

No. 688,353.

E. SMITH.
FEED WATER HEATER AND PURIFIER.
(Application filed Nov. 4, 1899.)

Patented Dec. 10, 1901.

(No Model.)

Fig. 1.

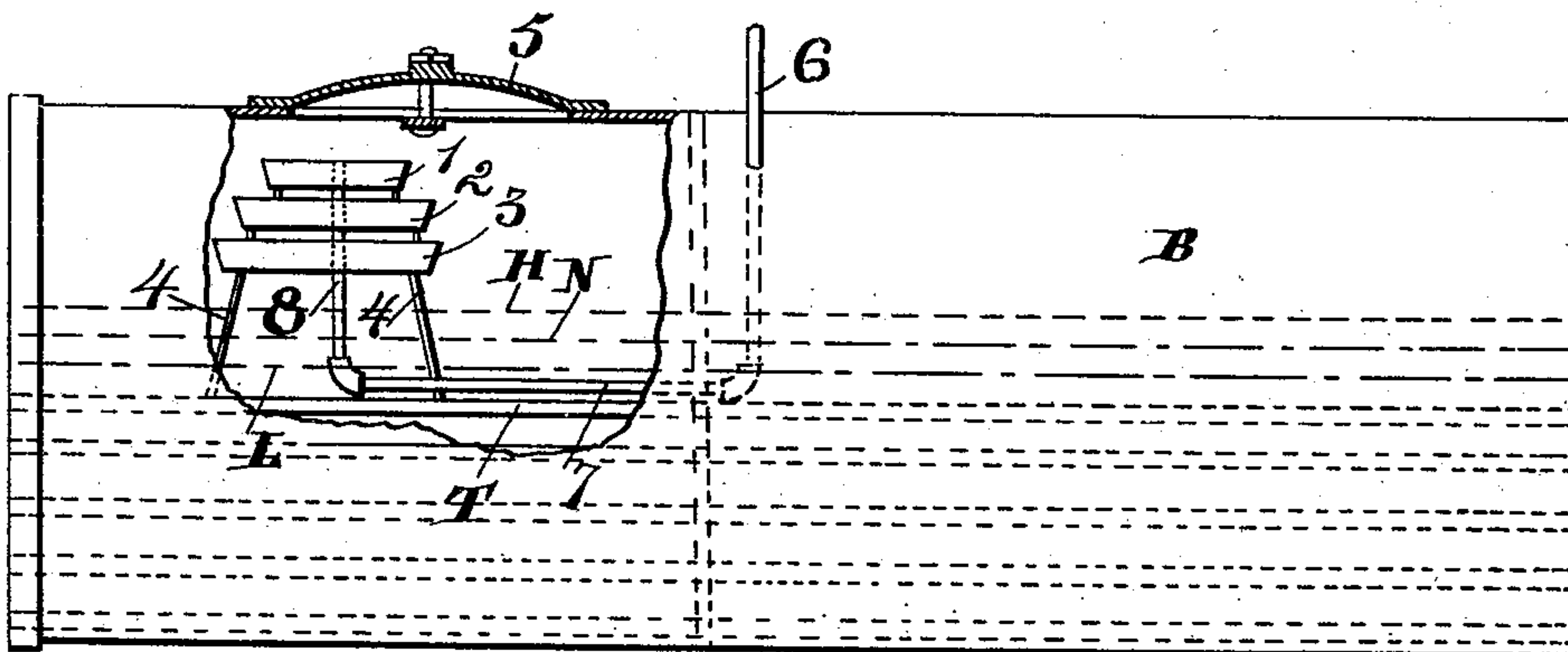


Fig. 2.

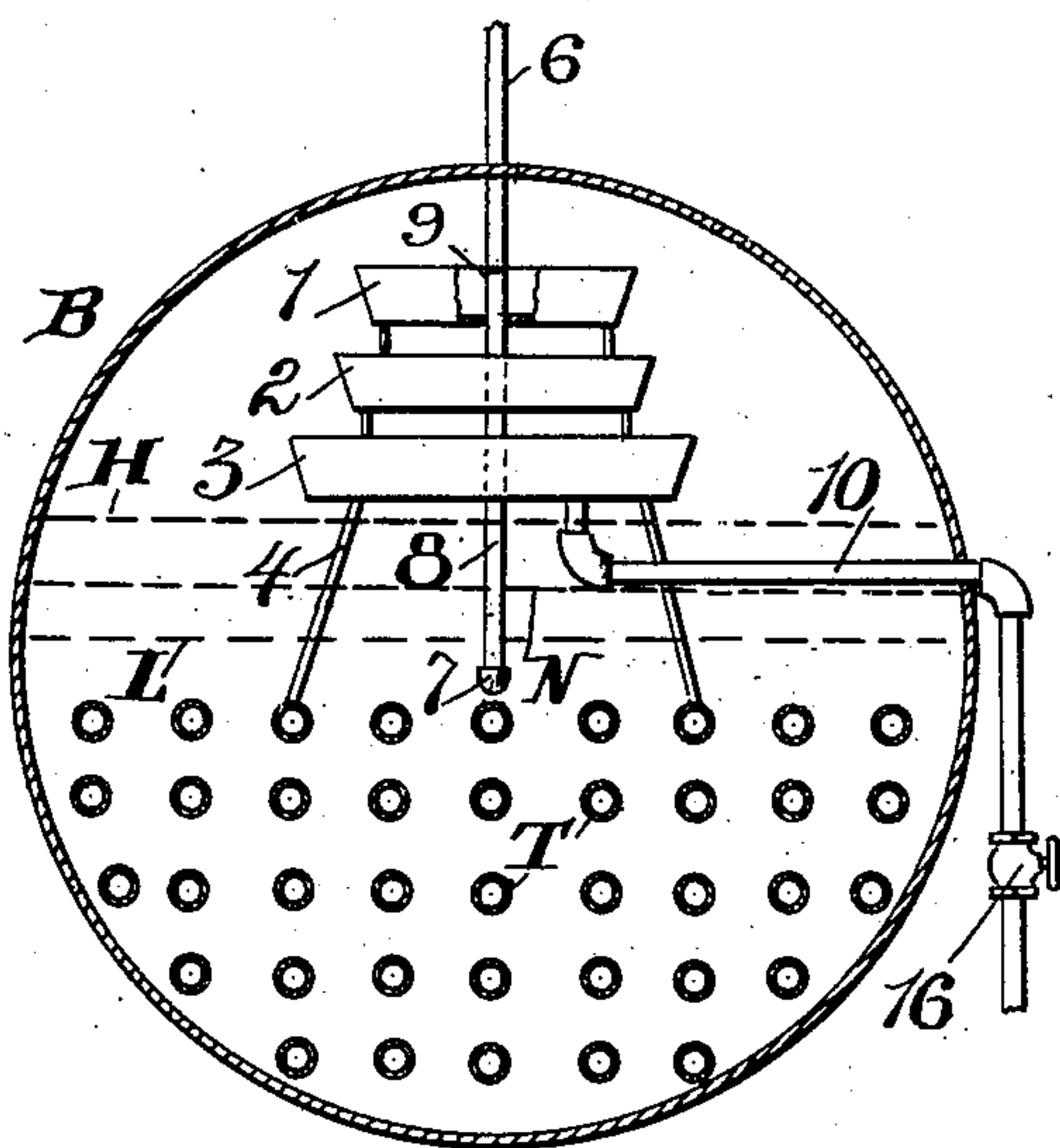
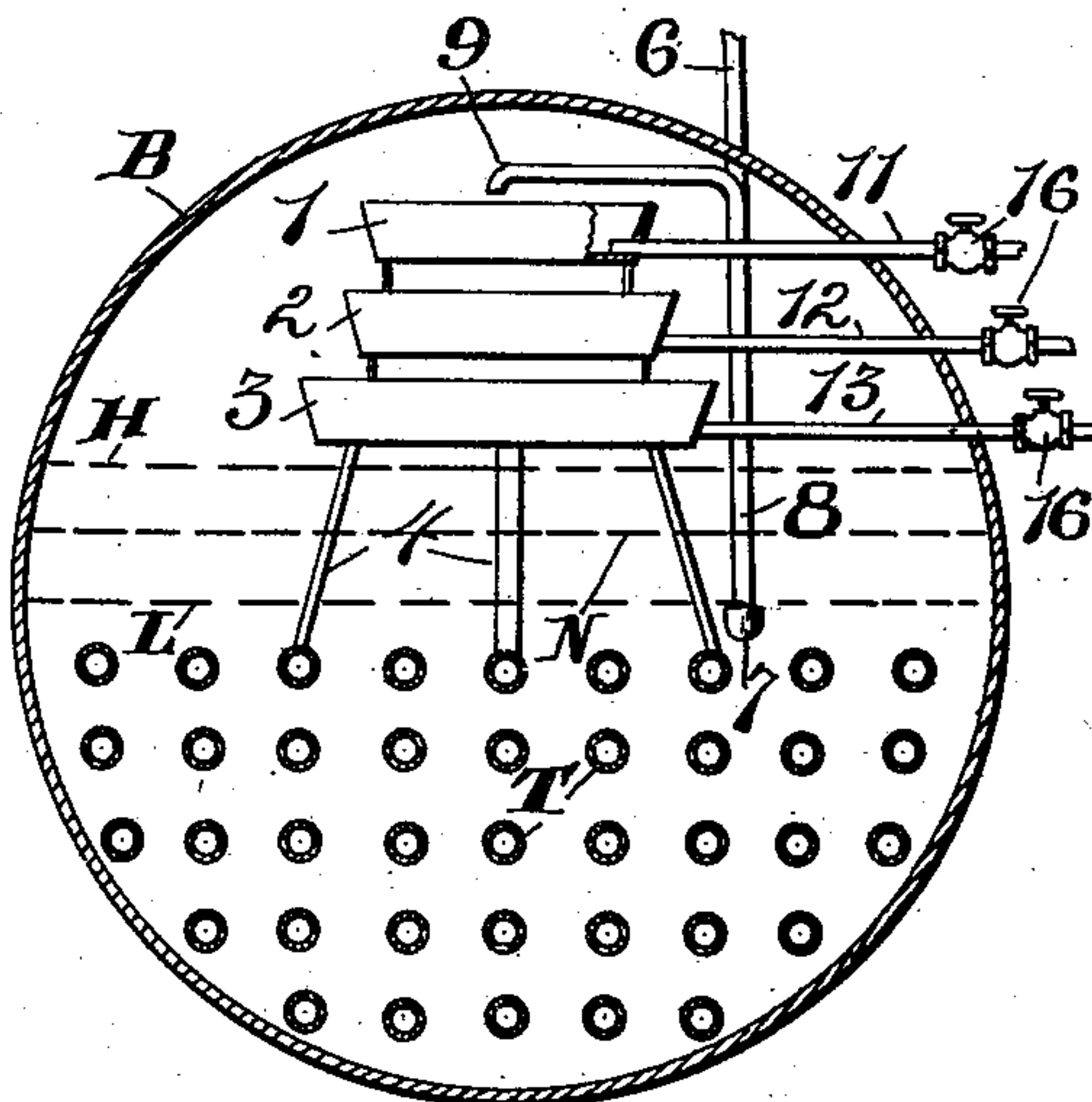


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

EDWARD SMITH, OF CANTON, OHIO.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 688,353, dated December 10, 1901.

Application filed November 4, 1899. Serial No. 735,771. (No model.)

To all whom it may concern:

Be it known that I, EDWARD SMITH, a citizen of the United States, and a resident of Canton, Stark county, State of Ohio, have invented certain new and useful Improvements in Feed-Water Heaters and Anti-Incrustation Devices; and my preferred manner of carrying out the invention is set forth in the following full, clear, and exact description, terminating with claims particularly specifying the novelty.

This invention relates to steam-boilers, and more especially to the heating and purifying of the feed-water thereof and the dislodgment of scales by means of steam; and the object of the same is to produce simple means for doing this work and permitting the blowing off of the steam and residuum at intervals.

To this end the invention consists in providing a series of pans supported within the boiler and entirely above the high-water line and within the steam zone thereof, means by which the water is superheated during its passage from the exterior of the boiler to the uppermost of said pans, and blow-off pipes communicating with the pans and the exterior of the boiler, all as will be hereinafter more fully described and claimed and as is illustrated in the accompanying drawings.

Figure 1 is an elevation of my invention, showing the boiler and tubes in dotted lines. Fig. 2 is a cross-section through the boiler, showing one form of blow-off pipe. Fig. 3 is a similar section showing a modified form of blow-off.

Referring to the said drawings, B is the boiler, and T represents the tubes, constructed as usual or in any preferred manner.

N is the normal water-line, L is the low-water line where an alarm is sounded, and H is the highest point which the boiling or bubbling water ever reaches. These lines are indicated on the boiler herein in about their proper positions, and my invention is located with relation thereto; but on different types of boilers the lines will occur elsewhere, though the respective location of my heater and purifier must be the same in order to produce the ends in view.

Coming now to the present invention, 1, 2, and 3 are pans, preferably shallow and flat, and they may be rectangular or of other shape,

provided they increase in size downward about as shown in the drawings, and 4 represents brackets or supports of any suitable character for holding these pans above the tubes, either by having the brackets rising therefrom or by having them depending from the upper portion of the boiler, which may be provided with an opening or manhole 5 for that purpose, if desired.

6 is the inlet for feed-water, which is a pipe extending from any suitable direction (here shown downward) into and through the steam-space in the boiler, thence along, as at 7, below the lowest point the water ever reaches, which is the alarm-line L, thence upward at 8 again through the steam-space, thence either through the pans or around them, and finally delivering at 9 into about the center of the uppermost pan 1. With this construction the incoming water is first heated by steam, then heated by the hot water, then again heated by steam, all within the pipe, and during its progress through the boiler, as heretofore described, the water becomes highly heated, and at the point of its passage into the smallest pan, which is also highly heated, it is immediately converted into steam and deposits in the pan all those impurities which it has been carrying in solution, and any portion of the water which has not immediately been converted into steam upon coming in contact with the upper pan overflows into the succeeding pans, and so on until the transition or change from water to steam is completed. The result is that the water is almost immediately converted into steam, depositing the sediment previously carried in solution, and the water in the boiler is the product of the condensation or cooling of the thus-purified steam.

From time to time it is necessary to cleanse the pans of the sediment and residuum therein accumulated. This is accomplished by opening a blow-off pipe which leads to the exterior of the boiler and permitting the steam-pressure on the surface of the water in the pans to forcibly drive out the residuum as the depth of the water is suddenly lowered. In Fig. 2 I have shown one blow-off pipe provided outside the boiler with a cock 16. This pipe leads from the bottom of the lowest pan 3, and when the cock is opened sud-

denly the cleansing will occur in the manner described by causing pan 1 to blow its sediment into 2, 2 into 3, and 3 out through the pipe 10. In Fig. 3 I have shown a different arrangement wherein there are three independent blow-off pipes 11, 12, and 13, each leading straight outward from a point in line with the bottom of pan through the boiler and to and through independent cocks 16. The latter are opened either simultaneously or independently, and it will be clear that the sediment in the pans will be forcibly blown straight out through the respective pipes. While this arrangement is more costly, it has its advantages in that the sediment is not necessarily caused to pass from one pan to the next nor through any angles or elbows, either of which might prevent the thorough removal of all residuum.

I will not elaborate upon the chemical action which takes place through the effect of the steam on the feed-water for preventing scaling of the interior of the boiler or removing scales already formed therein, as that is probably well known to those familiar with the art, and tests made by me show that it actually occurs. I do not confine myself to the exact arrangements, proportions, or materials of parts, as considerable change may be made therein without deviating from the spirit of my invention.

I am aware that it is old to use pans graduated in size as are mine; but it is highly important in my opinion that the feed-water be led thereto through pipes beneath the low-water line, and it is also important that the high-water line or bubbling-point of the water within the boiler should never reach the lowermost pan; otherwise it would agitate the water therein and destroy the settling action which permits the residuum to descend and accumulate upon the bottom of the pan. I am also aware that it is old to blow off various parts of a boiler or the mechanism appurtenant thereto; but I consider my specific blow-off as used in connection

with these pans a highly important detail of the invention.

What is claimed as new is—

1. A combined feed-water heater and boiler, consisting of a shell provided in its lower half with flues, a graduated series of pans located within the steam zone above the high-water line of the boiler, a substantially U-shaped feed-water pipe leading from the exterior of the boiler through the steam zone, thence through the water-space, and thence upward through the steam zone and emptying into the uppermost pan, and a blow-off pipe connecting said pans and the exterior of the boiler, substantially as described and for the purpose set forth.

2. The combination in a feed-water heater and boiler, of a series of graduated pans located within the steam zone and above the high-water line of the boiler, of a feed-water pipe leading from the exterior of the boiler through the steam zone and the water-space, and thence through the steam zone and terminating above the uppermost pan, substantially as described and for the purpose set forth.

3. The combination in a feed-water heater and steam-boiler, of a graduated series of pans located within the steam zone and above the high-water line of the boiler, a substantially U-shaped feed-water pipe leading from the exterior of the boiler down through the steam zone and the water-space, and thence upward through the steam zone and terminating above and emptying into the uppermost pan, and a series of blow-off pipes connecting said pans and the exterior of the boiler, substantially as described and for the purpose set forth.

In testimony whereof I have hereunto subscribed my signature this the 1st day of November, A. D. 1899.

EDWARD SMITH.

Witnesses:

G. N. SHAVER,
G. W. SHAVER.