(No Model.) 2 Sheets—Sheet 1.

N. A. T. JONES.

FEED WATER HEATER AND FILTER.

No. 261,612. Patented July 25, 1882.

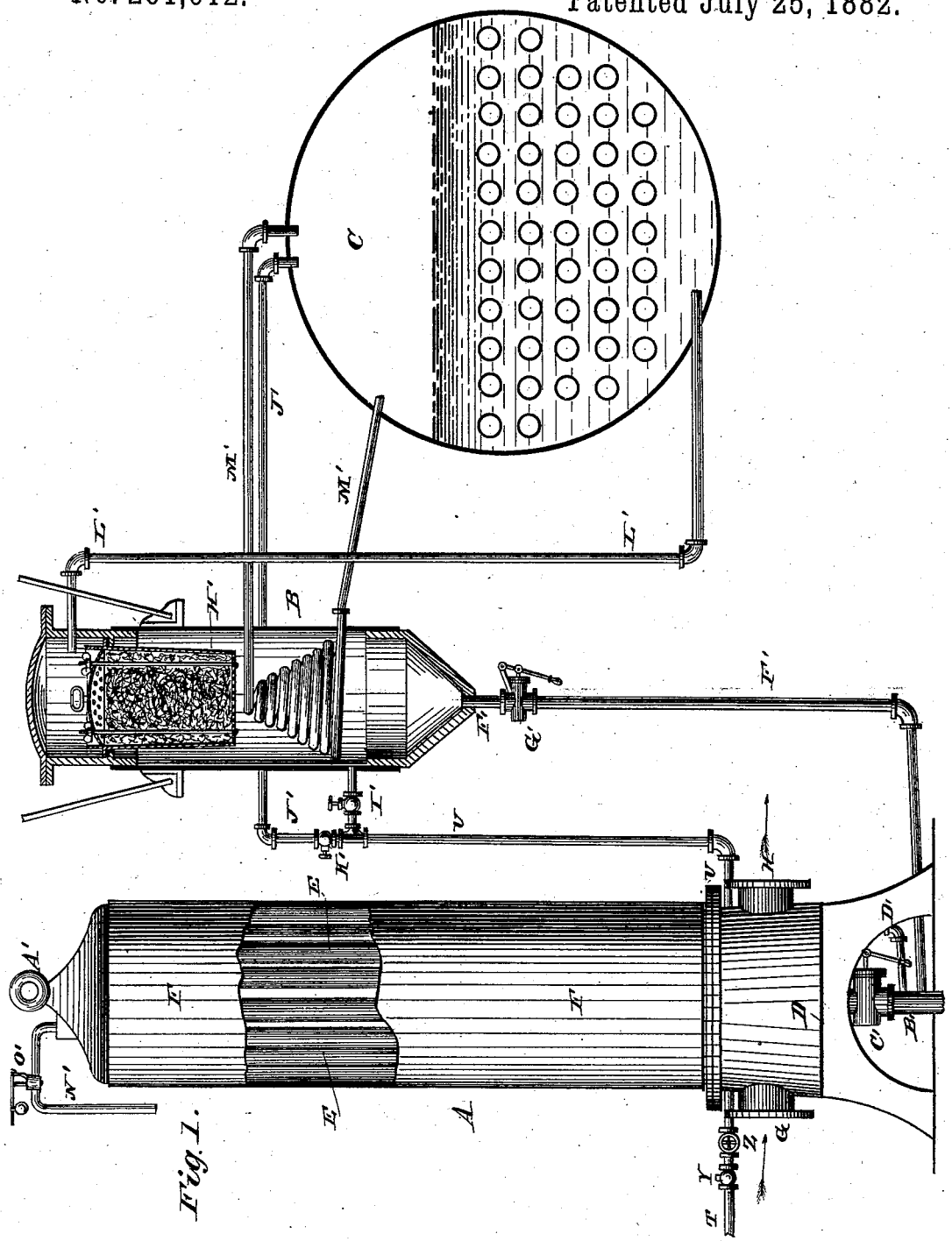

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

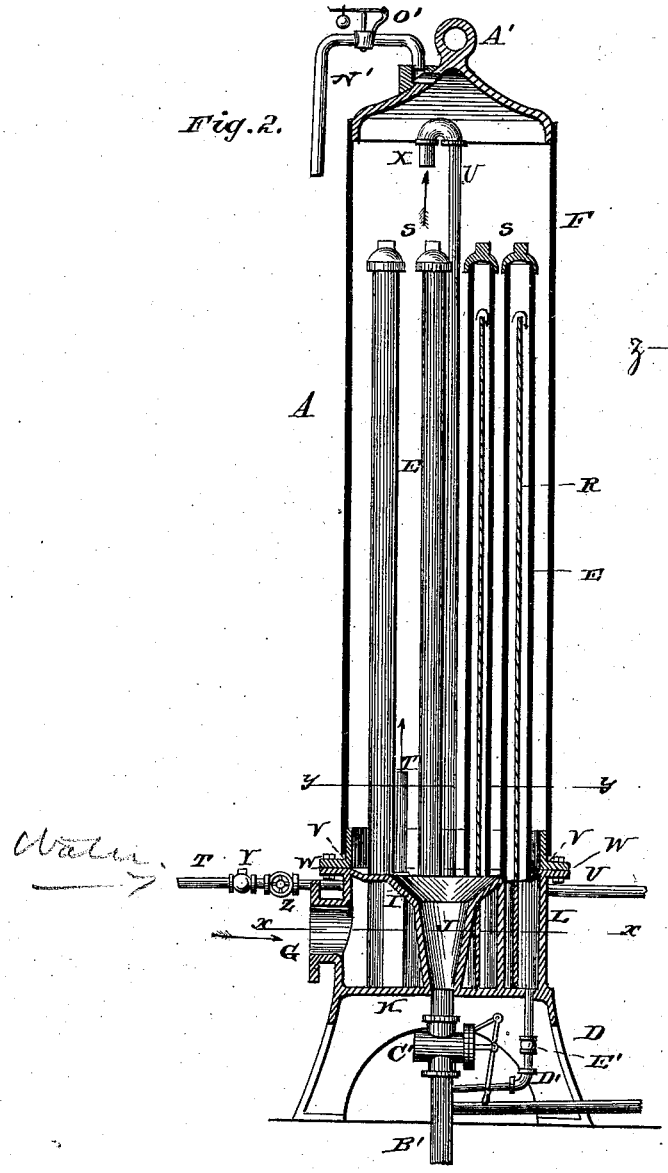


Fig. 3.

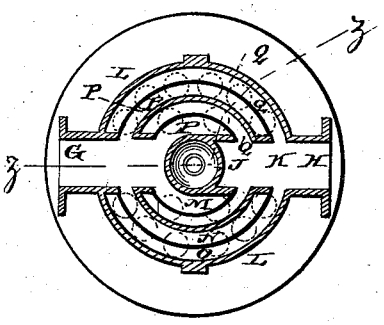
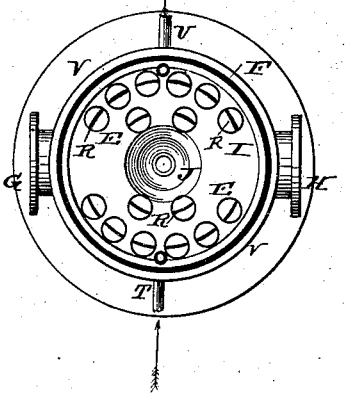


Fig. 4.



WITNESSES:

Fred. L. Dieterich

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UNITED STATES PATENT OFFICE.

N. A. T. JONES, OF PLYMOUTH, MASSACHUSETTS.

FEED-WATER HEATER AND FILTER.

SPECIFICATION forming part of Letters Patent No. 261,612, dated July 25, 1882.

Application filed April 7, 1882. (No model.)

To all whom it may concern:

Be it known that I, N. A. T. JONES, of Plymouth, in the county of Plymouth and State of Massachusetts, have invented certain new and useful Improvements in Feed-Water Heaters and Filters; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Figure 1 is a vertical sectional view of my improved feed-water heating and filtering device, showing also the boiler or steam-generator. Fig. 2 is a vertical sectional view of the heater on the line *z z*, Fig. 3. Fig. 3 is a horizontal sectional view of the heater on the line *x x*, Fig. 2. Fig. 4 is a sectional view on the line *y y*, Fig. 2.

Corresponding parts in the several figures are denoted by like letters of reference.

This invention relates to feed-water heaters and filters; and it consists especially in certain improvements in the construction of the heater, where the exhaust-steam is utilized to raise the temperature of the feed-water before it enters the filter; and it further consists in the arrangement of the heater, filter, and generator, which will be hereinafter fully described, and particularly pointed out in the claims.

Referring to the drawings hereto annexed, A represents the feed-water heater, B the filter, and C the steam-generator, which latter may be a boiler of any well-known construction. The heater A consists essentially of the base D, tubes E, and shell or casing F. The base, which is made preferably of cast-iron in one or more sections or pieces, as may be found most convenient and economical, is provided on diametrically-opposite sides with openings G H for the admission and escape of the exhaust-steam. The tube-sheet I, which forms the top of the base, is made dishing toward the center, where it is connected by a funnel-shaped tube, J, with the bottom K of said base, in which an annular chamber is thus formed between the top I, bottom K, central tube, J, and the outer wall, L. The top or tube-sheet I and the bottom K of the base are connected by segmental vertical partitions arranged on both sides of the openings G H and terminating in a line with the sides of said openings, as clearly shown in Fig. 3 of the drawings. Of these partitions, three (denoted respectively by letters M, N, and O) are formed or arranged in each side of the base. The ends of the partitions O adjoining the opening G are connected, as shown, with the outer wall of the base, and the ends of the partitions M N adjoining said opening G are connected together. Likewise the ends of the partitions M adjoining the exit-opening H are connected with the central tube, J, and the ends of the partitions N O adjoining said opening H are connected together. In this manner the base or the annular chamber of the latter is subdivided into passages or compartments P P, communicating with the opening G, and Q Q, communicating with the opening H.

The tubes E project upwardly from the tube-sheet I, in which they are firmly secured, in segmental rows or sets corresponding with the partitions M O in the base, directly over which they are placed, so that each tube shall be partly over one of the passages P and partly over the adjoining passage Q. Each tube is provided with a thin but closely-fitting vertical partition, R, forming an upward extension of the partition M or O, over which the tube may be located, and extending nearly to the top or upper end of the tube, which is closed by a suitably-constructed cap, S.

Owing to the construction and arrangement of parts just described, steam admitted through the opening G will pass through the passages or compartments P, up through the tubes E on one side of the partitions R, down through said tubes on the other side of said partitions, into the passages or compartments Q, and out through the opening H. This course or direction, which in the drawings is indicated by arrows, may of course be reversed without changing the spirit of my invention, the object of this part of my invention, which is to cause the steam in both its upward and downward passage through the tubes E to be in contact with the outer walls of said tubes, being equally well attained.

T U are the feed-pipes, which are connected to opposite sides of the base, from which they

extend upwardly through the tube-sheet, as shown, the arrows indicating the direction of the feed. The shell or casing F, which is provided at its lower edge with a flange, V, bolted to a flange, W, upon the base, forms the water-space, into which the feed-water is admitted through the pipe T, which terminates some distance above the tube-sheet, so that water may enter the heater without disturbing the mud and sediment which collect in the bottom of the water-space. The exit-pipe U extends nearly to the top of the water-space, where it terminates in a goose-neck, X, one object of which is to take the water from the heater without taking the scum which always rises to the surface. The pipe T has a check-valve, Y, and globe-valve Z for regulating the feed.

It will be observed that the steam as well as the feed-water pipes are connected to the base of the heater, and that the shell or casing is free from any pipe-connections whatever. Said shell may therefore be easily removed whenever necessary for the purpose of cleaning or repairing the interior of the heater. I prefer to construct the said shell with an eye, A′, to which tackle may be attached for hoisting it off the base.

B′ is the blow-off pipe, which is connected to the central funnel pipe or tube, J, in the base of the heater, and provided with a lever-valve, C′.

D′ is a drip-pipe connecting the bottom of the base with the pipe B′ below the valve C′, and having a valve or cock, E′, for drawing off the condensation-water from the base of the heater.

B is the filter, which consists of a suitably-constructed tank tapering toward the bottom, to which is secured a pipe, F′, having a lever-valve, G′, and connected with the blow-off pipe of the heater. The detailed construction of this filter will be the subject of another application for Letters Patent. Suffice it here to say that the tank of the filter is provided near the top with a suitable perforated pail or receptacle, H′, containing filtering material. The feed-water exit-pipe U of the heater is connected with tank B below the filtering-pail H′, and is provided with the valve I′.

J′ is a pipe connected to pipe U above or beyond the valve I′, and connecting said pipe U with the steam-space of the boiler or generator C. Said pipe J′ is provided with a valve, K′.

L′ is a pipe connecting the tank B, or the portion of said tank above the filtering-pail H′, with the water-space of the boiler, and M′ is a pipe having one end connected to the steam-space of the boiler, extending into tank B below the filtering-pail H′, coiled, as shown, in said tank, passing out of the same and finally back to the steam-space of the boiler. Through this coiled pipe M′ it will thus be seen that a circulation of live steam is kept up in the filtering-tank B, the condensation-water returning through said pipe to the boiler, which, as shown in the drawings, must be located lower than the coil of pipe M′ in tank B.

In operation the feed-water is forced through the pipe T into the shell of the heater, while the exhaust-steam enters through the opening G, circulates through the tubes E, and escapes through the opening H, from whence it may be conveyed to a condenser. The feed-water, partly heated by the exhaust-steam, passes through pipe U into the filter-tank B, where the live steam circulating through pipe M′ serves to heat it to an extreme degree before it passes through the filtering material in the vessel H′. Having been filtered, the feed-water finally passes through the pipe L′ from the upper end of the filtering-tank into the water-space of the boiler. The valves C′, G′, and K′ are of course normally in a closed position. By closing valve I′ and opening valves K′ C′ live steam passes from the boiler through pipes J′ U into the water-space of the heater, the contents of which, with all the scum and the impurities which may have settled at the bottom, are thus blown out through the pipe B′. As soon as the valves I′ K′ C′ are reversed the operation of the heater is instantly resumed, all without interfering with the operation of the steam-generator. By closing the valve I′ and opening valve G′ the flow of water in the filter is reversed, water passing from the boiler through pipe L′ into the upper end of tank B, down through the filtering material, which is thereby cleaned of impurities collected therein, and out through pipe F′, carrying off any impurities which may have settled in the bottom of tank B.

The upper end of the shell F of the heater is to be provided with a short pipe, N′, having a safety-valve, O′, to guard against the accidental closing of valves in the feed-pipes, and also to enable the scum to be drawn off from the water-space in the heater.

Details in the construction of my improved feed-water heater may be modified without changing the spirit of my invention. Thus, for instance, may the tubes E be provided with two or more partition-plates crossing each other, and the construction of the base be correspondingly modified. The construction of the filter may be changed, or it may be dispensed with entirely, the feed-pipe U being in the latter case connected direct to the water-space of the generator. The live-steam pipe J′, connected to said feed-pipe, is, however, in all cases retained for the purpose of blowing off the heater.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The combination, in a feed-water heater, of the tank having the water-space, the feed-pipe U, extending nearly to the top of said tank, where it is provided with a goose-neck, X, a pipe connecting said feed-pipe with the steam-space of the generator, and a valve controlling such connection, as set forth.

2. In a feed-water heater, the combination of the base having exhaust-steam passages and

tubes, the feed-water pipes connected to said base, and a detachable shell or tank forming the water-space and being destitute of pipe-connections, as set forth.

3. In a feed-water heater, the base having dishing top or tube-sheet I, central tooth, J, and vertical segmental partitions M N O, in combination with the tubes E, having partition-plates R, as set forth.

4. The combination of the base, the tubes E, the shell F, the feed-pipe T, connected to the base and extending a short distance into the water-space, and the feed-pipe U, extending nearly to the top of the water-space and having goose-neck X, as set forth.

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

N. A. T. JONES.

Witnesses:
T. D. STILES,
JOHN S. TAGGART.