

(No Model.)

2 Sheets—Sheet 1.

V. H. McCONNELL.
FEED WATER HEATER AND PURIFIER.

No. 445,934.

Patented Feb. 3, 1891.

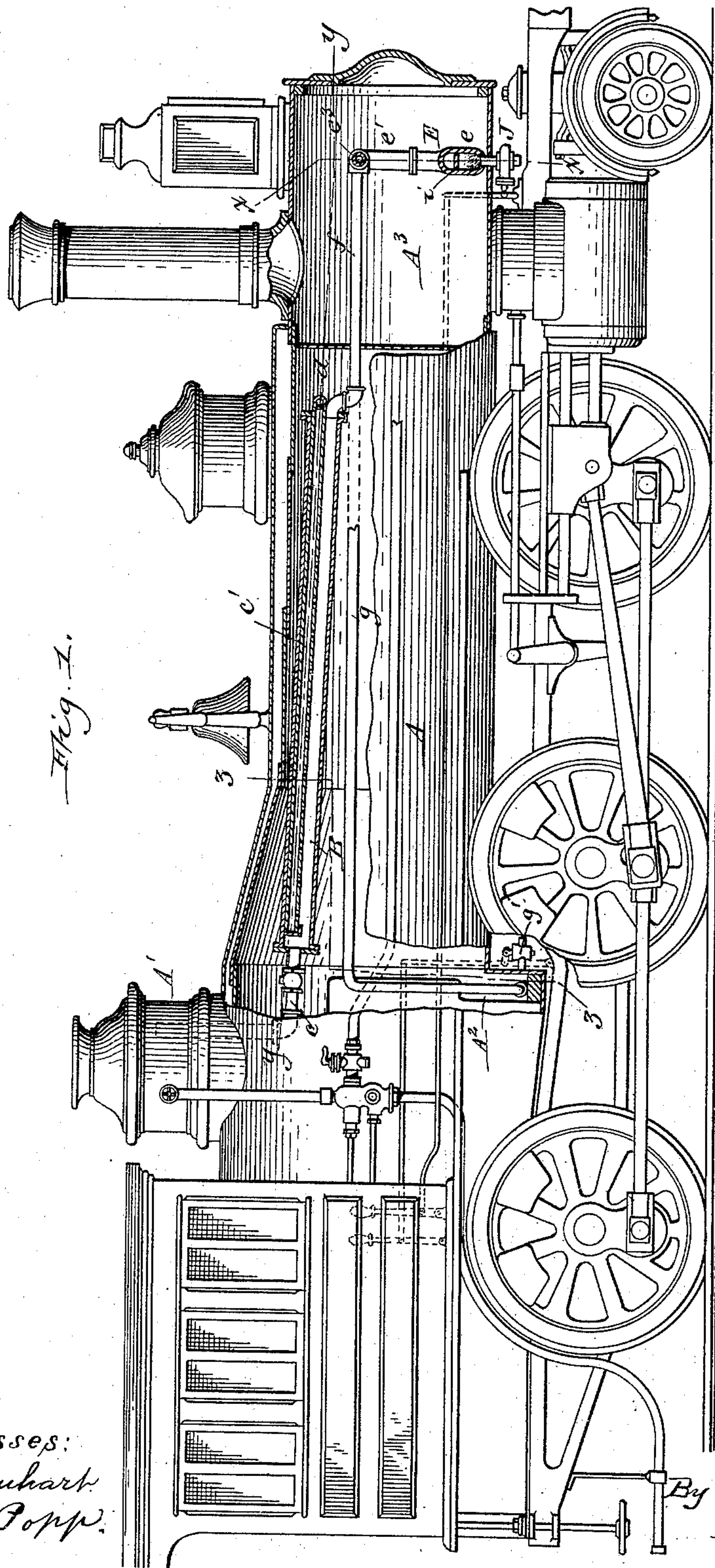


Fig. 1.

Witnesses:
Emil Neubart
Theo. L. Popp.

V. H. McConnell
Inventor.

By Wilhelm H. Brown.
Attorneys.

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2 Sheets—Sheet 2.

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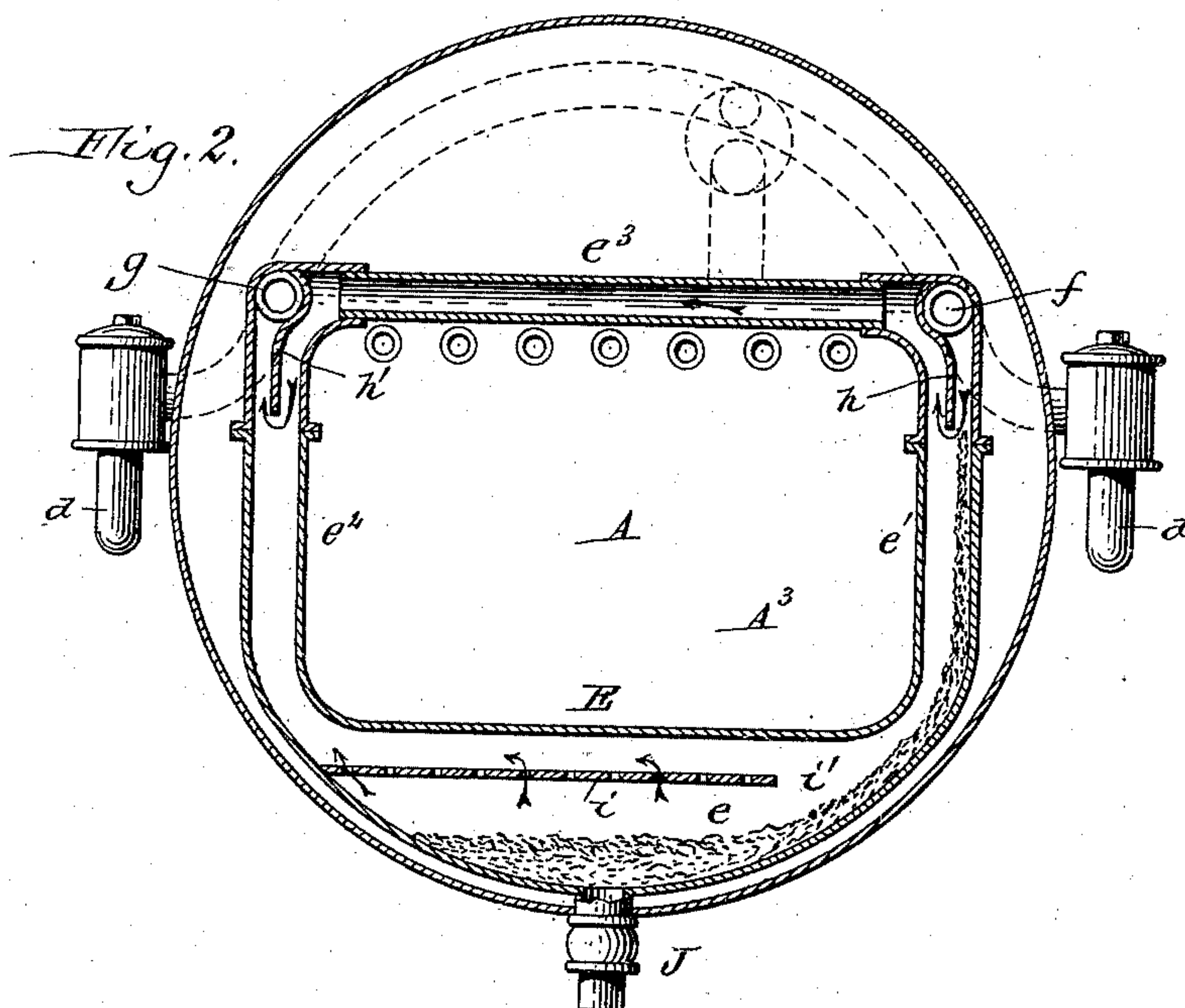


Fig. 3.

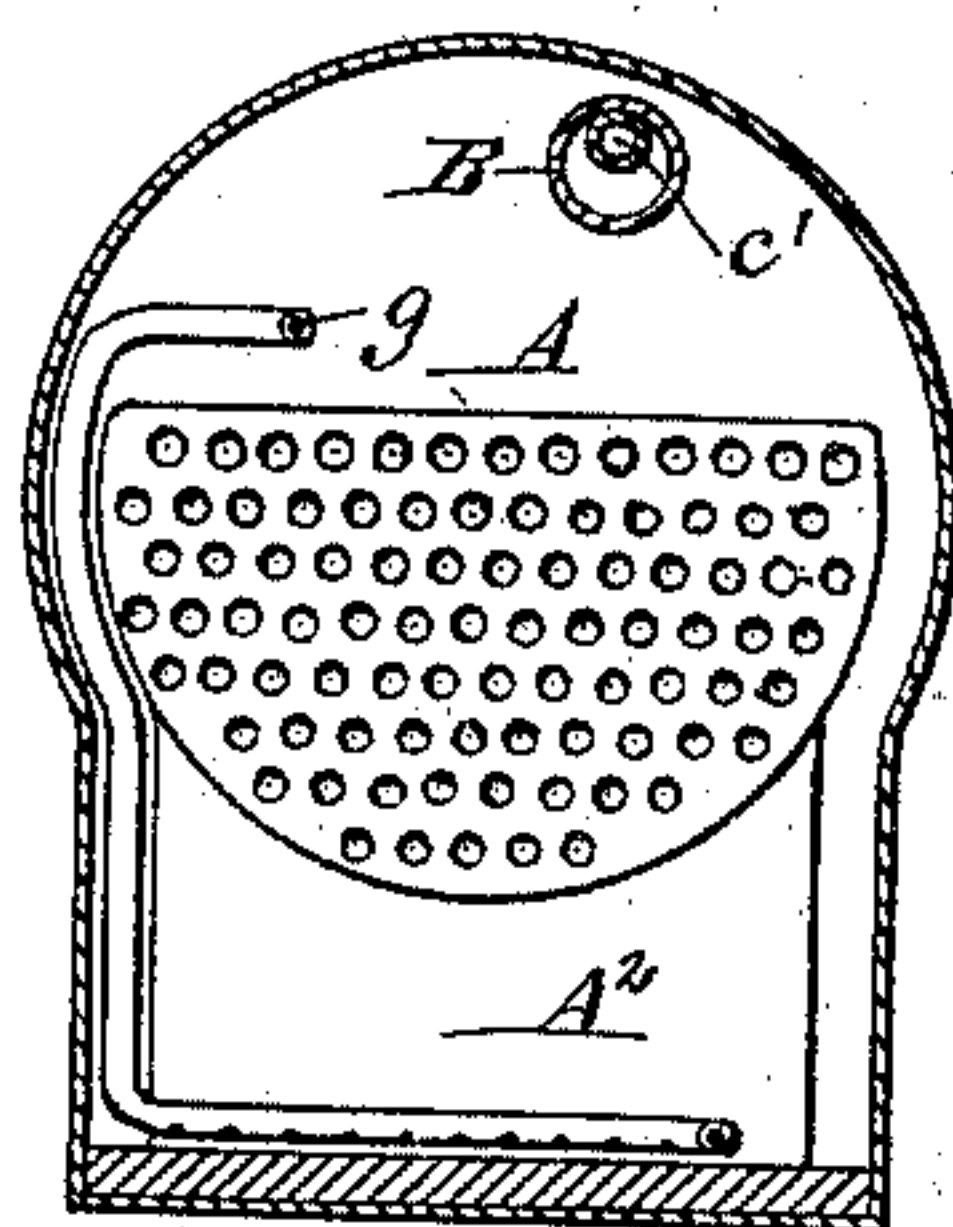
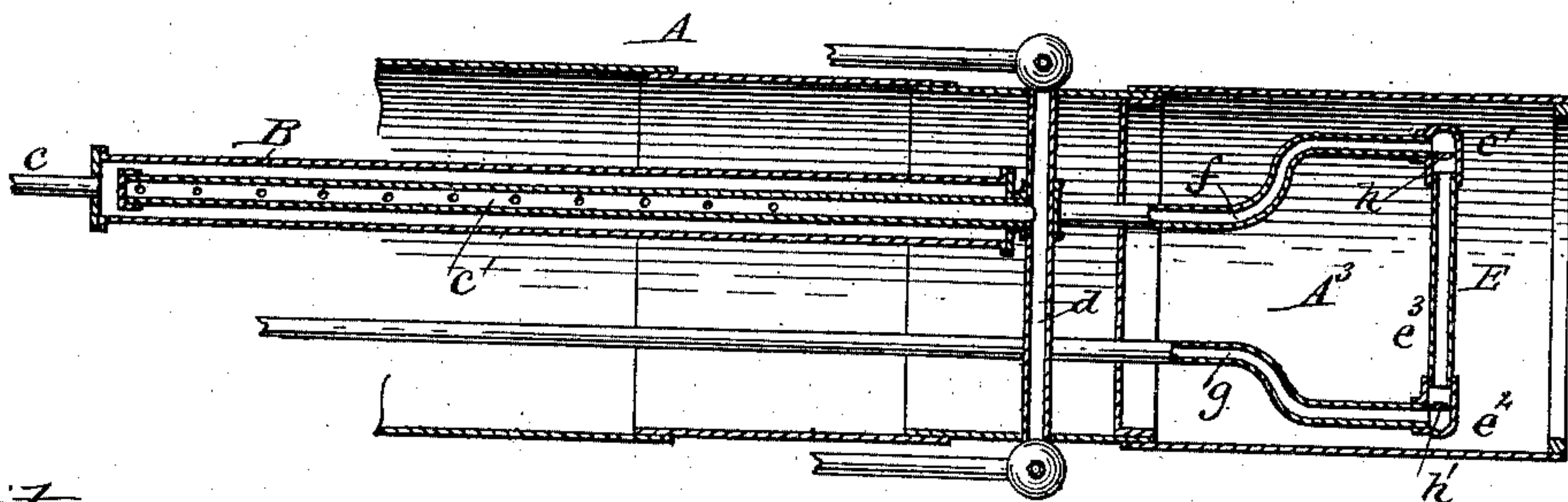


Fig. 4.



Witnesses:
Emil Neuhart.
Theo. L. Popp.

V. H. McConnell Inventor.
By Wilhelm Rouns.
Attorneys.

UNITED STATES PATENT OFFICE.

VIRGIL H. McCONNELL, OF BUFFALO, NEW YORK.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 445,934, dated February 3, 1891.

Application filed September 29, 1890. Serial No. 366,461. (No model.)

To all whom it may concern:

Be it known that I, VIRGIL H. McCONNELL, a citizen of the United States, residing at the city of Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Feed-Water Heaters and Purifiers, of which the following is a specification.

This invention relates to feed-water purifiers in which the feed-water before being delivered into the boiler is heated to a sufficiently-high temperature to liberate the lime or other solid impurities, the latter being precipitated and blown off from time to time while the purified water passes on to the boiler.

My improved apparatus is more especially designed for locomotive-boilers, and the invention has the object to provide an efficient apparatus whereby the feed-water is thoroughly deprived of all solid impurities before being admitted to the boiler, and which shall be conveniently located and easily applicable to existing boilers.

My invention consists to that end in combining with a suitable heater a settling-chamber, which is located in the smoke-box of the boiler.

In the accompanying drawings, consisting of two sheets, Figure 1 is a sectional elevation of a locomotive provided with my improved apparatus. Fig. 2 is an enlarged cross-section in line $x x$, Fig. 1. Fig. 3 is a cross-section of the boiler, taken through the water-leg, in line $z z$, Fig. 1. Fig. 4 is a fragmentary horizontal section in line $y y$, Fig. 1.

Like letters of reference refer to like parts in the several figures.

A represents the boiler of the locomotive; A' , the steam-dome; A^2 , the water-leg, and A^3 the smoke-box.

B represents a water-heater arranged, preferably, in the steam-space of the boiler and consisting of a tight cylindrical chamber extending lengthwise of the boiler and provided with a steam-supply pipe c , terminating in the dome of the boiler, and an internal perforated pipe c' , whereby the feed-water is sprayed into the heating-chamber in a finely-divided state. The water is highly heated by contact with the steam in the chamber, causing the solid impurities to be liberated from the water.

d represents the feed-water supply-pipe

leading from the supply-tank to the spray-pipe c' and with which the usual delivery-pumps are connected.

E represents a settling or separating chamber located in the smoke-box A^3 , and f is a pipe whereby the heated feed-water is conducted from the heater B to the settling-chamber. As more clearly shown in Fig. 2, this settling-chamber consists of an enlarged hollow base e , arranged transversely in the smoke-box and provided at one end with a descending inlet-pipe e' , with which the discharge-pipe f of the heater is connected, and at its opposite end with an ascending pipe e^2 . These ascending and descending pipes are connected at their upper ends by a horizontal circulating pipe e^3 .

g is the delivery-pipe connected with the upper end of the ascending outlet of the settling-chamber and which conducts the purified water to the boiler.

h is a shield or deflector arranged in the upper portion of the descending pipe of the settling-chamber on the inner side of the mouth of the inlet-pipe f and depending below the horizontal pipe e^3 , so as to direct the incoming feed-water downwardly in the inlet-pipe. h' is a similar shield arranged in the upper portion of the ascending pipe in front of the outlet thereof, and whereby the water which passes through the horizontal pipe in the direction of the arrow in Fig. 2 is directed downwardly in the ascending pipe, so as to retard its escape from the settling-chamber.

i represents a strainer-plate arranged horizontally in the enlarged base of the settling-chamber, and which extends from the outlet end of the enlarged base to within a short distance of the inlet end thereof, so as to leave a passage i' between the end of the strainer-plate and the adjacent-wall of the settling-chamber, through which the water enters the portion of the settling-chamber underneath the strainer-plate. The water entering the descending inlet-pipe passes into the enlarged base of the settling-chamber and ascends through the perforated strainer-plate into the outlet-pipe e^2 , from which latter it passes to the boiler through the delivery-pipe g . The lime and other solid impurities in the water settle in the bottom of the settling-chamber,

being intercepted by the strainer-plate and prevented from again commingling with the purified water. A portion of the sediment is precipitated in the heater B, while the residue is collected in the bottom of the settling-chamber, thereby thoroughly purifying the water before the same enters the boiler and avoiding the deposit of scale upon the flues and the boiler-shell. The upper horizontal pipe e^3 of the settling-chamber forms a connection between the upright pipes e' e^2 of the chamber, establishing with said pipes and the hollow base a continuous passage, through which the water circulates before escaping from the settling-chamber.

J represents a blow-off pipe connected with the bottom of the settling-chamber and having a suitable blow-off cock. Upon opening this blow-off cock the steam-pressure expels the water from the heater into the settling-chamber and from the latter through the blow-off cock, the water carrying with it any sediment which has collected in the heater and the settling-chamber, whereby the apparatus is thoroughly cleaned. The heater B is preferably inclined toward the settling-chamber, so that any sediment which is precipitated in the heater will flow into the settling-chamber.

The delivery-pipe g preferably extends transversely through the water-leg of the boiler, and is provided within the same with perforations through which the water issues into the boiler. This pipe may be provided outside of the water-leg with a blow-off cock g' , as described and shown in a pending application for patent filed by me on or about the 12th day of September, 1890, Serial No. 364,755, so that upon closing the blow-off cock of the settling-chamber the water in the heater and settling-chamber is discharged through the blow-off of the delivery-pipe g . This also creates a suction through the perforated portion of the delivery-pipe, whereby any sediment lodging in the water-leg or mud-ring around the delivery-pipe is discharged from the boiler. When the blow-off of the delivery-pipe is closed and that of the settling-chamber opened, a suction is created through the delivery-pipe and the sediment is discharged from the water-leg in the same manner as it is discharged by opening the blow-off of the delivery-pipe and closing that of the settling-chamber.

If desired, the blow-off of the delivery-pipe may be dispensed with; but I prefer to employ the same in addition to the blow-off of the settling-chamber, because any sediment which remains after blowing off through the cock of the settling-chamber may be discharged by means of the other blow-off, thereby enabling the boiler to be effectually cleaned.

By arranging the settling-chamber in the smoke-box of the boiler the same is not only readily applicable to existing boilers, easily accessible for making repairs, and protected from the weather, but it is heated to a consid-

erable degree, thereby maintaining the feed-water at almost the high temperature at which it comes from the heater and facilitating the precipitation of the sediment in the settling-chamber.

I do not wish to claim in this application the feature of the perforated delivery-pipe arranged in the water-leg of the boiler and provided outside of the boiler with a blow-off cock, as that forms the subject of my pending application hereinbefore referred to.

I claim as my invention—

1. The combination, with a steam-boiler having a smoke-box, of a water-heating chamber arranged in the steam-space of the boiler and communicating with the steam-space, a settling-chamber arranged in the smoke-box and receiving the hot water from said heating-chamber, and a pipe whereby the purified water is conducted from the settling-chamber to the boiler, substantially as set forth.

2. The combination, with a steam-boiler having a smoke-box, of a feed-water heater whereby the water is heated to liberate the solid impurities contained in the water, a settling-chamber arranged in the smoke-box connected with said water-heater and provided with a blow-off cock, and a delivery-pipe whereby the purified water is conducted from the settling-chamber to the boiler, substantially as set forth.

3. The combination, with a steam-boiler having a smoke-box, of a vertical settling-chamber arranged in the smoke-box and consisting of a hollow base provided with a descending inlet-pipe and an ascending discharge-pipe, a feed-pipe connected with the descending inlet of the settling-chamber, and a delivery-pipe leading from the ascending outlet thereof to the boiler, substantially as set forth.

4. The combination, with a steam-boiler having a smoke-box, of a vertical settling-chamber arranged in the smoke-box and consisting of a hollow base provided with a descending inlet-pipe, an ascending discharge-pipe, and a strainer arranged in the hollow base which intercepts the solid impurities in the water, a feed-pipe connected with the descending inlet of the settling-chamber, and a delivery-pipe leading from the ascending outlet thereof to the boiler, substantially as set forth.

5. The combination, with a steam-boiler having a smoke-box, of a vertical settling-chamber arranged in the smoke-box and consisting of a hollow base provided with a descending inlet-pipe, an ascending discharge-pipe, and at its bottom with a blow-off cock, a feed-pipe connected with the descending inlet of the settling-chamber, and a delivery-pipe leading from the ascending outlet thereof to the boiler, substantially as set forth.

6. The combination, with a steam-boiler having a smoke-box, of a vertical settling-chamber arranged in the smoke-box and consisting of a hollow base provided with a de-

scending inlet-pipe, an ascending discharge-
pipe, and a horizontal pipe connecting the
upper portions of the descending and ascend-
ing pipes, a feed-pipe connected with the de-
5 scending inlet of the settling-chamber, and a
delivery-pipe leading from the ascending out-
let thereof to the boiler, substantially as set
forth.

7. The combination, with a steam-boiler
10 having a smoke-box, of a vertical settling-
chamber arranged in the smoke-box and con-
sisting of a hollow base provided with a de-
scending inlet-pipe, an ascending discharge-

pipe, and a horizontal pipe connecting the up-
per portions of the descending and ascending 15
pipes, and shields or deflectors arranged in
the upper portions of the inlet and outlet
pipes of the settling-chamber, substantially as
set forth.

Witness my hand this 22d day of Septem- 20
ber, 1890.

VIRGIL H. McCONNELL.

Witnesses:

CARL F. GEYER,
- FRED. C. GEYER.