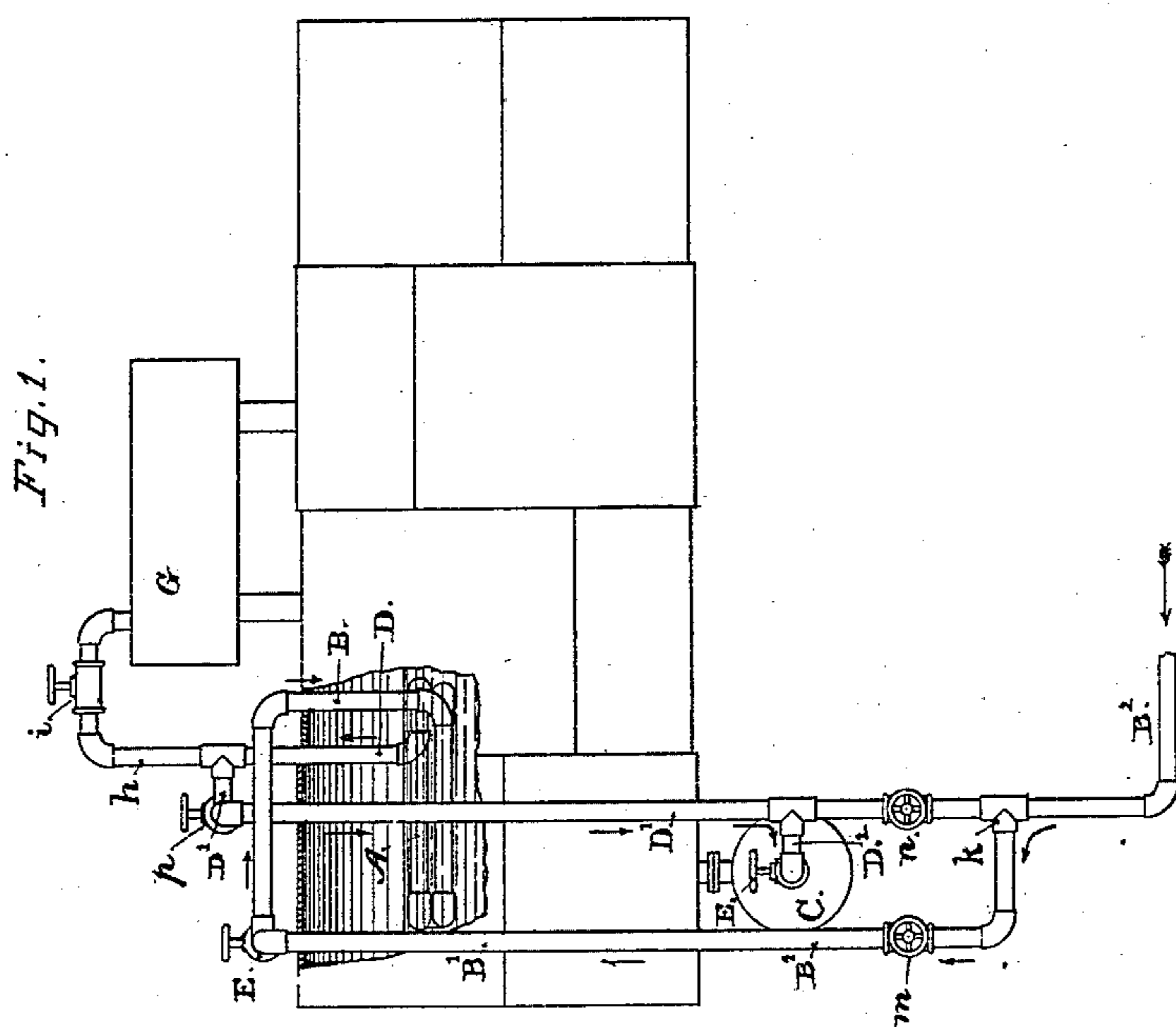
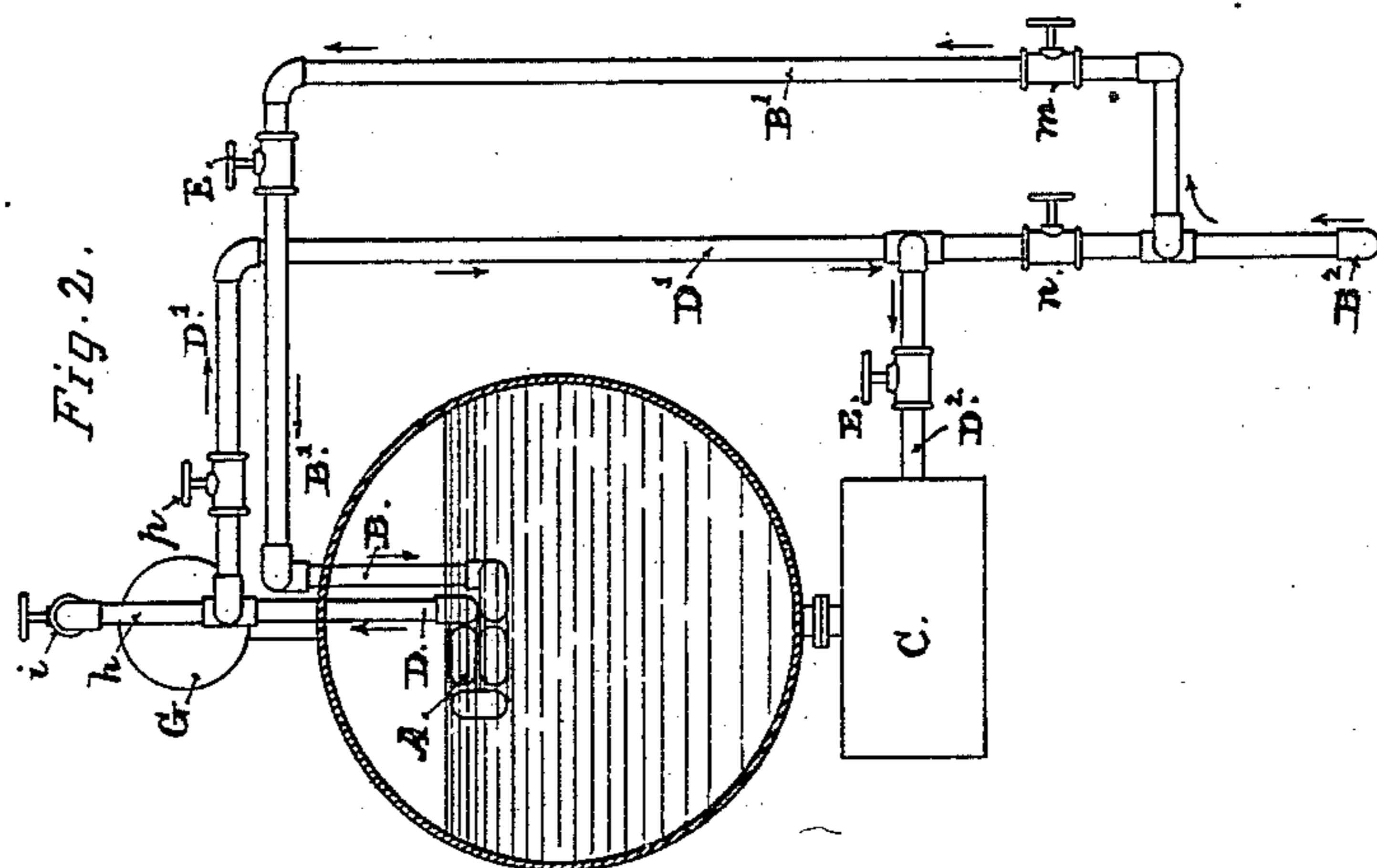


(No Model.)

J. W. HUBBER.
FEED WATER HEATER AND PURIFIER.

No. 277,285.

Patented May 8, 1883.



Witnesses:

Wm. Ford
Geo. Lincoln

Inventor:

James W. Hubber
By his Atty., Edward E. Cram

UNITED STATES PATENT OFFICE.

JAMES W. HUBBER, OF SAN FRANCISCO, CALIFORNIA.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 277,285, dated May 8, 1883.

Application filed July 10, 1882. (No model.)

To all whom it may concern:

Be it known that I, JAMES W. HUBBER, a citizen of the United States, residing in the city and county of San Francisco, State of California, have made and invented certain new and useful Improvements in Feed-Water Heating and Purifying Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings.

My invention relates to a means of raising the temperature of feed-water before it is introduced into the water-space of a boiler, and incidental thereto the precipitation and separation from such feed-water of grease, sediment, and other matter carried into the condenser from the engine or held in solution or suspension.

My improvement consists in a novel method of using heat obtained from the boiler-water to raise the temperature of the feed-water, of carrying said water out of the boiler-shell, and of introducing the feed-water so heated into that portion of the boiler-water where the temperature is considerably lower, or at such less degree of temperature that precipitation and separation of grease, sediment, and impurities are effected before the water comes in contact with the heating-surface of the boiler.

It consists, also, in a novel device or apparatus and its connection with a feed-pump or other means of maintaining a circulation of feed-water, and with the mud-drum or other point in the boiler where its water is the quietest and the temperature is lower than that of the feed-water, all as hereinafter more fully set forth.

The following description fully explains the nature of my said invention and the manner in which I proceed to apply and carry out the same, reference being had to the accompanying drawings, in which—

Figure 1 is a side view, and Fig. 2 an end view, of a horizontal boiler having my improvement applied to it.

Within the upper part of the boiler-space I first place a heater, A, formed of several lengths or coils of pipe coupled together, and having the ends carried up and out through the shell of the boiler to make connection with

an inlet or supply, B', and an outlet or discharge pipe, D'. This heater A is placed and supported in position to be submerged and always covered by the boiler-water, and it is connected by the pipe B' with the feed-pump and by the pipe D' with the mud-drum or a reservoir or chamber, C, connected with the lower part of the water-space of the boiler, so that when the feed-pump is at work a circulation of feed-water is produced through the coil A before it reaches the boiler. Being thus carried through the coil, it receives heat from the surrounding water and vapor, and its temperature is raised accordingly to a point nearly equal to the temperature within the boiler at this point. Then by being introduced into the drum C and into a body of water at considerable lower temperature, this feed-water so heated is caused to part with its impurities by precipitation, whereby it leaves such matter in the drum before entering the boiler to mingle with the water therein. The heater A is placed and kept submerged in the boiler-water in order to prevent its coils from being injured and destroyed by the irregular intensity of the heat, to which it would be otherwise exposed if placed in any other part of the boiler above the water-line or in the fire-place. E E are check-valves placed in the pipe B' and in a branch, D², of the pipe D', to control the direction of the flow of water from the coil into the boiler. These parts constitute my apparatus in its simplest form, and illustrate my method of raising the temperature of feed-water and at the same time purifying it before it comes in contact with the heating-surface of the boiler.

In connection with such device I also provide a means for cleaning out the coil A and its connections at any time to remove sediment and deposit that may accumulate therein. In some localities such means may be necessary to the successful continuous operation of the heater. I therefore connect the outgoing pipe D' of the coil with the steam-drum G by a pipe, h, provided with a cock, i, and then carry down the pipe D' and connect it with the pipe B' by the T-coupling k.

At convenient points in the pipe B' D', I provide two valves, m n, and in the upper part of the pipe D', near its point of connection with

the steam-pipe *h*, I place a valve, *p*. By such means steam from the drum *G* can be blown into and through the coil *A* and its pipes *B D* by simply opening the steam-valve *i*, closing the valves *p n*, and opening the valve *m*. This gives an outlet for the steam from the coil through the pipe *B D* and in a direction contrary to the flow of the water from the feed-pipe *B²*, and all the sediment and other matter from the coil and pipes are then loosened and blown out as often as such cleansing is required.

The arrangement and operation will be readily understood from the figures of the drawings, the feed-pipe *B²* being carried to any desired point for connection with the feed-pump.

The application of such improvement to a steam-boiler results in economy in use of fuel, the production of pure feed-water free from grease, grit, and other matter otherwise frequently taken up and carried into the boiler from the condenser or contained in the water, and an absolute prevention of the evils of foaming.

As before stated, the coils *A*, in which the water is heated, are so located as to lie under the surface of the water in the boiler at all times. This insures a regular degree of heat in the feed-water as it passes through the coils, so that the water passing therethrough will always be heated to the same degree as the surrounding water in the boiler, and will, in consequence, always be hotter than the water in the drum into which it is taken afterward to cleanse it.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The feed-water heater consisting of the heater *A*, located within the water-space of the boiler below its water-level, having its inlet *B* and outlet *D* leading through the shell of the boiler, and the pipes *B' D'*, one connected with the feed-pump and the other connecting with the interior of the boiler, and the check-

valves *E E* in the said pipes, substantially as described.

2. The combination, with a steam-boiler, of a feed-water heater, *A*, located within the boiler, having connection with the feed-pump by means of the inlet-pipe *B B'*, leading out through the boiler-shell, and with the water-space of the boiler by means of the pipe *D D'*, leading out through the boiler-shell, and connecting with the water-space of the boiler through the mud-drum *C* or other part where the temperature of the boiler-water is lower than that of the incoming water from the heater, constructed and arranged to operate as set forth.

3. The combination, with the heater *A*, adapted to be placed within the upper part of the space in a boiler, of the inlet-pipe *B B' B²* to connect with the feed-pump, the outlet-pipe *D D' D²* to connect with the mud-drum of the boiler, the steam-pipe *h* to connect with the steam-drum of the boiler, and the valves *E E h i m n*, connected and arranged for application and operation as set forth.

4. The herein-described method of treating feed-water preparatory to introducing it into the boiler for the generation of steam, consisting in leading it through coils located below the lowest level of water in the boiler, and thence, after receiving a high degree of heat, conducting it out through the boiler-shell and into the mud-drum or some other chamber connected with the boiler in which the degree of temperature of the contained water is lower than that of the incoming feed-water, whereby precipitation of the impurities of the feed-water is effected, and then conveying the purified water to the boiler, substantially as herein set forth.

Witness my hand and seal.

JAMES W. HUBBER. [L. S.]

Witnesses:

EDWARD E. OSBORN,
GEO. VINCENT.