

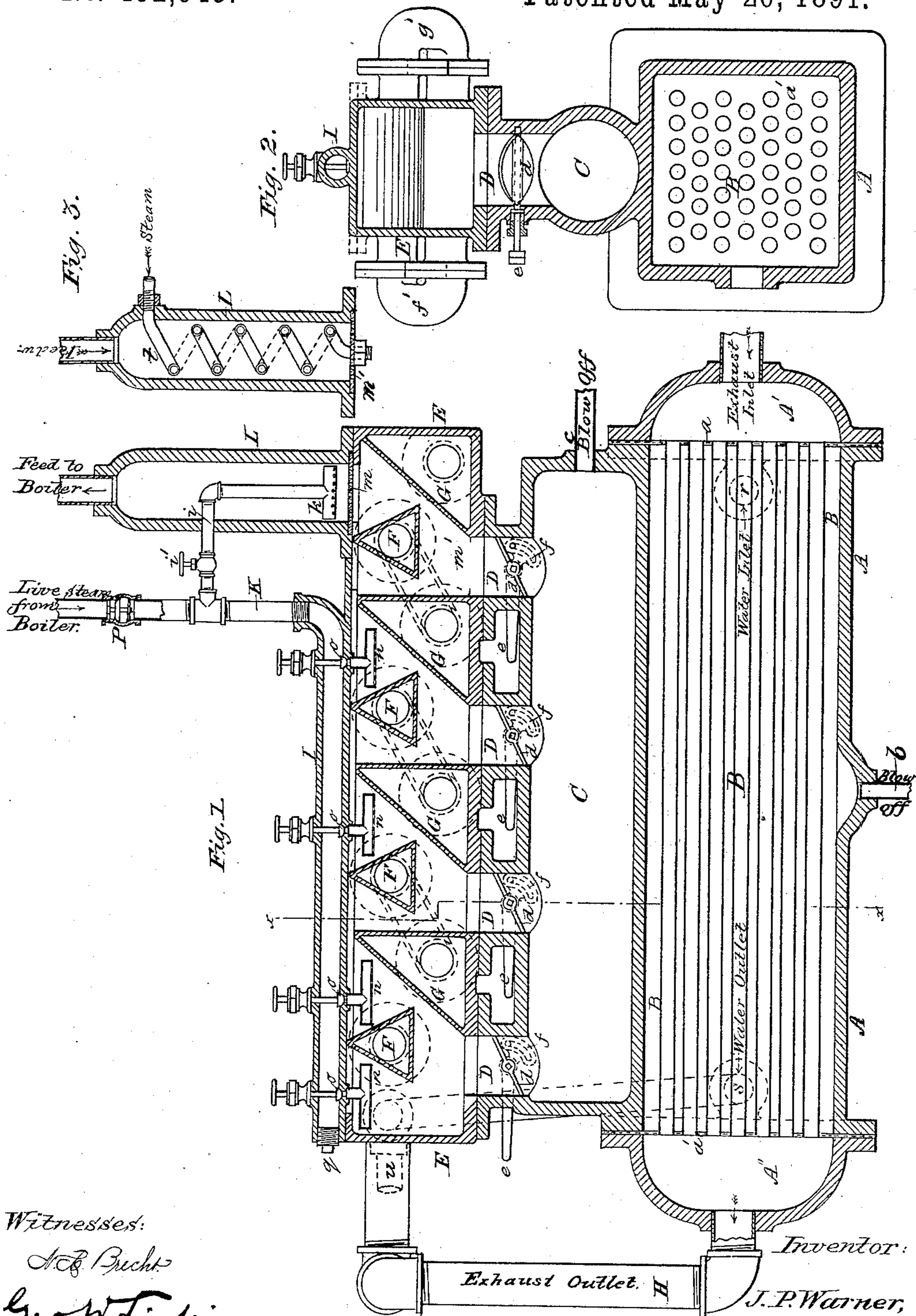
(No Model.)

J. P. WARNER.

FEED WATER HEATER AND PURIFIER.

No. 452,943.

Patented May 26, 1891.



Witnesses:

A. B. Bucht

Geo. W. Linkins

Inventor:

J. P. Warner,

By J. C. Buehler,

Attorney.

UNITED STATES PATENT OFFICE.

JOHN P. WARNER, OF WASHINGTON, DISTRICT OF COLUMBIA.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 452,943, dated May 26, 1891.

Application filed August 18, 1890. Serial No. 362,326. (No model.)

To all whom it may concern:

Be it known that I, JOHN P. WARNER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Feed-Water Heaters and Purifiers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to that class of heaters and purifiers for steam-boilers and for other purposes in which the water is heated to a very high degree, while at the same time it is deprived of all its impurities; and the object of the invention is to produce an apparatus that is very simple in its construction, having very few joints, to prevent leakage thereby, all of its parts being easily accessible for repairs or replacing any of them when worn out; also, to construct the apparatus in such a manner that it will occupy a very small space; furthermore, to thoroughly separate all mineral or vegetable matters contained in the water, convey them to a chamber provided for their reception and blow them out, and, finally, to convey it in a highly-heated and perfectly-purified condition to the boiler for speedily converting it into steam for running engines or for other purposes.

My invention consists in the construction of certain details and combination of parts, as will be fully described hereinafter, and specifically pointed out in the claims, reference being had to the accompanying drawings, and the letters of reference marked thereon.

Like letters indicate similar parts in the different figures of the drawings, in which—

Figure 1 represents a longitudinal section of the heater and purifier. Fig. 2 is a vertical cross-section on line *xx* of Fig. 1. Fig. 3 is a modification of the dome.

In the drawings, A represents the main chamber or casing, made preferably of cast-iron and of rectangular section, although it may be made of cylindrical shape and of suit-

able size for the purpose described. This chamber is provided with the hollow removable heads A' and A'', between which the tube sheets *a* and *a'* are bolted by flanges and bolts. To the tube sheets, made preferably of brass, the tubes B are secured in any suitable manner, and a blow-off pipe *b* is attached to a depression at the lower side of the case. To the upper side of the case A the sediment-chamber C, of circular form, is cast to prevent the necessity of joints and bolts, as well as the fitting of flanges usually required. The chamber C is provided with a series of nozzles D, more or less, having flanges, to which an auxiliary heating-chamber E is bolted. In this chamber a number of triangular hollow partitions F and right-angled hollow partitions G are arranged and receive the exhaust-steam in succession. It enters through the pipe H from the main chamber A, after having partly heated the water contained between the tubes in the chamber A. In each of the nozzles D a damper-valve *d* is arranged, through which any sediment deposited above said valves can be blown by opening them into the sediment-chamber C and out through the blow-off pipe *c*. The valves can be operated by levers *e*, and, if desired, they can be secured by a suitable bolt arranged in the segment *f*. (Shown in dotted lines.)

On the top of the chamber E a steam-pipe I is secured or preferably cast, communicating by a pipe K with the boiler, and a branch pipe *i* leads to a perforated T-piece *k* in the lower part of the steam-dome L, secured to the chamber E, and separated by a perforated partition *m* from it. Between the partitions F and G are placed the perforated pipes *n*, to which the live steam is admitted from the steam-pipe I, by means of the valves *o*, operated by a hand-wheel above. A check-valve P in the steam-pipe I serves to prevent any return of steam to the boiler. In the end of the steam-pipe I is placed a screw-plug *q* for cleaning out the pipe whenever necessary. The water from the pump or other supply is admitted through the inlet *r* and passes out through the outlet *s*.

The operation is as follows: The exhaust-steam is admitted into the head A' and the

water into the space between the tubes by the water-inlet *r*, when the water will be heated by the exhaust-steam, which then passes through the pipe *H* into the first hollow partition *F*, and successively into the partitions *F* and *G*, when it will be thoroughly condensed and deprived of nearly all its heat. The water will pass through the outlet-pipe *s* into the chamber *E*, meeting the heat from the live steam, as well as the hot partitions, passing over the first partition *G*, and falling in a thin stream or film over its top, and so on in succession. It finally passes through the perforated partition *m* and the outlet-pipe to the boiler in a highly-heated and purified state. The impurities contained in the water have been precipitated in its passage through the chamber *E*, and, passing through the nozzles *D* and valves *d*, descend into the sediment-chamber *C*, from which they can be readily blown when desired.

In the modified form of dome the steam from the boiler is admitted into a coil *t*, which is secured to the partition *m'* below, and thus heats the incoming water, which in this case enters at the top of the dome and passes in the reverse direction to the above-described method of heating the feed-water. The main chamber is in this instance dispensed with and the water passes out at *u*. This is especially adapted for land purposes.

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

1. A feed-water heater and purifier in which the water is first heated in a chamber with tubes, then in a chamber with triangular and right-angled hollow partitions heated by exhaust-steam and by jets of live steam from successive perforated pipes arranged between said partitions, and finally passes out through a heated dome, as specified.

2. In heaters and purifiers, an auxiliary heating-chamber provided with a series of triangular and a series of right-angled hollow partitions into which exhaust-steam is admitted, in combination with live-steam jets arranged between them and the nozzles and sediment-chamber, all arranged as set forth.

3. The combination of a main chamber provided with tubes and a sediment-chamber having nozzles provided with valves, with an auxiliary chamber containing triangular and right-angled hollow partitions and a series

of live-steam-jet nozzles, as and for the purpose specified.

4. A main chamber provided with tubes in which the water is heated by exhaust-steam and having a sediment-chamber cast to it, provided with nozzles and valves therein, in combination with an auxiliary chamber containing triangular and right-angled hollow partitions, and a series of live-steam-jet nozzles, all as set forth.

5. The combination of a main chamber provided with tubes and a sediment-chamber cast thereto, with an auxiliary chamber having a live-steam pipe cast to it, and provided with triangular and right-angled hollow partitions and a steam-dome, all as set forth.

6. The combination of the main chamber *A*, containing tubes, the sediment-chamber *C*, having nozzles *D*, to which the auxiliary chamber *E* is attached, and provided with triangular and right-angled hollow partitions *F* and *G*, and the steam-pipe *I* communicating by pipe *K* with the boiler and by a branch pipe *i* with the steam-dome *L*, all as and for the purpose specified.

7. The method of heating and purifying feed-water herein described, consisting in first heating it in a chamber with tubes by exhaust-steam, then passing it into an auxiliary chamber with hollow partitions containing exhaust-steam, and said chamber provided with live-steam jets to precipitate the impurities, and finally passing said water through a steam-dome, all as specified.

8. A feed-water heater and purifier, consisting of a chamber provided with hollow heated partitions of triangular and right-angled shape, the water passing up on the angle side of said partitions and falling in a film over the square side, as and for the purpose set forth.

9. A feed-water heater and purifier, consisting of a chamber containing triangular hollow heated partitions and right-angled hollow heated partitions, between which steam-jet nozzles are arranged, as shown, in combination with a sediment-chamber, as specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN P. WARNER.

Witnesses:

N. A. BRECHT,
GEO. W. LINKINS.