

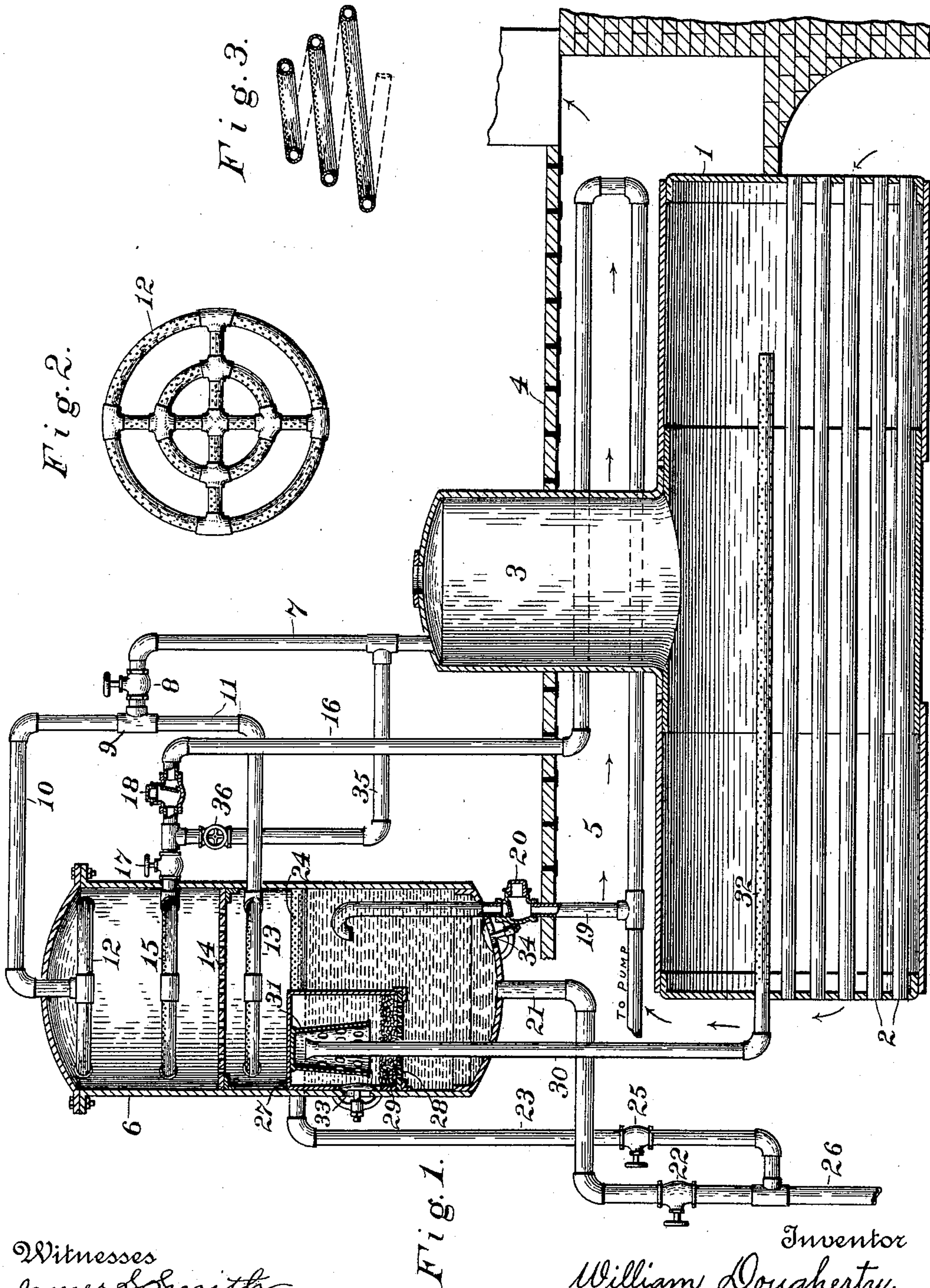
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Patented July 5, 1898.

W. DOUGHERTY.
BOILER CLEANER AND FILTER.

(Application filed June 30, 1897.)

(No Model.)



Witnesses
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UNITED STATES PATENT OFFICE.

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BOILER-CLEANER AND FILTER.

SPECIFICATION forming part of Letters Patent No. 607,004, dated July 5, 1898.

Application filed June 30, 1897. Serial No. 642,964. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM DOUGHERTY, a citizen of the United States, residing at Chester, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Boiler-Cleaners and Filters; 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 figures of reference marked thereon, which form a part of this specification.

My invention relates to boiler-cleaners and filters, more particularly to that class of steam-boiler attachments in which the feed-water on its way to the boiler is received and held temporarily in an independent exterior settling-chamber maintained at approximately boiler temperature and pressure for the purpose of depositing by heat all impurities liable to cause incrustation.

The object of my invention is the production of an improved cleaner and filter of simple and durable construction, especially accessible for cleaning and repairs, in which steam directly from the boiler and feed-water from heater, pump, or injector are caused to meet in opposing sprays, thereby breaking the water into minute globules and violently agitating it before reaching the comparative calm of the settling-chamber, from which it is served through a suitable filter by gravity to the boiler.

I accomplish the object stated by employing a cylindrical shell supported higher than the boiler and introducing in the upper portion of the shell perforated pipes arranged to spray live steam and feed-water oppositely, the lower part of the shell constituting the settling-chamber. There are also provided adequate boiler and other connections, scum and mud blow-off pipes, water-gage, and valves to govern the fluid distribution as desired.

Each constituent element of my invention is described in detail and its individual office, together with the mode of operation of the whole, fully explained hereinafter.

Referring to the accompanying drawings, wherein like numbers designate like parts

throughout the several views, Figure 1 represents a side view, the shell of my invention and that of the boiler being in vertical section. All of the piping, with valves and connections, is shown, part being in section to exhibit the operative difference between the check-valves. Fig. 2 represents a plan view of one of the similar spray-heads, and Fig. 3 shows a modified form of the spraying devices in vertical section.

Considering Fig. 1, numeral 1 marks the boiler-skin, 2 the flues, and 3 the dome. Raised somewhat above the boiler is a properly-supported brickwork covering 4, which forms the top of a return-passage 5 immediately over the boiler, leading at the right into a stack or uptake in the common manner. The arrows indicate the path of heated products of combustion.

Numerals 6 designates the shell of my invention. As hereinbefore stated and as shown in Fig. 1, shell 6 is suitably supported somewhat higher than the boiler 1. From dome 3 extends pipe 7, usually provided with cut-off valve 8 and terminating in a T 9, coupled to branch pipes 10 and 11, the former passing through the top of shell 6 and ending in spray-head or nozzle 12; (see Fig. 2,) the latter passing through the side of the shell and ending in head 13. Immediately above head 13 will be noted a perforated diaphragm 14, which aids in dividing the falling water, and between the diaphragm and head 12 is a third spray-head 15, terminating the feed-water pipe 16, which enters shell 6 above branch 11. The spray-heads are usually of similar design, and I occasionally fashion heads and diaphragm in conical shape, as represented in Fig. 3. Under certain circumstances I may omit diaphragm 14 within the purview of my invention. After leaving the shell pipe 16 is provided with a cut-off valve 17 and check-valve 18, opening inwardly. Steam or water passing check-valve 18 cannot, therefore, return. As ordinarily constructed pipe 16 is given one or more turns longitudinally in the passage 5 above the boiler, enabling it to act as a feed-water heater. I do not, however, confine myself to this arrangement, as any efficient heater may be introduced. From passage 5 pipe 16 is led to the pumps. At some

point before pipe 16 finally leaves passage 5 it is interrupted by a T, from which arises pipe 19, having check-valve 20, opening downwardly, as shown. Pipe 19 enters the bottom 5 of shell 6 and terminates in a curved portion bent downwardly, in order that falling impurities may not be again introduced into the feed-water by the intermittent circulatory action to be explained later. That portion of 10 pipe 19 within shell 6 stands wholly in the settling-chamber part of my invention, and hence its mouth must be guarded from descending solid matter, as stated.

There are two discharge-pipes leading from 15 shell 6, one, 21, opening centrally through the bottom and possessing valve 22, the other, 23, passing into the shell at a distance above the bottom predetermined as the desired depth of water in the settling-chamber and 20 ending in a perforated pipe or skimmer 24, the office of which is to collect the surface scum from the settling-chamber. Pipe 23 is furnished with valve 25. Pipe 21 blows off the deposit of solid particles and joins with 25 pipe 23 in a common outlet-pipe 26 below.

Numeral 27 marks a box, closed at the top, supported within shell 6 and extending somewhat above the surface of the body of settling water. A perforated bottom 28 is given 30 the box and a filtering plate or stratum 29 rests upon the inner surface thereof. The diverging mouthpiece of the boiler feed-pipe 30 is situated within box 27 upon a level with perforated pipe 24, and it is my practice to 35 cover the mouth of pipe 30 with an open-ended bell 31, suspended within the box and having slotted walls, as shown, although the bell is not essential. Boiler feed-pipe 30 passes out through the bottom of shell 6 and 40 into the boiler proper, terminating in a perforated portion 32, as commonly made.

A suitable water-gage (not shown) is usually attached to shell 6.

Assume the boiler to be steaming and the 45 settling-chamber to be filled by the pump through the heater and pipe 16 until the water rises above the mouth of pipe 30. The pressure being equal throughout by reason of the dome connection the water will pass by gravity 50 through pipe 30 into the boiler. Let the pump be stopped. There is now no longer a mechanically - forced circulation through the heater portion of pipe 16. As soon, however, as the water in the vertical portion of pipe 16 55 is so far expanded or vaporized as to render it lighter than the column of water, bulk for bulk, in pipe 19 the water in the latter descends through check-valve 20. A sort of intermittent circulation is thus set up which 60 is found to be perfectly protective of those portions of pipe 16 subjected to direct heat in passage 5.

In practice it is my custom to attach box 27 to one side of shell 6 and to provide a hand- 65 hole 33, affording manual access to the box for the arrangement and renewal of the filtering stratum. The opening in the side of the

filter chamber or box 27 is larger than the hand-hole plate, which is thus brought directly 70 against the interior of shell 6 or in contact with a seat prepared for it and attached in the usual manner. A second hand-hole 34 in the bottom of the shell permits the removal of matter deposited in the settling-chamber 75 which may not be ejected through blow-off pipe 21. It is usual also in setting up my invention to run a steam-pipe 35 from the dome or in any convenient manner connecting it with feed-water pipe 16 near shell 6, 80 as shown, and providing a cut-off valve 36. The office of pipe 35 is to transmit steam to spray-head 15 for the purpose of clearing out its perforations periodically. Either of the blow-off pipes 21 23 may be employed as an 85 outlet during this operation, if required.

I am aware that boiler-cleaners of this character, in which the feed-water, heated by steam, is caused to throw down its solids, have been constructed, and I do not claim 90 that feature broadly.

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

1. In a boiler-cleaner and filter, the combination of a shell, a feed-water pipe entering 95 the upper portion of the shell and terminating in a spray-head, a steam-pipe, upper and lower branch pipes connected with said steam-pipe, said branch pipes entering said shell and terminating in spray-heads one above and 100 one below the spray-head of said feed-water pipe, the spray-heads of said branch pipes arranged to discharge toward each other, a scum-blow-off pipe, a bottom blow-off pipe, a box supported within said shell and having 105 a perforated bottom, a filter situated within said box, and a boiler feed-pipe having its mouth within said box, said piping provided with suitable valves, substantially as described. 110

2. In a boiler-cleaner and filter, the combination of a shell, a feed-water pipe entering the upper portion of the shell and terminating in a spray-head, a steam-pipe, upper and 115 lower branch pipes connected with said steam-pipe, said upper branch pipe entering the upper portion of said shell and terminating in a spray-head, said spray-heads arranged to discharge toward each other, a perforated diaphragm secured beneath said spray-heads, 120 said lower branch pipe entering said shell and terminating in a spray-head arranged below and adapted to discharge toward said diaphragm, a scum-blow-off pipe, a bottom blow-off pipe, a box supported within said shell and 125 having a perforated bottom, a filter situated within said box, and a boiler feed-pipe having its mouth within said box, said piping provided with suitable valves, substantially as described. 130

3. In a boiler-cleaner and filter, the combination of a shell, a feed-water pipe entering the upper portion of the shell and terminating in a spray-head, a steam-pipe connected

with said feed-water pipe, a steam-pipe having upper and lower branches, said upper branch pipe entering the upper portion of said shell and terminating in a spray-head, 5 said spray-heads arranged to discharge toward each other, a perforated diaphragm secured beneath said spray-heads, said lower branch pipe entering said shell and terminating in a spray-head arranged below and 10 adapted to discharge toward said diaphragm, a scum-blow-off pipe, a bottom blow-off pipe, a box supported within said shell and having a perforated bottom, a filter situated within said box, hand-holes affording access to said 15 box and shell, and a boiler feed-pipe having its mouth within said box, said piping provided with suitable valves, substantially as described.

4. A boiler-cleaner, consisting in the combination of a feed-water heater having an inlet-pipe adapted for connection with a pump or feed-water source, a shell supported higher than said feed-water heater, a pipe connected with the outlet of said heater and terminating 25 within the upper portion of said shell, a circulation-pipe connected with the inlet-pipe of said feed-water heater and terminating within the lower portion of said shell, said circulation-pipe having a check-valve opening from said shell, a boiler feed-pipe terminating within the lower portion of said shell, 30 the mouth of said boiler feed-pipe opening within the shell above the level of the mouth of said circulation-pipe and below the mouth of the pipe from the heater-outlet, said shell 35 provided with blow-off pipes, substantially as described.

5. A boiler-cleaner, having in combination with a boiler, a feed-water heater, a shell 40 supported higher than said boiler and feed-water heater, a feed-water pipe connected with the outlet of said heater and entering the upper portion of said shell, said feed-

water pipe possessing a check-valve opening toward the shell, a circulation-pipe entering 45 the lower portion of said shell and having a check-valve opening from said shell, said circulation-pipe connected near the inlet of said feed-water heater, a steam-pipe connected with said boiler and entering the upper portion of said shell, a boiler feed-pipe entering 50 the lower portion of said shell and passing into said boiler, said shell provided with pipes arranged to discharge scum and deposited matter, the piping having suitable cut-off valves, substantially as described. 55

6. A boiler-cleaner, having in combination with a boiler, a feed-water heater, a shell supported higher than said boiler and feed-water heater, a feed-water pipe connected 60 with the outlet of said heater and entering the upper portion of said shell, said feed-water pipe possessing a check-valve opening toward the shell, a circulation-pipe entering the lower portion of said shell and having a 65 check-valve opening from said shell, the mouth of said circulation-pipe within said shell opening downwardly, said circulation-pipe connected near the inlet of said feed-water heater, a steam-pipe connected with 70 said boiler and entering the upper portion of said shell, a box supported within said shell and having a perforated bottom, a filter situated within said box, a boiler feed-pipe entering said shell and box and opening above 75 said filter, said feed-pipe passing into said boiler, said shell provided with pipes arranged to discharge scum and deposited matter, the piping having suitable cut-off valves, 80 substantially as described.

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

WILLIAM DOUGHERTY.

Witnesses:

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LOUIS MEETH.