

No. 753,860.

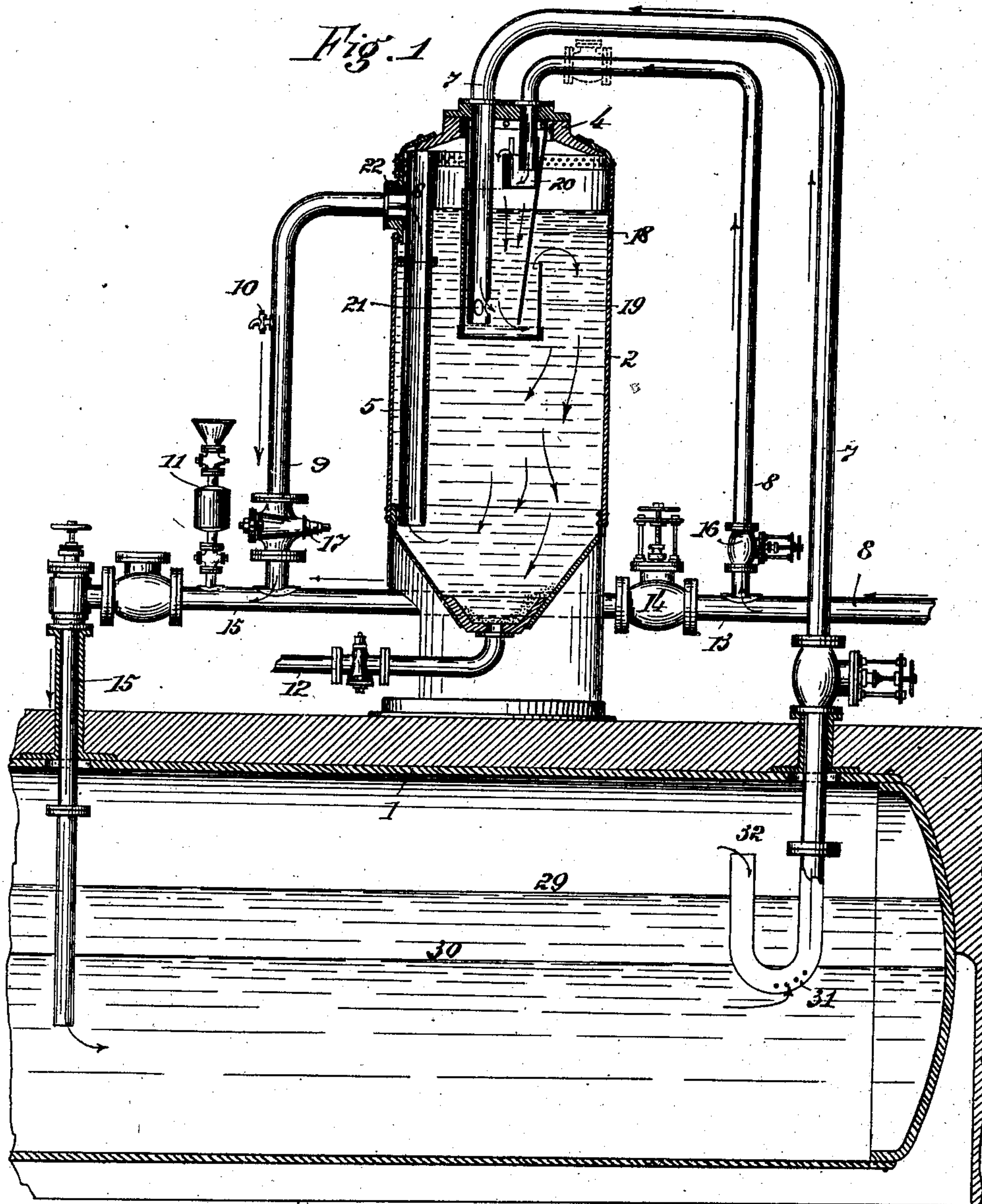
PATENTED MAR. 8, 1904.

J. B. L. DESTOMBES.  
PROCESS OF PURIFYING FEED WATER.

APPLICATION FILED APR. 29, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:  
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C. Heymann.

Inventor:  
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2 SHEETS—SHEET 2.

Fig. 2.

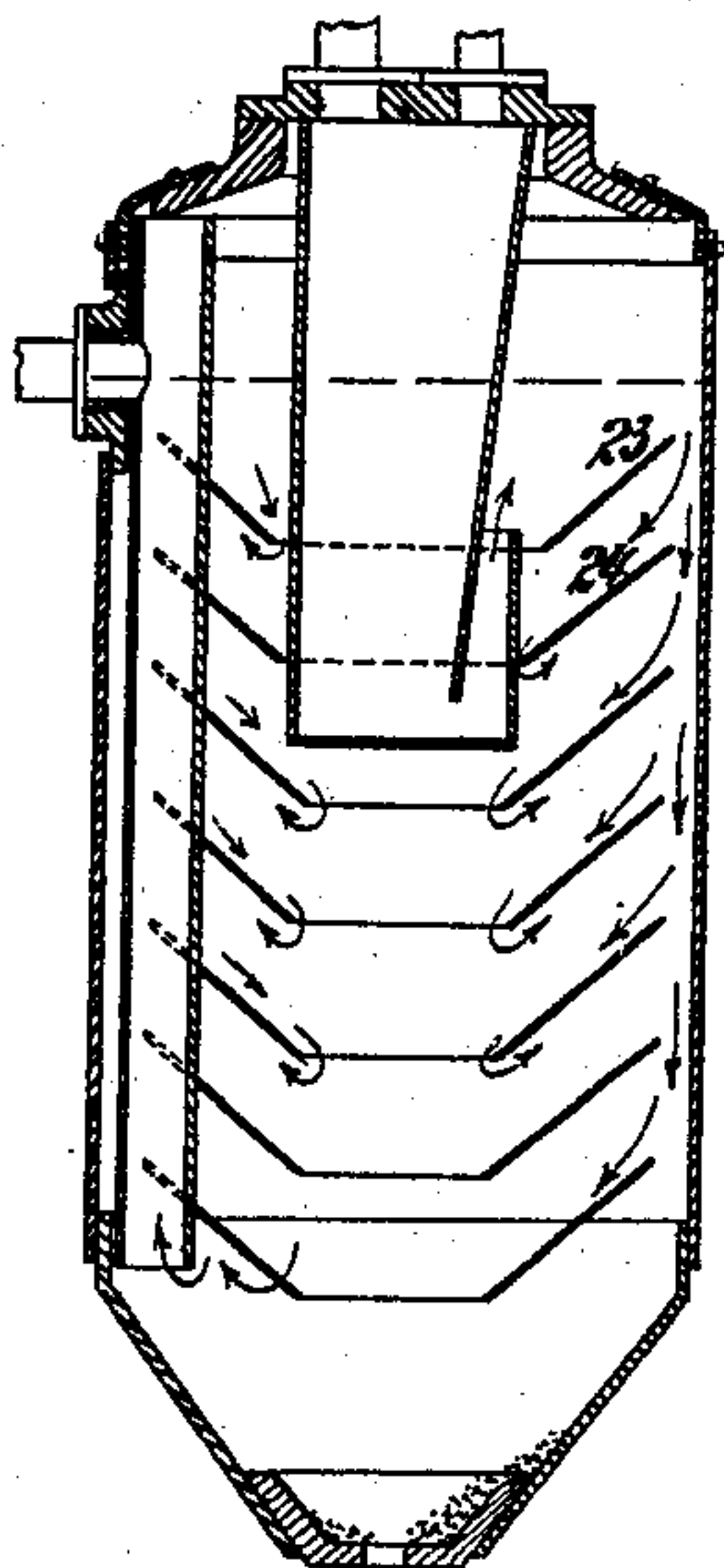


Fig. 3.

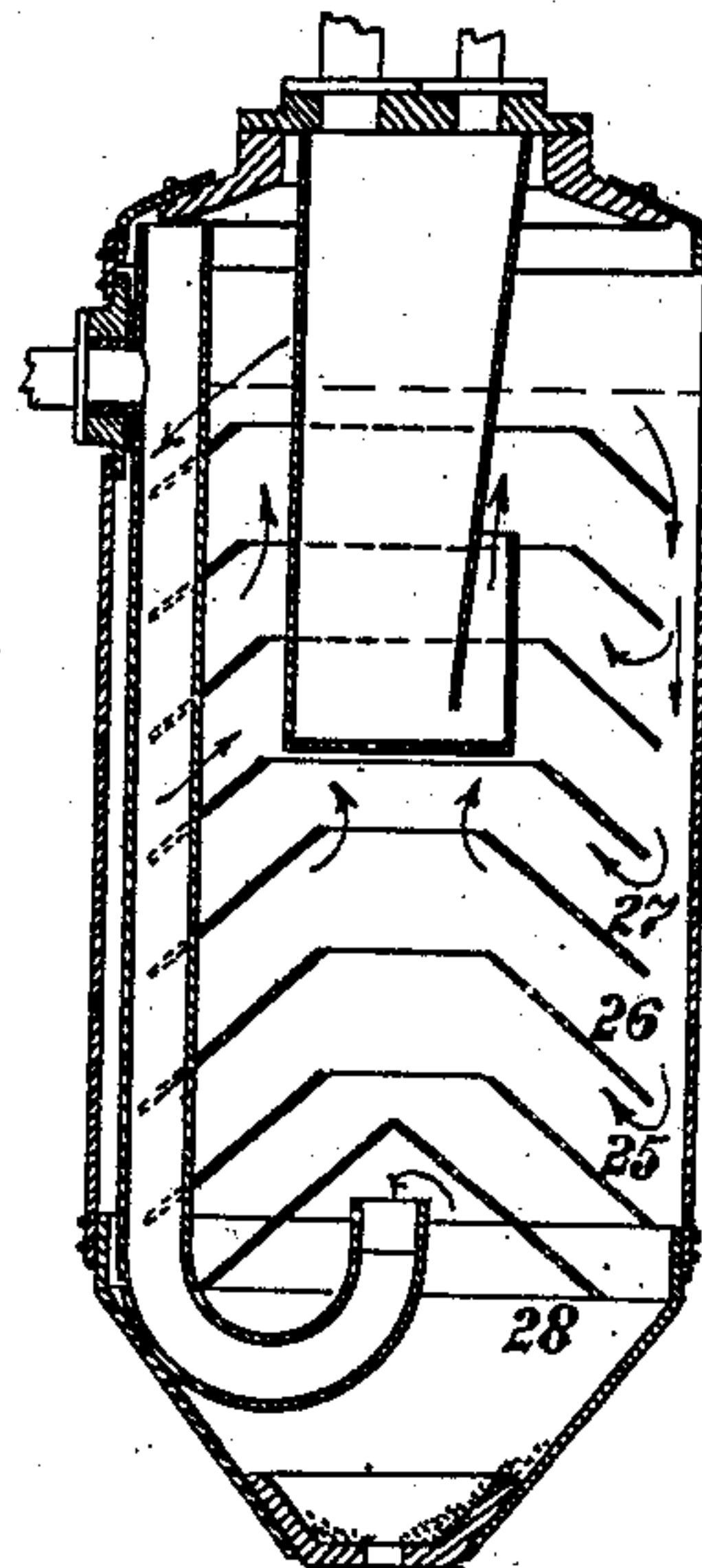


Fig. 4.

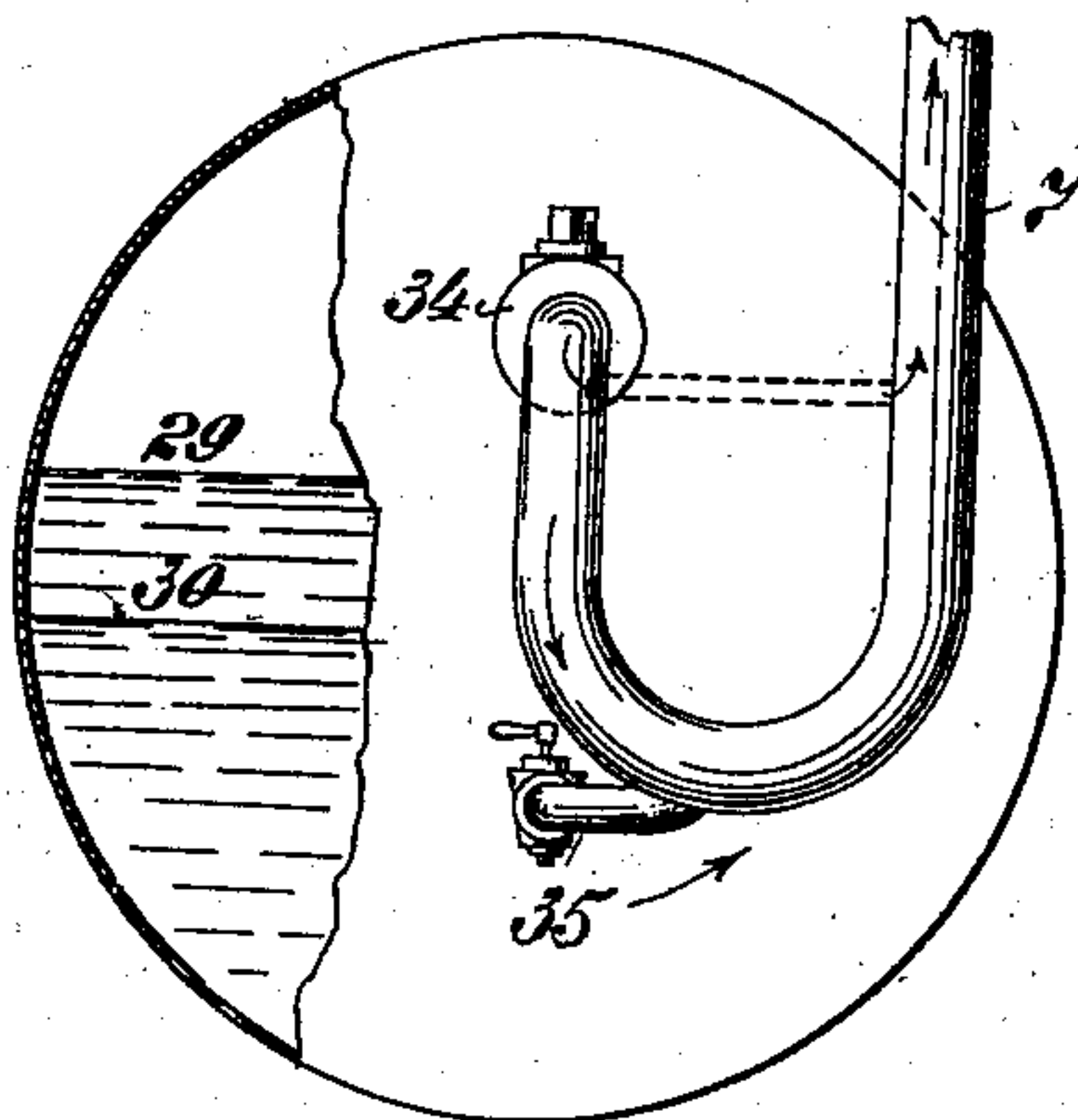
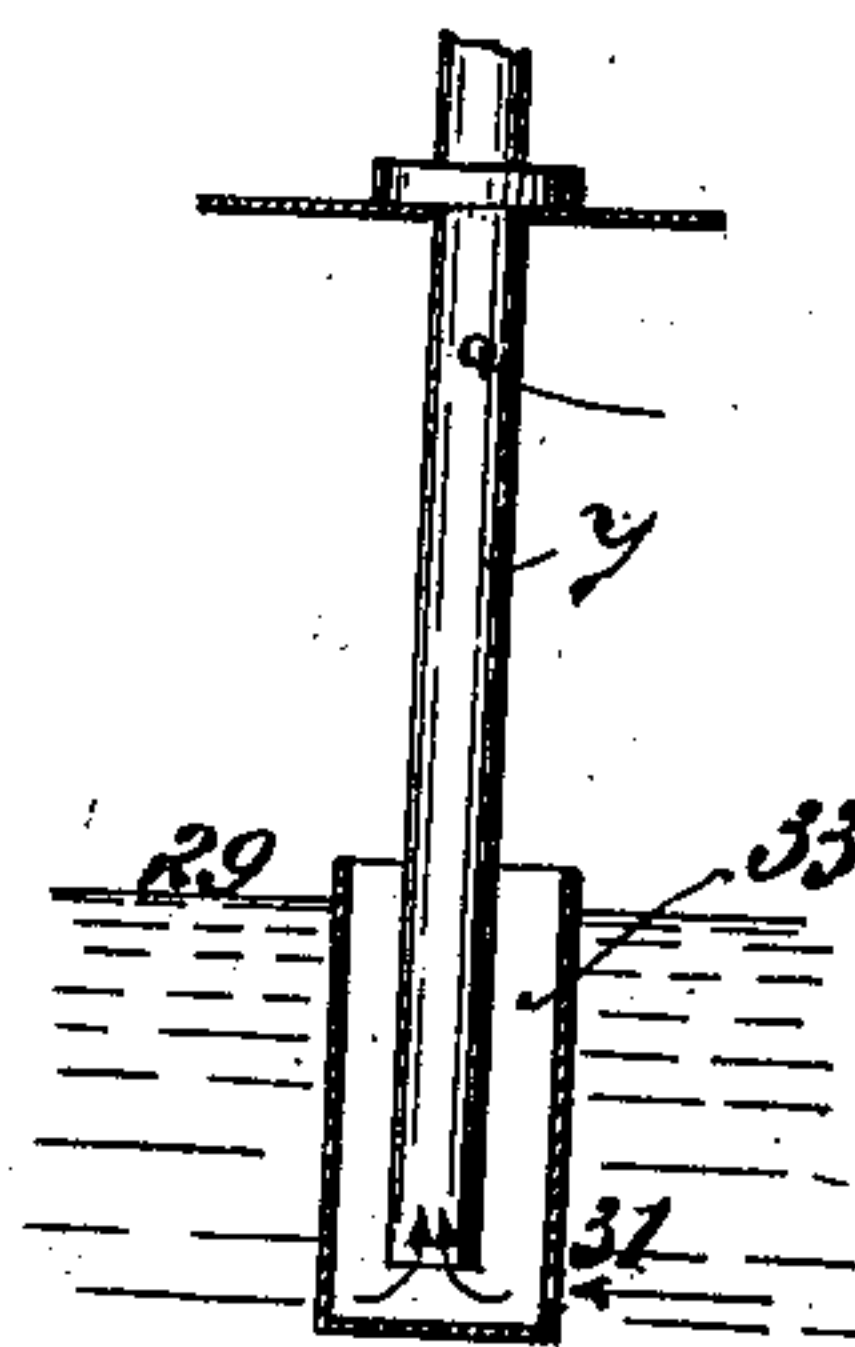


Fig. 5.



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# UNITED STATES PATENT OFFICE.

JEAN BAPTISTE LEMAIRE DESTOMBES, OF TOURCOING, FRANCE.

## PROCESS OF PURIFYING FEED-WATER.

SPECIFICATION forming part of Letters Patent No. 753,860, dated March 8, 1904.

Application filed April 29, 1903. Serial No. 154,772. (No specimens.)

*To all whom it may concern:*

Be it known that I, JEAN BAPTISTE LEMAIRE DESTOMBES, a citizen of the French Republic, and a resident of Tourcoing, France, have invented a certain new Process for the Automatic Purification of Feed-Water for Steam-Boilers, of which the following is a specification.

In order to avoid defects prevalent in previous processes of this character, instead of adding a chemical reagent, such as carbonate of soda, in a continuous manner in the feed-water before its entry into the boiler I add from time to time a certain quantity of the reagent into the boiler itself, so that the quality of the water inside the boiler in carbonate of soda remains nearly constant, and to cause the previous ebullition of the feed-water I cause to be brought to the purifier not steam alone, but a mixture of steam and water taken from the generator. The water thus taken from the generator causes, with the steam, the heating of the feed-water, and as it is charged with carbonate of soda it also supplies the reagent necessary to hasten the precipitation. As for the purifier itself, in order that the decantation may properly proceed I form it of a recipient divided into two compartments, which communicate together at the top above the level of the water and below at a certain distance from the bottom. One of these compartments receives the feed-water in special conditions, which will be hereinafter described. Besides this it receives the mixture of steam and water charged with carbonate of soda, which comes from the boiler by a pipe leading into the purifier below the level of the water. The purified water is taken from the upper part of the other compartment, so that the feed-water is compelled to descend into the first compartment and to remount in the other before going to the boiler, thereby assuring the deposit of the precipitate and the decantation.

In the accompanying drawings, Figure 1 is a vertical section of an apparatus realizing in a practical manner the process above set forth. Fig. 2 represents a vertical section of the same apparatus with extra decanting surfaces. Fig. 3 is another species of the apparatus shown

in Fig. 2. Figs. 4 and 5 are two different species of the pipe taking from the boiler the mixture of steam and water and leading it to the purifier.

The purifier (shown in Fig. 1) fitted upon a boiler 1 comprises a recipient 2, terminated at its lower end by a conical part and constituting a settling and decanting chamber in which the liquid circulates from top to bottom. This recipient, hermetically closed at its upper part by a cover 4, contains a tube 5, forming the aforementioned compartment, into which the liquid circulates upwardly to an opening 6, through which it escapes to go to the boiler. 7 is the tube which leads the mixture of steam and water from the boiler to the purifier. 8 is the tube leading the feed-water to the purifier. 9 is the tube for leading the purified water to the boiler 1. This pipe is furnished with a test-cock 10. 11 is the recipient into which the carbonate of soda is poured, and 12 is a drain-cock for sediment which accumulates upon the bottom of the recipient 2. Upon the feed-water pipe is branched a tube 13, provided with a valve 14, connected to the pipe 15, which leads to the boiler, to permit the direct admission of the feed-water into the boiler without passing through the purifier—for instance, in case of repairs to the latter. For this purpose the cock 16, fitted upon the feed-pipe 8, is closed, as well as the cock 17, fitted upon the pipe 9. Within the upper part of the recipient 2 is established the ebullition-chamber, into which lead the inlet-pipes for the feed-water and the mixture of water and steam coming from the boiler. This conical part opens into a cylinder 19, which is closed at the bottom and open at the top. The feed-water from the pipe 8 is also discharged into this cone and is thoroughly mixed therein with the charged water and steam from the boiler and passes from the cone out through the cylinder 19 into the decanter 2, and thereby prevents ebullition in the decanter. The pipe 8, leading the feed-water, passes through the cover of the purifier and terminates at a cap 20. The pipe 7 also passes through the cover of the purifier. It is closed at its bottom end and is furnished with lateral perforations 21. Inside the recipient 2 is placed in the above-



described manner the vertical tube 5, through which the water returns to arrive purified by the opening 6 at the mouth 22 and from thence to the boiler. The level of the liquid in 1 and 5 is established at the height of the exit-opening 6.

It is known that in a recipient containing water at a temperature higher than that of the surrounding atmosphere a cooling of the liquid is caused at the side, which gives place to a descending movement along the side and an ascending movement in the middle of the recipient. Taking this principle as a basis in order to obtain a more perfect decantation I adapt the apparatus shown in Fig. 3 to my apparatus, which allows the water to circulate in the apparatus by causing it to return over several decanting-surfaces upon which the calcareous substances are deposited and agglomerate to then fall to the bottom of the decanter. Conical surfaces being arranged as shown in Fig. 2, the water leaving the ebullition-column rises into the top of the apparatus, where it spreads over the whole surface. This water becoming cooled upon the walls of the decanter descends the whole length of the walls and a portion passes upon the inner surface of the conical portion 23 and passes down this wall, at the same time yielding up its calcareous substances. Another portion which should have continued to pass down the walls of the decanter goes over the inner surface of the conical part 24, where it also abandons its calcareous substances. The water which has descended the cone 25 being (by reason of a shorter contact with the walls of the decanter) warmer than that which has passed down the wall of the cone 24 returns up the outer part of the cone 23 and again mixes itself along the walls of the apparatus with the water descending from the upper part, to be again taken up by the other cones, in which it makes the same circuit. It then arrives clarified into the bottom of the apparatus and leaves by the pipe 5. The sediment collects upon the cones and falls by the center into the bottom of the apparatus.

In the species of this apparatus illustrated by Fig. 3 the conical surfaces are placed in the opposite direction to that of the preceding figure. With this arrangement the water, moving upwardly from the lower cone 25, draws by contact, like an injector, the water contained between the conical portions 25 and 26. The mixture of these cones operates in the same manner upon the water between 26 and 27, and so on until the top cone, where the upwardly-moving water mixes with that from the ebullition-column, to redescend the walls of the decanter and recommences the same cycle. The calcareous substances are deposited upon the cones and fall to the bottom of the apparatus by the free space between the walls and the outer edge of the cone. With this device the withdrawal of

purified water takes place at the middle of the decanter, Fig. 3, so that the calcareous substances falling from the cones cannot be carried away. For greater safety and to prevent upward suction a closed cone 28 may be arranged as shown in Fig. 3 and from underneath which leads the exit-pipe for the purified water. This device for the exit of water can also be adapted to the species shown in Fig. 1. A series of helicoidal plates may be substituted for these truncated cones. These are arranged in a circular manner inside the apparatus. The coldest current descends down these plates and an upward current is produced at their upper part. These plates can also be replaced by a series of elliptical portions.

As to the withdrawal of the mixture of steam and water from the boiler, it is performed by means of one of the arrangements shown in Figs. 1, 4, and 5 or by any other appropriate arrangement which allows a certain quantity of water from beneath the lower level 30 allowable for the water in the boiler to be carried up through the pipe 7 by the steam taken from above the top level 29, which represents the highest level for the water in the boiler. In Fig. 1 the pipe dips to beneath the lower level 30, then curves round, so as to empty above the upper level 29, and at its lower part it is provided with holes 31. The steam, which enters by 32, sucks up some liquid by the holes 31 and carries it on. The lead for steam above the level of the water, constituting one of the particular features of this invention, has the great advantage of maintaining constant the water at the temperature of the boiler. The apparatus always remains warm, even after stoppages of a considerable time, and avoids the ram-strokes, which took place by the sudden arrival of steam upon cold water at the moment of starting. Instead of being bent, as shown in Fig. 4, it may be surrounded by a box 33, opening above the upper level of the water, so as to be able to withdraw steam, and is provided at its lower part with holes 31 for the inlet of the water. The pipe instead of dipping into the boiler can be placed upon the outside, as shown in Fig. 4. In this figure the pipe is curved upwardly, as in Fig. 1, and its lower end is connected to the boiler at 34 above the top level 29, while a small branch 35 ends below the lower level 30. Cocks are placed at 34 and 35, thereby permitting a very exact mixture of steam and water, and a pipe (shown in dotted lines) is provided for conducting steam from the boiler into the pipe 7.

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

A process for the continuous purification of feed-water for steam-generators or the like, which consists in charging the boiler with a reagent consisting of carbonate of soda,



and injecting a mixture of water and steam from the boiler into the feed-water beneath the level of said water, whereby the feed-water which is sprayed into the purifying-re-  
5 ceptacle is heated by the steam and is thoroughly mixed with the water from the boiler, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

JEAN BAPTISTE LEMAIRE DESTOMBES.

Witnesses:

ALFRED C. HARRISON,  
D. TRUER.