

W. P. WIEMANN.
 WATER PURIFYING SYSTEM FOR STEAM BOILERS.
 APPLICATION FILED NOV. 22, 1909.

982,107.

Patented Jan. 17, 1911.

FIG. 2.

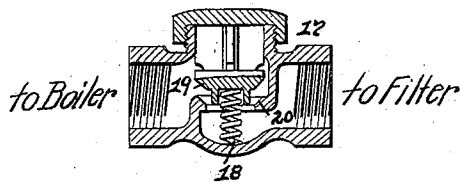
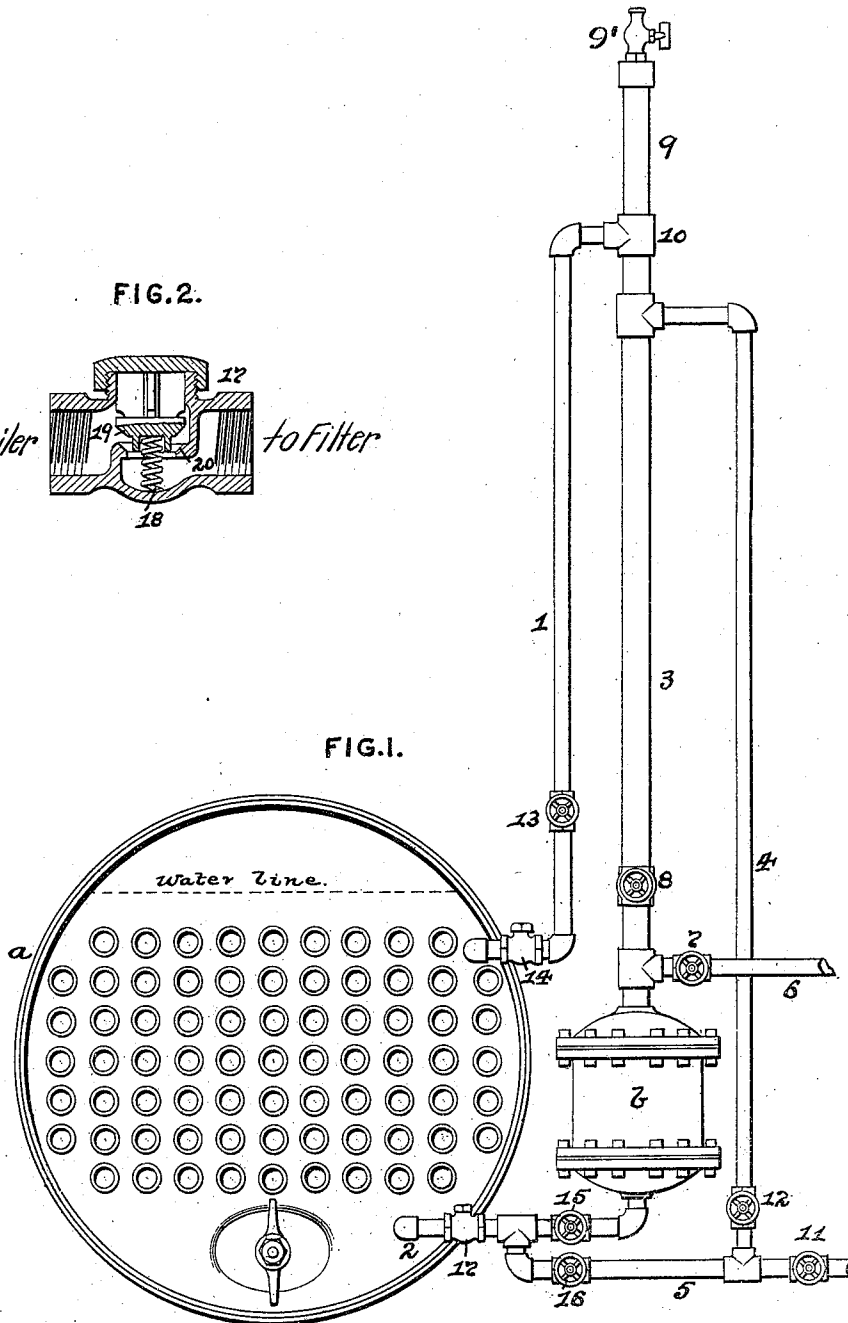


FIG. 1.



WITNESSES

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WATER-PURIFYING SYSTEM FOR STEAM-BOILERS.

982,107.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM P. WIEMANN, a resident of Pittsburg, north side, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Water-Purifying Systems for Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to a system for purifying the water in steam boilers.

The object of my invention is to provide a cheap, simple and efficient system for purifying water in steam boilers which can easily and conveniently be applied to the ordinary steam boiler, without the employment of complicated and expensive means or parts, and will enable the water to be used in such boiler to be completely and thoroughly purified thereby.

My invention consists, generally stated, in the novel arrangement, construction and combination of parts as hereinafter more specifically set forth and described and particularly pointed out in the claims.

To enable others skilled in the art to which my invention appertains to construct and use my improved system for purifying water in steam boilers, I will describe the same more fully, referring to the accompanying drawing, in which—

Figure 1 shows an end elevation of any ordinary steam boiler having my invention applied thereto. Fig. 2 is a sectional view of one of the valves employed therewith.

Like symbols of reference herein indicate like parts in each of the figures of the drawing.

As illustrated in the drawing, *a* represents an ordinary steam boiler, which is shown as being set in a horizontal position, and communicating with the same are the pipes 1 and 2. The pipe 1 connects with the upper part of the water space with the boiler *a* and the pipe 2 connects with the lower part of the same and with the lower end of an ordinary sand filter *b* in a horizontal line. The pipe 1 extends upwardly from the boiler *a* in a vertical line and connects with a pipe 3 at the upper end, which pipe 3 extends downwardly therefrom and

connects with the upper end of the filter *b*, while such pipes 1 and 3 with the pipe 2, constitute the circulating circuit of the system, with the pipe 1 acting as the ascending part of the same and the pipe 3 acting as the descending part of the same. Connected to the pipe 3 and at some distance below the junction of the same with the pipe 1 is the supply pipe 4, which leads upwardly in a vertical line to said pipe 3 from the pipe 5 leading from the usual feed pump (not shown) for supplying the boiler *a* with water, and such pipe 5 connects with the pipe 2. A blow-off pipe 6 leads from the pipe 3 and is provided with a valve 7 therein for opening and closing the same and a valve 8 is located in the pipe 3 and above the pipe 6 for opening and closing the pipe 3. A condensing chamber 9 is connected to the top of the pipe 3 through a tee 10 on said pipe which also connects the pipe 1 and a vent cock 9' is connected to the top of said condenser for the escape of any air within the system upon the starting of the same while such condensing chamber will prevent any steam pocket in the upper part of the system and will therefore allow the steady flow of the boiler water from the pipe 1 to the pipe 3 continuously. The pipe 5 is provided with the valve 11 therein for regulating the water fed to the supply pipe 4 and such pipe is also provided with a valve 12 therein for opening and closing the same. Within the pipe 1 is the valve 13 for opening and closing the same and between said valve and the boiler *a* is a check valve 14. A valve 15 is provided in the pipe 2 between the filter *b* and the pipe 5, for opening and closing the same, and a like operating valve 16 is provided in the pipe 5, while between said pipe 5 and the boiler *a* is a check-valve 17 of the same construction as the valve 14, and these valves 14 and 17 are held normally open by means of a spring 18 engaging with their valve disks 19 and acting to hold said disks away from their seats 20, as shown in Fig. 2.

The use and operation of my improved system for purifying water in steam boilers is as follows—The pipe 3 is preferably larger in diameter than the pipes 1 and 4 to

decrease friction or resistance to the water therein, and when the system is in operation the feed water passes from the pipe 5 into the pipe 4 and thence into the upper end of the descending water circuit pipe 3 where it meets the water passing from the boiler *a* up through the ascending water circuit pipe 1. The feed water for the boiler *a* thus entering the pipe 3 from the pipe 4 being colder and denser than the boiler water meeting the same from the pipe 1 operates to lower the temperature of such boiler water, and both these waters in so meeting and descending as a column by gravity within said pipe 3 will combine with each other, which will result in a column of water in said pipe of a temperature higher than such feed water and lower than such boiler water, so causing a denser water in the descending pipe 3 than in the ascending pipe 1 and thereby inducing a current through the filter *b* by such descending water passing through the same. After such water from the descending pipe 3 has passed through the filter *b* it enters the boiler *a* through the pipe 2 and the circulation of the water to and from the boiler and through the filter is thus maintained by the circuit pipes 1, 2 and 3. The check-valves 14 and 17 in the pipes 1 and 2 being held normally open by the springs 18 engaging with their disks 19 will allow the water to circulate through the circuit pipes 1, 2 and 3 and filter *b*, and should the difference of pressing between the boiler water and that in system exceed the tension on said springs, the compression on such springs will be overcome by the higher pressure of the water on the boiler side of the disks 19 and close the same against their seats 20 to thereby prevent the escape of any water from said boiler. In case the filter *b* becomes clogged with matter, or the feed water from the pipe 4 enters the pipe 3 faster than such filter will allow it to pass through the same, such excess water will pass down the pipe 1 and enter the boiler *a* without any interference by the check-valve 14. The valves 14 and 17 being arranged near the boiler *a* and on both the inlet and outlet lines of the circuit will act to close by a difference of pressure from five (5) to ten (10) pounds of the boiler water over that of the water in the system, which will thereby overcome all dangers arising from accidents to the system, will prevent draining of the boiler and will not interfere with the proper operation of the system.

When it is desired to clean the filter *b* the flow of the water is reversed through the same by closing the valve 8 and opening the blow-off valve 7, which will allow the water to pass from the boiler *a* through the pipe 2 into the filter *b* and then up through the

same and out the blow-off pipe 6, while during such cleaning out of the said filter, the feed water in pipe 4 continues to flow to the boiler *a* through pipe 1.

During the operation of the system the valves 8, 12, 13 and 15 are open and valves 7 and 16 are closed, while the feed water is regulated to the boiler *a* by the valve 11, and in case the boiler is to be fed direct without using the system all that is necessary is to close valves 12, 13 and 15 and open 16, which will allow the feed water to pass into said boiler through the pipes 5 and 2.

The descending port 3 of the circuit to which the feed supply from 4 is applied, will necessarily contain solid column of water by reason of the condensation of all the steam globules which it may have contained from the boiler *a* through the pipe 1, and such combined water will vary in specific gravity from that in the ascending column 1 in proportion to its reduction in temperature. Thus in a boiler at 100 pounds pressure, the temperature of the water would be 337 degrees Fahrenheit, and if the temperature of the feed water was 60 degrees the temperature of the descending column might be reduced to 138 degrees, while the proportionate reduction of volume arising from such a reduction in temperature would be over seven per cent., as a cubic foot of water at 337 degrees and corresponding pressures weighs 56.18 pounds and its weight at 198 degrees is 60.12 pounds. Besides the difference arising from temperature in the specific gravity of the descending column is greatly affected by the condensation of the steam globules therein, so that in practice the difference in the weight between the two columns of water in the ascending and descending circuit, at about 21 feet in height, would amount to about four pounds upon each square inch of the filter affected by the descending column.

The usual form of sand filter is employed in which the reversal of the flow of water from that in operating cleanses the same, and all liability of accident to the strainer plates therein is overcome by the use of the check-valves, as it is found that when the filter contains much accumulation of matter it will raise with the sand when the water is reversed in cleaning the filter, which will press the plate with great force to break the same if the blow-off is open too wide or suddenly. These check-valves will also prevent the contents or water of the boiler from being blown out in case of any accident to the system and resulting in a destruction of the boiler and system or loss of life thereby.

It will thus be seen that by my improved

water purifying system for steam boilers that the hot water from the boiler and cold water from the feed pump mingle and do not come in contact with a hot metal surface, as in ordinary cases, and any precipitated matter contained in the feed water on entering the system, or is precipitated after entering the descending column is retained by the filter and does not enter the boiler, while such matter also does not bake on the circulating lines, and further any matter, such as sulfates of limes, requiring greater heat, are precipitated within the boiler and carried to the filter through the circulation, as heretofore described. It will also be seen that by my improved water purifying system for steam boilers that the cooling influence of the feed water in contact or mixed with the boiler water, will produce and generate the necessary current in the circulating circuit and the use of any mechanical agency to force the water through the filter is entirely obviated, while the cleansing of the water in the boiler is effectually secured with safety to such boiler, system and life, and the formation of scales in the boiler is prevented without the consumption of power or loss of any heat from the contents of the boiler.

The system can be applied to different forms of boilers and set at different positions, while various modifications and changes in the design, arrangement and operation of the various parts of my improved water purifying system for steam boilers may be resorted to, without departing from the spirit of the invention or sacrificing any of its advantages.

What I claim as my invention and desire to secure by Letters Patent is—

1. A system for purifying water in steam boilers, comprising a boiler, a filter, and a pipe circuit between said boiler and filter having ascending and descending portions and provided with a feed water connection leading into the descending portion for the purifying of both boiler and feed water simultaneously, said circuit being adapted to circulate the water therein by the difference in temperature between the ascending and descending portions thereof and the mixing of hot and cold water in the descending portion.

2. A system for purifying water in steam boilers, comprising a boiler, a filter, pipes between said boiler and filter having an ascending portion leading from the boiler to a descending portion leading to the filter for carrying the boiler water to the filter, said pipes being adapted to circulate the water therein by the difference in temperature between the ascending and descending portions thereof and the mixing of hot and cold

water in the descending portion, and a feed water connection leading into said descending portion.

3. The combination with a boiler and filter, of a means for circulating water through said filter to and from said boiler to purify said water and having inlet and outlet connections below the water level of the boiler, and check-valves in said connections adapted to be held normally open during the purifying of said water and be closed upon a determined reduction of pressure of the water in said means and filter.

4. The combination with a boiler and filter, of a means for circulating water through said filter to and from said boiler to purify water and having inlet and outlet connections below the water level of the boiler, and check-valves in said connections adapted to be held normally open by a spring during the purifying of said water and be closed upon a determined reduction of pressure of the water in said means and filter.

5. A system for purifying water in steam boilers, comprising a boiler, a filter, a pipe circuit between the boiler and filter for circulating water through said filter to and from said boiler to purify said water and having inlet and outlet connections below the water level in said boiler, and a check-valve in each of said connections and adapted to be held normally open during the purifying of said water and be closed upon a determined reduction of pressure of the water in said circuit and filter and beyond said valves.

6. A system for purifying water in steam boilers, comprising a boiler, a filter, a water circulating pipe circuit between the boiler and filter for circulating water through said filter to and from said boiler to purify said water and having inlet and outlet connections below the water level of said boiler, and a check-valve in each of said connections and adapted to be held normally open by a spring during the purifying of said water and be closed upon a determined reduction of pressure of the water in said circuit and filter and beyond said valves.

7. A system for purifying water in steam boilers, comprising a boiler, a filter, a pipe circuit between said boiler and filter for circulating water through said filter to and from said boiler to purify said water and having ascending and descending portions and provided with a feed water connection leading into the descending portion for the purifying of said boiler and feed water simultaneously, said circuit being adapted to circulate the water therein by the difference in temperature between the ascending and descending portions thereof and the mixing

of hot and cold water in the descending portion, and a condensing chamber at the top of said circuit.

5 8. The combination of a boiler, means connected to said boiler for purifying the boiler water by circulation through said means and having inlet and outlet connections below the water level in said boiler, and check-valves in said connections adapted to be held

normally open during the purifying of said 10 water and be closed upon a determined reduction of pressure in said means.

In testimony whereof, I, the said WILLIAM P. WIEMANN, have hereunto set my hand.

WILLIAM P. WIEMANN.

Witnesses:

JAMES L. WEHN,
J. N. COOKE.