

(No Model.)

2 Sheets—Sheet 1.

V. W. BLANCHARD.
WATER HEATER.

No. 413,914.

Patented Oct. 29, 1889.

Fig. 1.

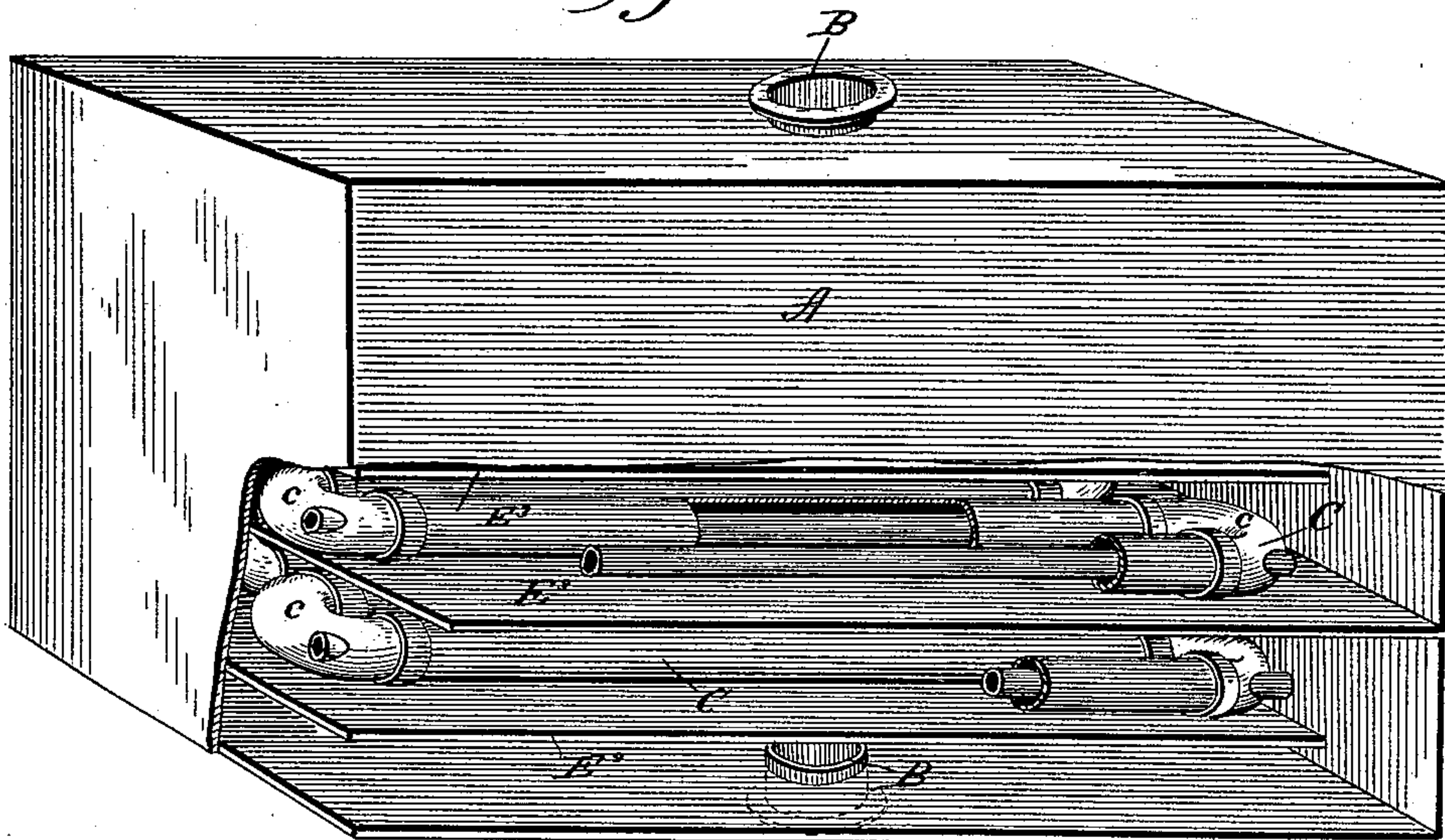


Fig. 2.

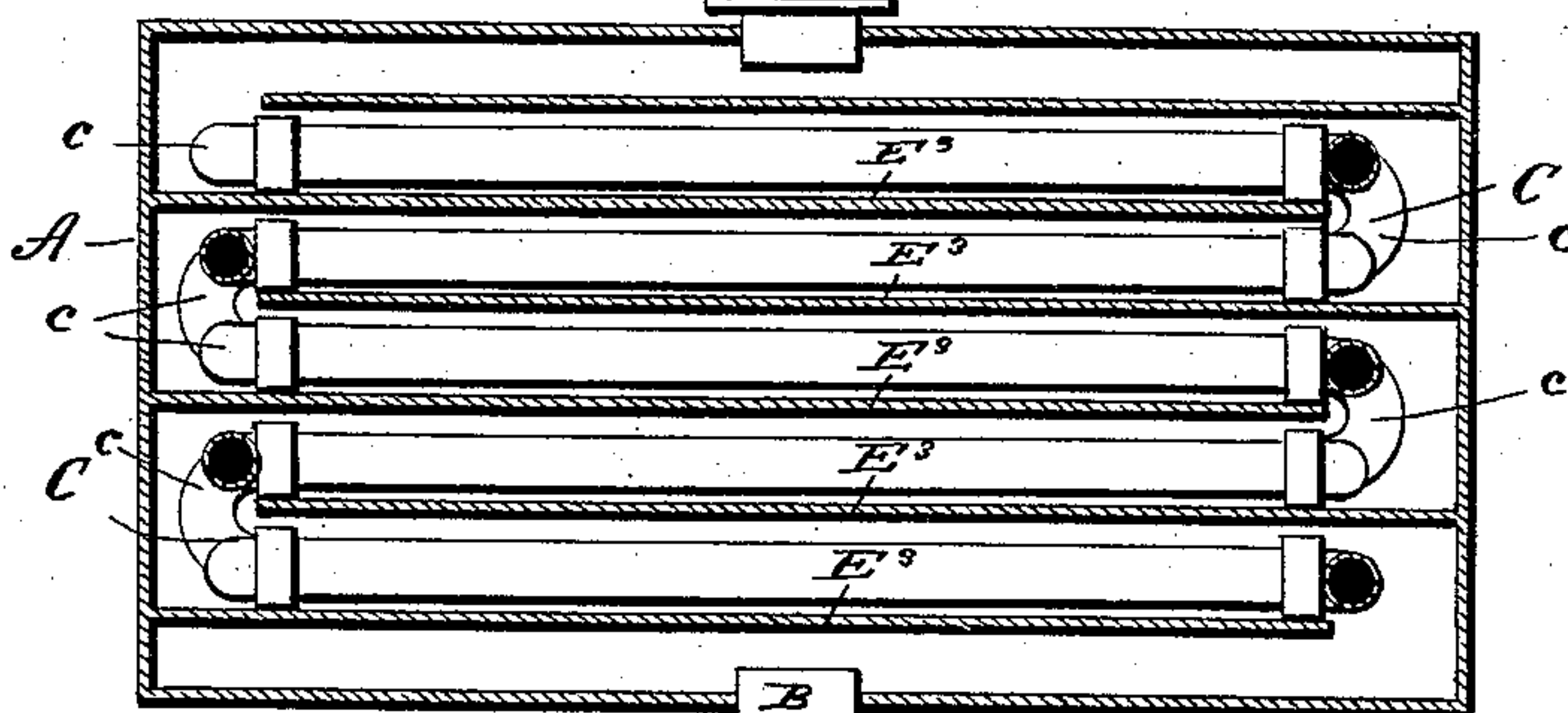


Fig. 3.

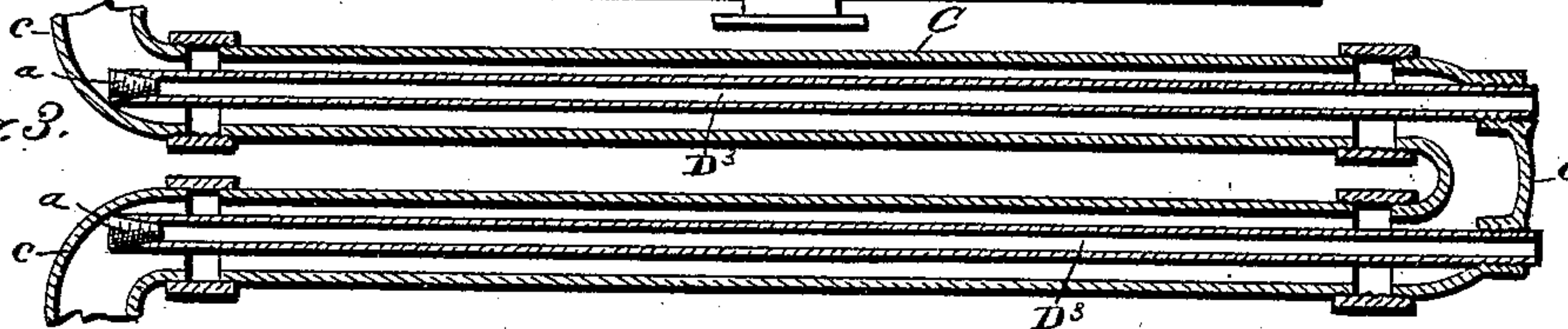
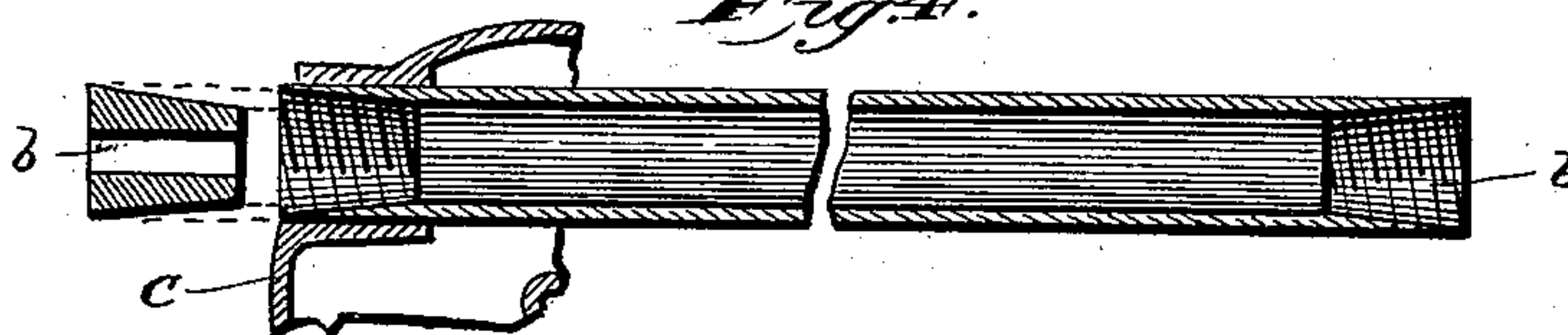


Fig. 4.



WITNESSES

Geo. S. Finch Jr.
A. E. Dowell

INVENTOR

Vigil W. Blanchard
by
W. Alexander
Attorney

(No Model.)

2 Sheets—Sheet 2.

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WATER HEATER.

No. 413,914.

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Fig. 5.

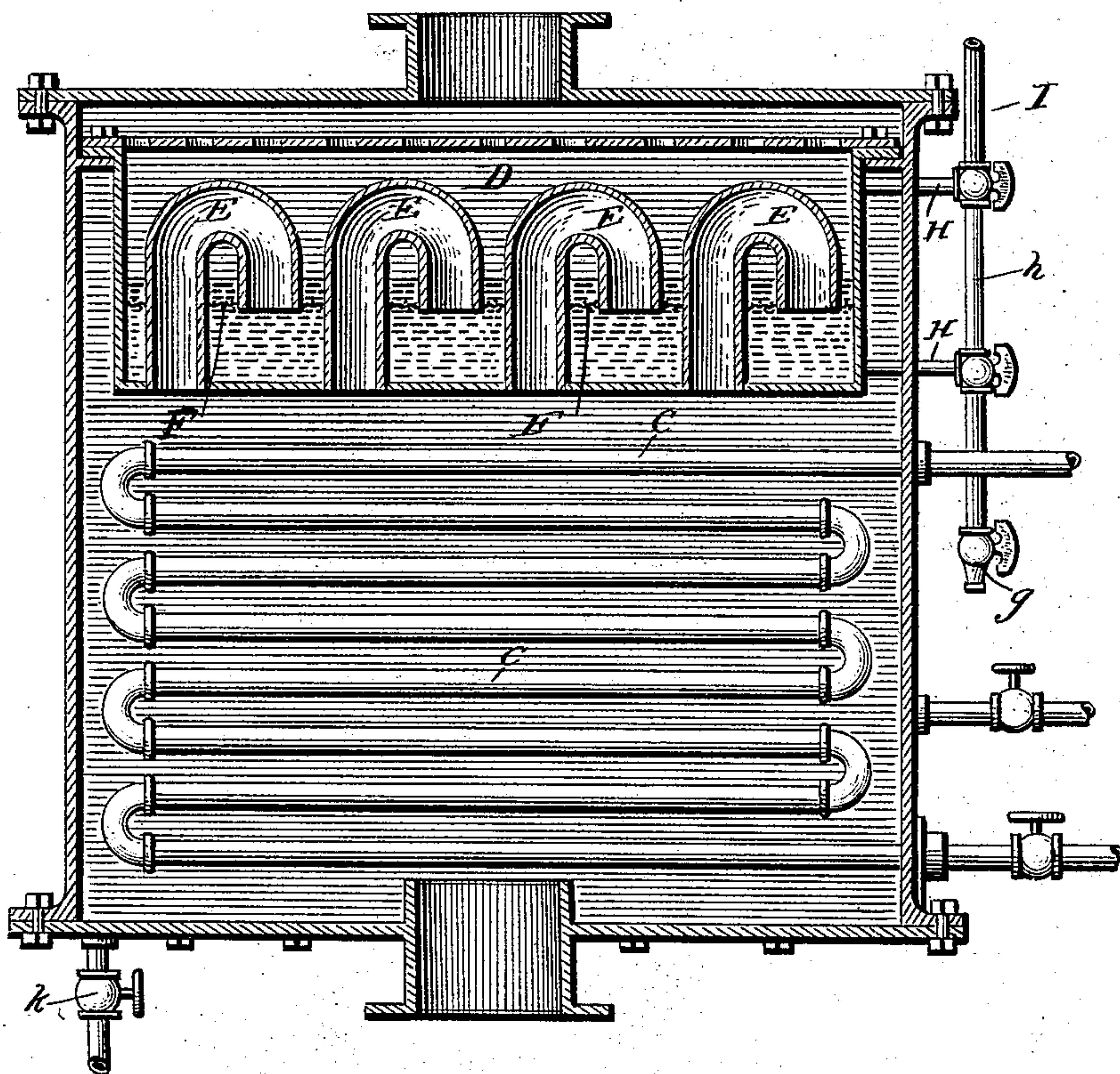
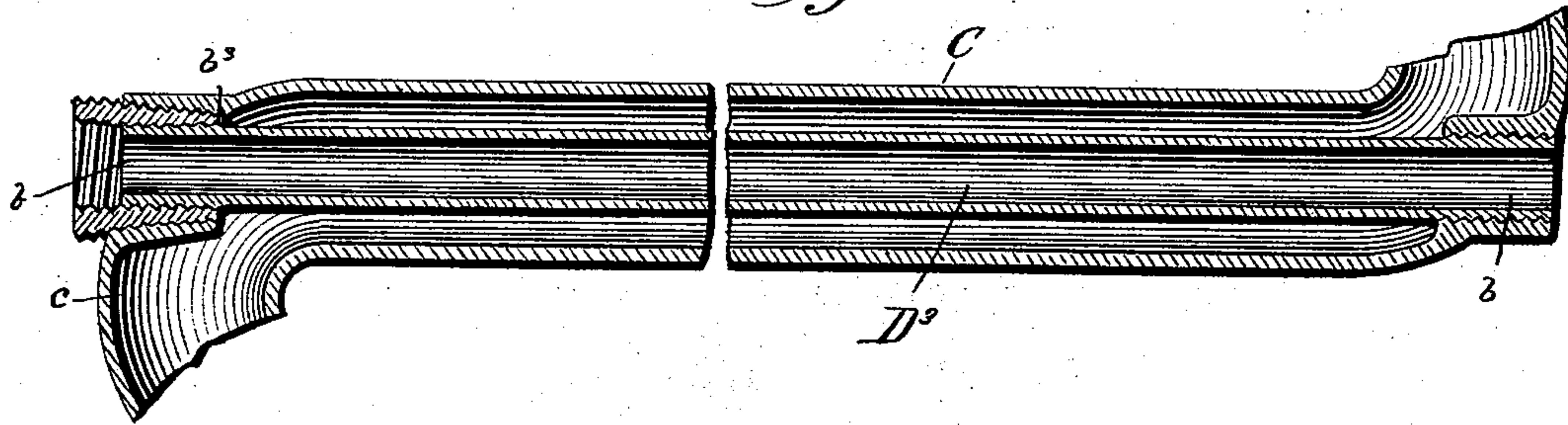


Fig. 6.



Witnesses

Jno. S. Finch Jr.

A. E. Dowell.

Virgil W. Blanchard Inventor

By *his Attorneys W. Alexander*

UNITED STATES PATENT OFFICE.

VIRGIL W. BLANCHARD, OF NEW YORK, N. Y., ASSIGNOR TO JOSEPH A. DAVIS, OF SAME PLACE.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 413,914, dated October 29, 1889.

Application filed April 11, 1889. Serial No. 306,803. (No model.)

To all whom it may concern:

Be it known that I, VIRGIL W. BLANCHARD, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Water-Heaters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification, in which—

Figure 1 represents a perspective view of my improved water heater and purifier, the casing being broken away to show the heating-coils. Fig. 2 is a reduced sectional view of the same, showing the heating-coils. Fig. 3 is a detail sectional view of the heating-coil; Fig. 4, a detail view of a steam-pipe. Fig. 5 is a central vertical section through the apparatus complete, and Fig. 6 shows a modified arrangement of the coil and steam-pipe.

This invention relates to improvements in apparatus which are designed for use in connection with a steam-boiler and a steam-engine, the object of which is to heat the feed-water on its way to the boiler by the exhaust-steam from the engine-cylinder, and also to supply pure water to the boiler; and it consists in combining in a single case or shell a water-heater and a purifier in the manner hereinafter clearly explained.

Further objects of the invention are to improve the construction of the heating-coil so that a large amount of heating-surface is presented to the feed-water, and the combination and arrangement of parts.

Referring by letter to the drawings, A designates a casing made, preferably, of boiler-iron and of any desired capacity, and which is preferably of rectangular shape.

B B' designate the inlet and outlet ports of said casing at top and bottom thereof, which are designed for connection, respectively, to the exhaust-pipe of an engine and to a condenser. In the lower part of the casing is a series or bank of pipe-coils C, arranged in close relation to each other in gangs. One end of the continuous coil leads from a steam-boiler and the other end is preferably con-

nected with the condenser (not shown in the drawings) with which the casing A is connected, so that the water of condensation may be drawn through the coil into the boiler. This coil is constructed as hereinafter explained. At the lower end of the casing A is a pipe provided with a cock *k* for drawing off water of condensation from time to time as it accumulates.

D designates a steam-purifier, which is located near the top of the casing A and suitably supported therein. The shell of this purifier, like the shell of the casing, is made strong enough to withstand high steam-pressure, and inside of it are a number of siphon-legs E, the longest legs of which communicate with the chamber of the casing at the bottom of the purifier in which the coil is located, and the shortest legs of these siphons dip down below the water-line in the purifier.

For the purpose of causing a thorough diffusion of the steam issuing from the shortest legs of the said siphons I preferably employ a horizontal reticulated plate or wire-gauze diaphragm F, arranged horizontally in the generator D at or below the water-line therein.

I designates a feed-water pipe leading from a convenient source and communicating with the upper part of the casing G, and also with the lower part thereof. These branch pipes H H are connected together outside the casing A by means of a gage-glass *h*, at the lower end of which is a cock *g*, for drawing off the sediment which subsides to the bottom of casing D.

The straight portions of the pipe-coils C are secured by elbows *c* by steam-tight joints, and all of the coils form one continuous channel, leading from a steam-boiler through the casing A. Between the tiers of pipe-coils C are arranged horizontal plates or diaphragms E³, as shown in Figs. 1 and 2, alternating, so that the exhaust-steam entering the bottom of the casing through inlet B is compelled to take a serpentine ascending course through the casing, insuring a very thorough distribution of the heated steam.

For the purpose of greatly increasing the heating capacity of the apparatus and to utilize the heat of the exhaust-steam to the

utmost degree I employ inside of the pipe-coils C smaller pipes D^3 , which may extend entirely through the coils C, opening at both ends $b b$ in the steam-space of the casing, as indicated in Figs. 4 and 6, so that steam can
5 freely pass through them as well as around the coils. If desired, the steam-pipes D may be open at one end and closed at the other end inside pipes C by plugs a , as indicated in
10 Fig. 3.

For the purpose of effectually sealing the joints of the inside or steam pipes D^3 at the points b^3 , I employ tubular tapered plugs, (shown clearly in Fig. 6,) which plugs are
15 screwed onto the ends of pipes D^3 and into the openings in the walls of the couplings c ; or the plugs may be placed inside pipes D, as indicated in Fig. 4, and expand said pipes at their joints in the coupling. The pipes D^3
20 are made of such diameter relatively to the bores of pipes C that the water caused to circulate through the latter is reduced to a thin film, thus obtaining the greatest heating effects in the smallest possible space.

Exhaust-steam from the engine-cylinder is alternately injected into the casing A and heats the water circulating through the pipe-coil C, as described. The steam then passes through the siphons E in the purifier and is
30 injected into the water therein, which is more or less impure. The water is thus in a measure distilled and the impurities are precipitated, the steam passing off to the condenser laden with water and in condition for ready
35 condensation.

By means of the glass gage h the height of the water in the generator or purifier D can be observed at all times, and when necessary this purifier can be replenished by opening a
40 cock i in the supply-pipe I.

From the foregoing it is clear that I utilize the heat of the exhaust-steam from an engine to heat the water circulating to the boiler, and also to distill impure feed-water and supply purified water to the boiler, which is heated to a high temperature in the coil C, as is evident, previous to its delivery to the boiler.

Having thus described my invention, what I
50 claim is—

1. In an apparatus for purifying water for steam-boilers, the combination of a purifier provided with feed and outlet pipes and siphons with a casing provided with steam-inlet pipes, substantially as described.
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2. In an apparatus for purifying water, the combination of a purifier provided with siphons and a reticulated diaphragm, and also with a feed-pipe, a steam-outlet pipe, and a
60 sediment-cock, substantially as described.

3. In an apparatus for heating and evapo-

rating water for steam-boilers and other purposes, the combination, with a series of communicating pipe-coils arranged in a suitable casing, of steam-pipes open at one or both
65 ends and applied longitudinally and centrally inside of the straight portions of the said coils and in communication with the steam-space of said casing at the bends of the coils, substantially in the manner and for the purposes
70 described.

4. A gang or bank of water-circulating coils arranged inside a casing, in combination with steam-pipes inside said coils and a series of alternate diaphragms arranged between the
75 pipe-coils, substantially as described.

5. A gang or bank of water-circulating coils arranged inside of a steam-casing, in combination with steam-pipes inside the straight portions of the said coils, plugged at one end and
80 communicating with the steam-space at the other end, substantially as and for the purpose specified.

6. The combination of the casing provided with steam inlet and outlet pipes, a bank of
85 water-circulating coils, a series of short straight steam-pipes in said coils, and tubular conical plugs holding said steam-pipes in their places, substantially as described.

7. The combination of a casing having
90 steam-inlet pipes and a coil of pipes communicating with a steam-boiler, in combination with a purifier consisting of siphons arranged in a case and communicating with the interior of the said casing, and the feed and steam-
95 outlet pipes, all constructed and arranged to operate substantially in the manner and for the purpose specified.

8. The combination of a casing provided with steam inlet and outlet pipes, a bank of
100 water-circulating coils of pipe, steam-pipes through the horizontal portions of said coils, and a series of alternating diaphragms between the coils forming serpentine channels for the circulation of steam through the casing, substantially as and for the purpose described.
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9. In a water heater and purifier, the combination of the casing, a vessel secured therein having a case provided with siphons, and water feed and drain pipes, with a coil of water-circulating pipes below said vessel and a series of steam-pipes arranged inside the horizontal limbs of said coils, all substantially as and for the purpose specified.
115

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VIRGIL W. BLANCHARD.

Witnesses:

W. R. KEYWORTH,
F. O. MCCLEARY.