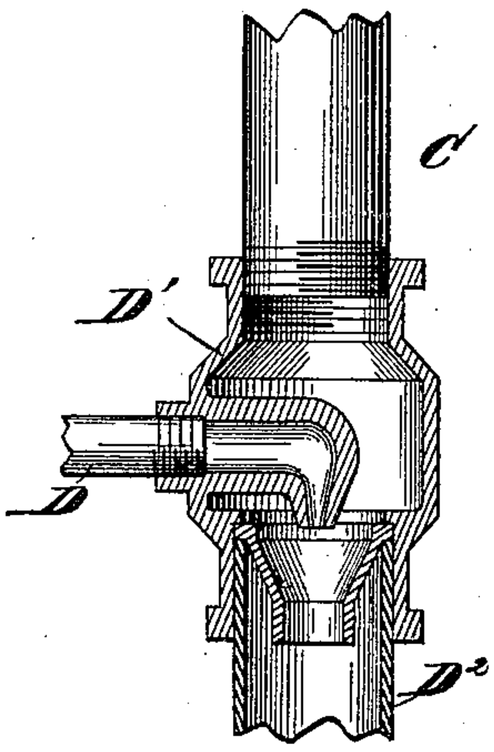
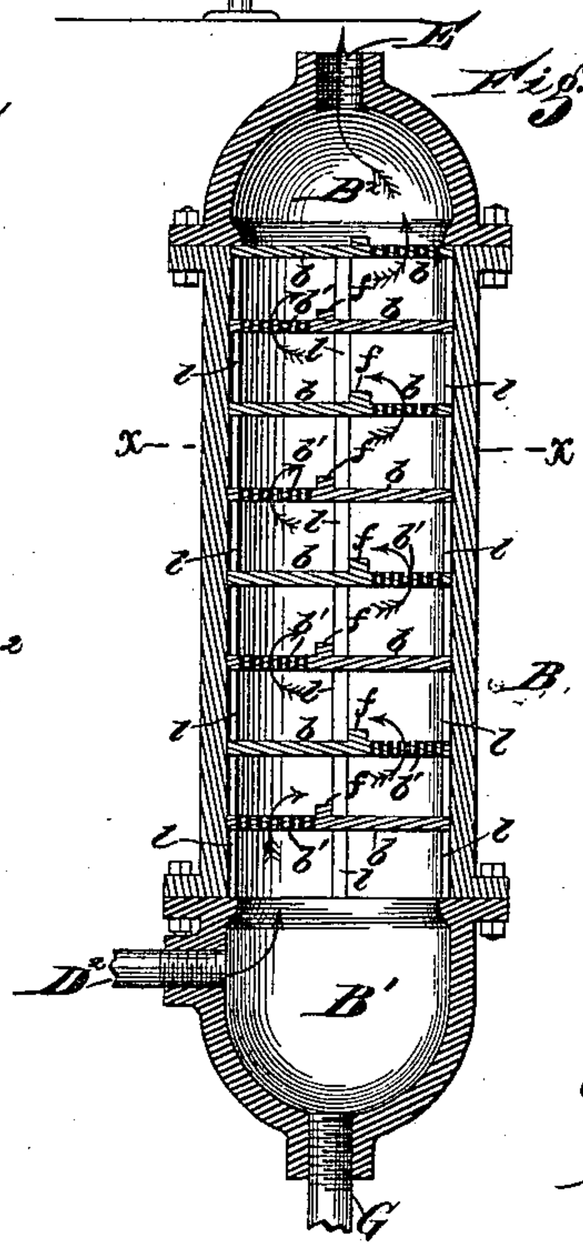


Fig. 2.



Attest,
Jno. E. Wiles
Jno. L. Jones

Inventor,
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by Wood & Boyd.
his Attorneys &c.

(No Model.) 2 Sheets—Sheet 2.

E. W. VANDUZEN.

WATER PURIFIER FOR STEAM BOILERS.

No. 292,076. Patented Jan. 15, 1884.

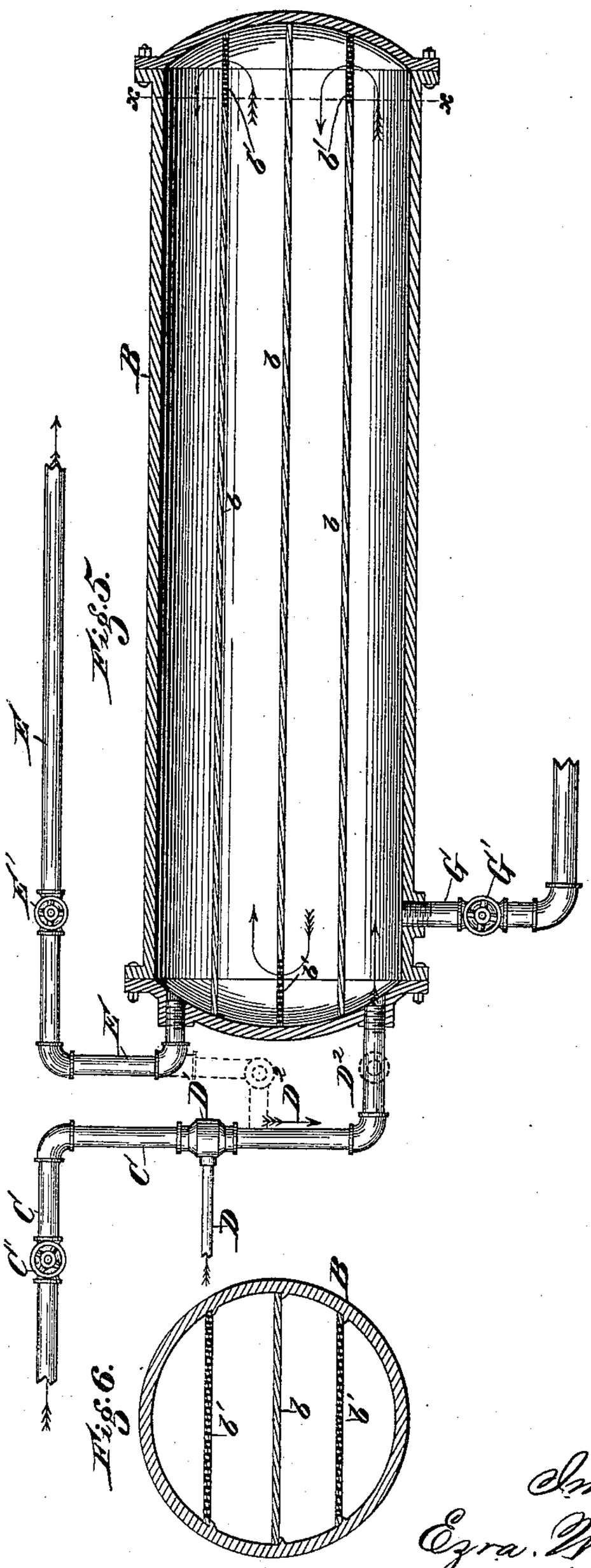

Fig. 6.

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UNITED STATES PATENT OFFICE.

EZRA W. VANDUZEN, OF NEWPORT, KENTUCKY.

WATER-PURIFIER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 292,076, dated January 15, 1881.

Application filed May 31, 1883. (No model.)

To all whom it may concern:

Be it known that I, EZRA W. VANDUZEN, a citizen of the United States, and a resident of Newport, in the county of Campbell and State of Kentucky, have invented certain new and useful Improvements in Water-Purifying Attachments for Steam-Boilers, of which the following is a specification.

My invention relates to improvements in water circulating and purifying attachments for steam-boilers.

The objects of my invention are, first, to provide means for intermingling the water from the heater with water taken from the boiler, and passing the same through the purifying device to the boiler; second, to provide means for taking the water from one end of the boiler and introducing water at the other, so as to produce a current or circulation of water in the boiler and assist in purifying the water; third, to provide means for mixing soda or other purifying material with the feed-water; fourth, to provide diaphragm-shelves or settling-pans in series inside of the purifying-chamber, one above the other, and so arranged that the water, in its passage through the purifier to the boiler, must take a zigzag course from side to side of said chamber, so as to allow the water to deposit a portion of the mud or other sediment it contains upon each of the series of settling-diaphragms; fifth, to provide means for using water from the boiler or feed-water to wash off the series of settling pans or diaphragms.

Other features of my invention will be fully described in the following description of the accompanying drawings, in which—

Figure 1 is a side elevation of my device attached to a boiler. Fig. 2 is a central vertical section of the purifying device; Fig. 3, a cross-section of the same on line *x x*, Fig. 2; Fig. 4, a detail view of the ejector or apparatus for mingling the water from the heater with that from the boiler. Fig. 5 is a longitudinal vertical section of a modified form of purifier; Fig. 6, a section of same, line *x x* Fig. 5.

A represents the steam-boiler.

B represents the purifying-chamber; B′, the lower and B² the upper head of same; *b*, the settling diaphragms or pans inside of said chamber; *b′*, the perforated portion of same; C, the pipe conveying water from the boiler to the purifier; C′, valve in same; D, water-pipe supplying the chamber; D′, the ejector or device for mixing the feed-water with that from the boiler; D², the pipe conveying said water to the purifier; *d*, a vessel for containing soda or other suitable purifying material; *d′*, cut-off valve, and *d²* drain-cock; *d³*, screw-cap, screwing onto the top of vessel *d;* E, boiler feed-pipe, leading from the purifying-vessel to the boiler; E′, valve in same; *f*, ledges on the settling-diaphragm *b;* G, the blow-off pipe; G′, valve in same; *g*, leg or standard tapped into bottom of pipe G and resting on the floor to support the apparatus; *l*, legs supporting diaphragms *b*.

The operation of my device is as follows: Valves C′ and E′ are opened, water is forced through pipe D and downward through ejector D′ by a pump or inspirator, which causes a flow of water from boiler A through pipe C to ejector D′, where it mingles with the water from the pump, coming through pipe D, and thence through pipe D² to the purifier. The valve *d′* is left open, so that water from the pump or inspirator can enter vessel *d* and dissolve the soda contained therein, when the pulsation of the pump or inspirator exhausts a portion of the solution and mingles it with the feed-water, and it passes with it into the purifying-chamber, and assists in separating the lime or other impurities from the water and depositing the same in the purifying-chamber. After the water enters the purifier, it follows the course indicated by arrows in Fig. 2, passing upward, and depositing the mud or other sediment it contains upon plates *b*. Ledge *f* serves to retain the deposited sediment upon said plates or diaphragms. The water passes thus slowly through vessel B, depositing its sediment on diaphragms *b*, and goes out through pipe E to the boiler at the end thereof opposite that from which water is taken. This is a very desirable feature, as by this means a circulation of water from end to end of the boiler is obtained, thus preventing the depositing of sediment inside the boiler.

When it is desired to blow out the sediment contained in the vessel B, valves C′ and E′ are first closed, (the pump being stopped.) Valve

G is then opened, and the water in vessel B is allowed to run out. Valve E′ is then opened, and water is forced by the pressure in boiler A through pipe E, and dashes down upon diaphragm *b*, washing off all sediment lying thereon, and carrying it down through mud-chamber B′ and blow-off pipe G. In blowing out vessel A, the water takes a course just the opposite of that indicated by arrows in Fig. 2.

It will be seen that the perforated or open portion of the diaphragms are located alternately on opposite sides or ends of vessel B, and each over the solid portion of the next in series below. By this arrangement the water strikes fairly upon the top of said solid portion, and readily washes off all sediment thereon. It is obvious that instead of using the water from the boiler to clean the settling-diaphragms *b*, water from pump may be used by means of pipe-connections. (Shown in Fig. 5 in dotted lines.) This method would be desirable in some cases, as it economizes the water in the boiler.

In Figs. 5 and 6 I show a modified form of my device, in which the vessel B is placed in a horizontal position, instead of upright, and the settling diaphragms or shelves are placed longitudinally, as shown in Fig. 5. The functions of the various parts are exactly the same as in the first form of my device.

It is obvious that soda-chamber *d* may be attached to my device between the heater and the pump, and still perform the same function.

The soda-chamber *d* may be connected to the purifier direct, instead of being connected to the feed-water pipe, and still embrace one of the features of my invention, as the mingling of the soda with hot feed-water in the purifier materially assists the separation of the lime or other minerals held in solution.

It is also obvious that plates or diaphragms *b* may be made with a section entirely removed, instead of being perforated, as shown in the drawings.

By combining the soda-vessel with a boiler and purifier having a circulation as described, the soda is caused to mingle with warm water in the purifier, thus insuring the settlement of the lime and like impurities in the purifying-chamber.

What I claim as new and useful, and desire to secure by Letters Patent, is as follows:

1. In a boiler feed-water circulator and purifier, the combination of a purifier, a boiler, a pipe connecting the delivery end of the purifier with the boiler, a water-supply pipe connecting with the receiving end of the purifier, a pipe connecting the supply-pipe and boiler, and valves, the several parts being arranged to maintain a circulation of water from the supply-pipe and boiler through the purifier to the boiler, substantially as described.

2. In a boiler feed-water circulator and purifier, the combination of a purifier provided with a series of diaphragms having openings at alternate ends, a boiler, a pipe connecting the delivery end of the purifier with the boiler, a water-supply pipe connecting with the receiving end of the purifier, a pipe connecting the supply-pipe and boiler, an ejector connected with the pipe between the boiler and purifier, and valves, the several parts being arranged to maintain a circulation of water from the supply and boiler through the purifier to the boiler, substantially as described.

3. In a boiler circulating and purifying attachment for steam-boilers, the purifier B, having heads B′ B², and provided with a series of diaphragms, *b*, perforated or partially open at alternate ends, and having dividing-ledges *f*, substantially as described.

4. In a boiler feed-water circulator and purifier, the combination of the boiler, a purifier, a pipe connecting the delivery end of the purifier with the boiler, a water-supply pipe connecting with the receiving end of the purifier, a pipe connecting the supply-pipe and boiler, whereby a circulation is maintained from the boiler through the purifier and back to the boiler, and a device for supplying a purifying material to the purifier, whereby the warm water and purifying material will mingle in the purifier, and the resulting sediment deposited in the purifier, substantially as described.

5. In a boiler feed-water circulator and purifier, the combination of boiler A, purifier B, pipe E, connecting the boiler and purifier, supply-pipes D D², pipe C, connecting the boiler and pipe D², and the vessel *d*, connecting with pipe D, and the valves, whereby water is circulated from the boiler through the purifier and back to the boiler, and a purifying water is drawn from vessel *d*, to mingle with warm water in the purifier, substantially as described.

In testimony whereof I have hereunto set my hand.

EZRA W. VANDUZEN.

Witnesses:
JNO. E. JONES,
A. GLUCHOWSKY.