

(No Model.)

2 Sheets—Sheet 1

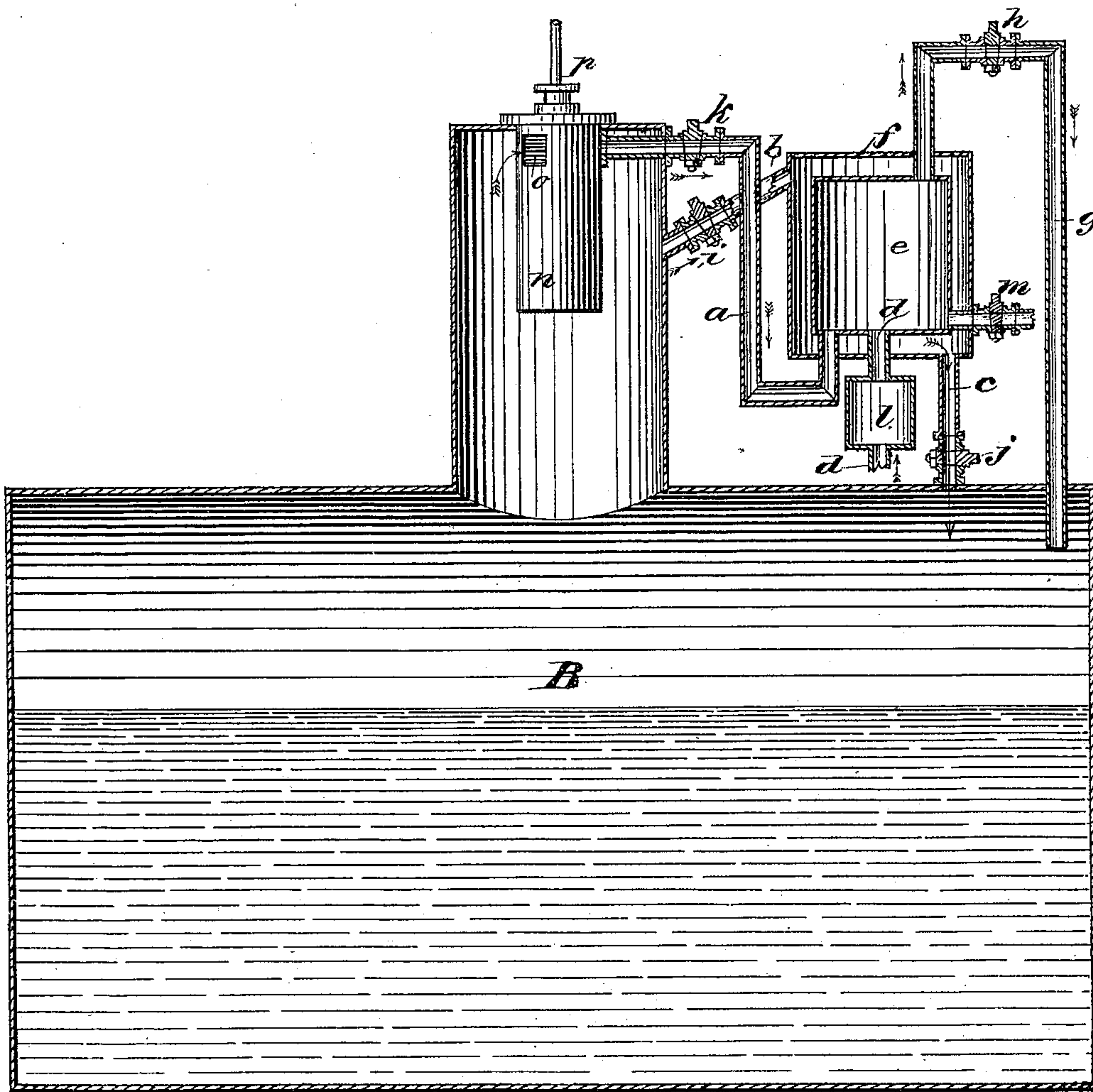
C. A. FRENCH.

PURIFYING FEED WATER IN STEAM BOILERS.

No. 250,520.

Patented Dec. 6, 1881.

Fig. 1.



WITNESSES

T. C. Brecht.
A. H. Betz.

INVENTOR

Chas. A. French.

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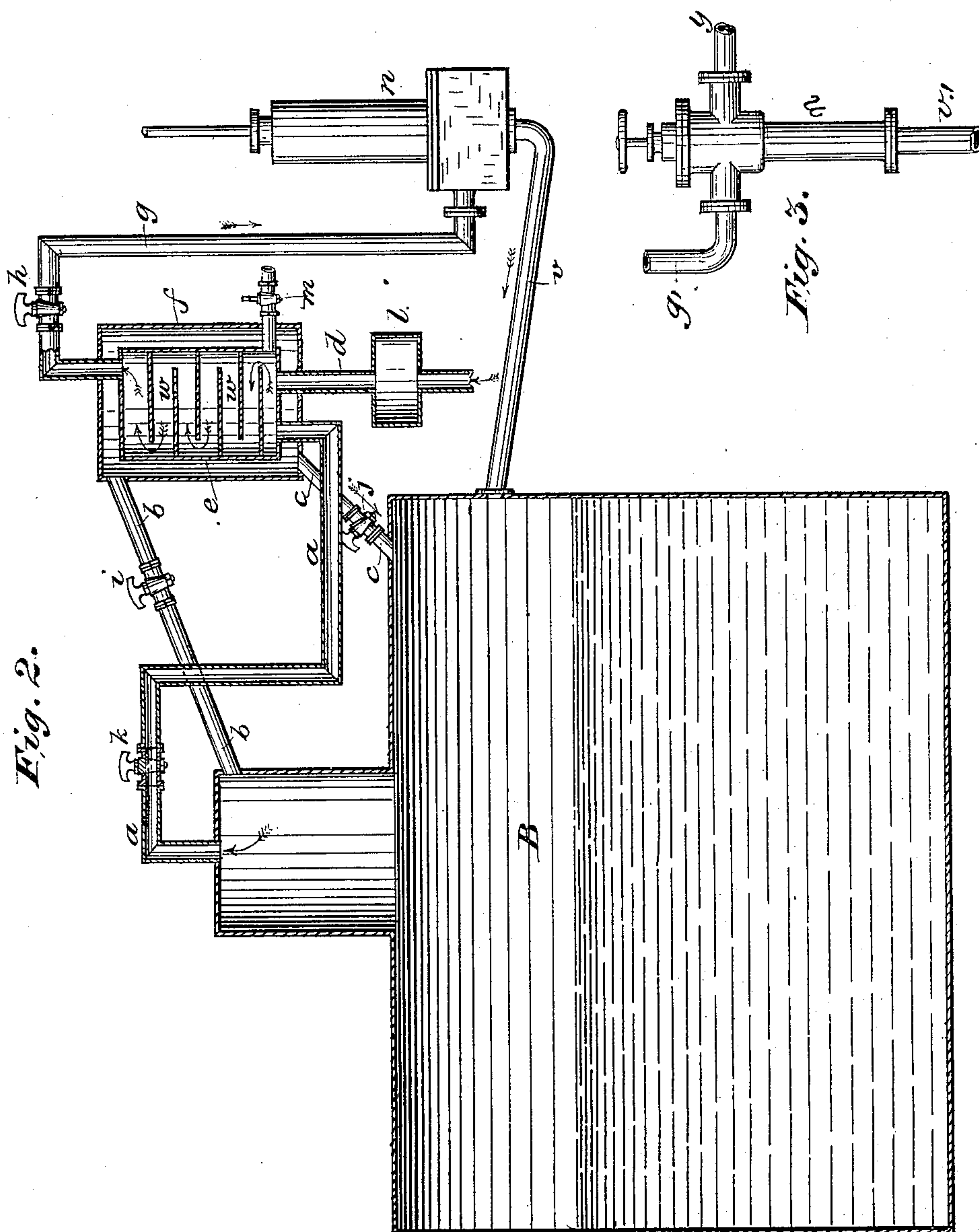


Fig. 2.

Fig. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES A. FRENCH, OF DAVENPORT, IOWA.

PURIFYING FEED-WATER IN STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 250,520, dated December 6, 1881.

Application filed September 5, 1881. (No model.)

To all whom it may concern:

Be it known that I, CHAS. A. FRENCH, a citizen of the United States, residing at Davenport, in the county of Scott and State of Iowa, have invented certain new and useful Improvements in Feed-Water Generators and Purifiers for Steam-Boilers, of which the following is a specification.

Heretofore feed-water has been only partially purified by compositions tending to filter, absorb, or collect only a part of the impurities, which after a while lose their power of absorbing impurities, and must be replaced or cleaned.

The object of my invention is to perfectly and more speedily purify the feed-water and make it better adapted for locomotives, and make the operation continuous without any perceptible loss of heat, and provide for a quick and speedy mode of removing the impurities as they accumulate; and it consists in forcing the feed-water into a receptacle that is surrounded by steam, causing the feed-water to be speedily evaporated and condensed or absorbed by the steam of the boiler—that is, pumped or injected, or mechanically or artificially circulated or exhausted or forced through the feed-water—leaving all the impurities in the receptacle, where they can be blown out or speedily removed by taking off the heads of the jacket *f* and receptacle *e*. I attain these objects by the apparatus illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical section of the boiler and apparatus, with the pump forcing the steam through the apparatus. Fig. 2 shows the pump exhausting the steam through the apparatus. Fig. 3 shows an injector or siphon connected in place of the pump.

B is the boiler; *e*, the receptacle into which the feed-water to be evaporated is pumped or injected. *f* is the outer drum or jacket. The drum *l* is to work in connection with a feeding-injector, to have the same results were the injector connected with the boiler; but this drum might be dispensed with if the pipe *a* is connected a little above the bottom, so as to leave some water in the receptacle all the time.

To carry my invention into effect I place

above the water-line a vessel or receptacle, *e*, of any desired shape or style, and connect (I prefer) at or near the bottom by a pipe, *a*, and extend upward enough to prevent the water from running out of the receptacle *e*, and connect with the pump in the boiler above the water-line, or with the boiler itself, according to the location of the circulating device. I connect the top or near the top of this receptacle with another pipe, *g*. I prefer to extend it upward, then turn down and connect with the boiler, either above or below the water-line, or with a pump, siphon, or injector, *n*, thence discharging to the same place in the boiler. I circumscribe this vessel or receptacle *e* with another steam-tight drum, chamber, or jacket, *f*, leaving a steam-space between. I then connect the top or near the top of this outer drum or jacket, *f*, by a pipe, *b*, with the boiler above the water-line, to supply the drum or jacket *f* with live steam to keep the vessel *e* hot, and the bottom of the outer drum or jacket, *f*, I connect by a pipe, *c*, with the boiler at any place, so that the steam that condenses within the jacket *f* will run into the boiler by gravity.

The pump *n* may be either in or out of the boiler, and may be a rotary or centrifugal pump, siphon, or injector, and may be connected with the receptacle either at the steam inlet or outlet. In one case it will force the steam into the apparatus. In the other case it will exhaust the steam through the apparatus, either way causing the desired circulation. If the injector or siphon, Fig. 3, is used in place of the pump, the pipe *g'* may be connected with the pipe *g*, and the pipe *v'* with the pipe *v*, and live steam may be conducted through the pipe *y*.

The receptacle *e* may have a series of shelves or partitions, *w w*, Fig. 2, so as to cause the live steam to circulate more in going through the feed-water, so that the steam will become more thoroughly saturated with moisture.

It will be seen the feed-water may be allowed to circulate in a heater connected with the steam from the receptacle on its way to the boiler, thus partially condensing the steam, and thus increasing the circulation of the steam through the apparatus.

I do not confine myself to the exact location of the injector, as it may be cut either at the inlet or outlet to the receptacle.

If the pipe *a* is large enough, the pipe *b* may be connected with it, in place of being connected with the boiler, in which case the cock should be placed between the pipe *a* and the jacket *f*.

The feed-water is forced into the receptacle *e* through the pipe *d*, and, being surrounded by steam, is soon heated as hot as the water in the boiler *B*, and hot steam from the boiler *B* enters the pump *n* at *o*, and is pumped or forced through the pipe *a*, comes in contact with the water in the receptacle *e*, absorbs it, and carries it over into the boiler *B* through the pipe *g*, leaving every particle of impurity in the vessel or receptacle *e*, where, by opening a cock in the pipe *m* and closing the cock *k*, the impurities can be blown out or steam may be allowed to blow through the pipe *a* for the same purpose; or the cock *k* may be opened and the cock *k* closed and water from the boiler blown through and rinse out the drum; or the chamber or receptacle *e* may be cleaned any time, without blowing off the steam in the boiler, by closing the cocks *h i j k* and taking the heads off the jacket *f* and receptacle *e*. The feed-water may be heated by exhaust-steam or otherwise in any manner before it is forced or injected into the receptacle *e*, to save fuel. All the water that condenses in the jacket *f* is the same as so much pure water pumped into the boiler.

It will be seen that the pipe *a* can be connected anywhere on the receptacle *e*. As long as there is a place in the pipe that is higher than the water in the receptacle *e* the water cannot run into the boiler by gravity; also, that the pipe *b* might be dispensed with by making the pipe *e* large enough to supply steam, and also carry off the condensed steam; or the jacket *f* may be secured to the boiler, and a

series of holes in the partition, or no partition between the bottom of the receptacle *e* and the boiler.

It will be seen that the receptacle *e* and jacket *f* may be placed below the water-line, if there is some means of pumping or keeping the water out of the steam space; also, the upward bend in the pipe *a* may be dispensed with, if the pump is tight, to prevent the water from running into the boiler.

The receptacle *e* may be dispensed with by making the pipe *a* large enough and extending it upward or at an angle, enlarging it in place of extending the receptacle *e*.

By a peculiar or nozzle shape given to the pipe *a*, and introducing the feed-water at an appropriate place and in such a quantity, there may be an increased speed of circulation of the steam, and cause the water to rise in the shape of spray and enter the boiler as steam.

I claim—

1. As an improvement in the process of purifying feed-water for steam-boilers, the process of mechanically or artificially circulating live steam through a feed-water receptacle, by which the water is absorbed or generated into steam, as set forth.

2. In the process of feeding steam-boilers, the process of mechanically or artificially circulating live steam through the feed-water that is confined in a receptacle, absorbing or generating it into steam, and conducting it out of the receptacle as steam, as set forth.

3. The combination of a boiler or dome with a circulating device, and a steam-passage leading to a receptacle having a feed-inlet, and an outlet or passage for carrying the steam generated in the receptacle into the boiler, as described.

CHAS. A. FRENCH.

Witnesses:

S. M. FRENCH,
CHARLES FRENCH.