(No Model.) 2 Sheets—Sheet 1.

C. STICKLE.

PURIFYING FEED WATER FOR STEAM BOILERS.

No. 526,330. Patented Sept. 18, 1894.

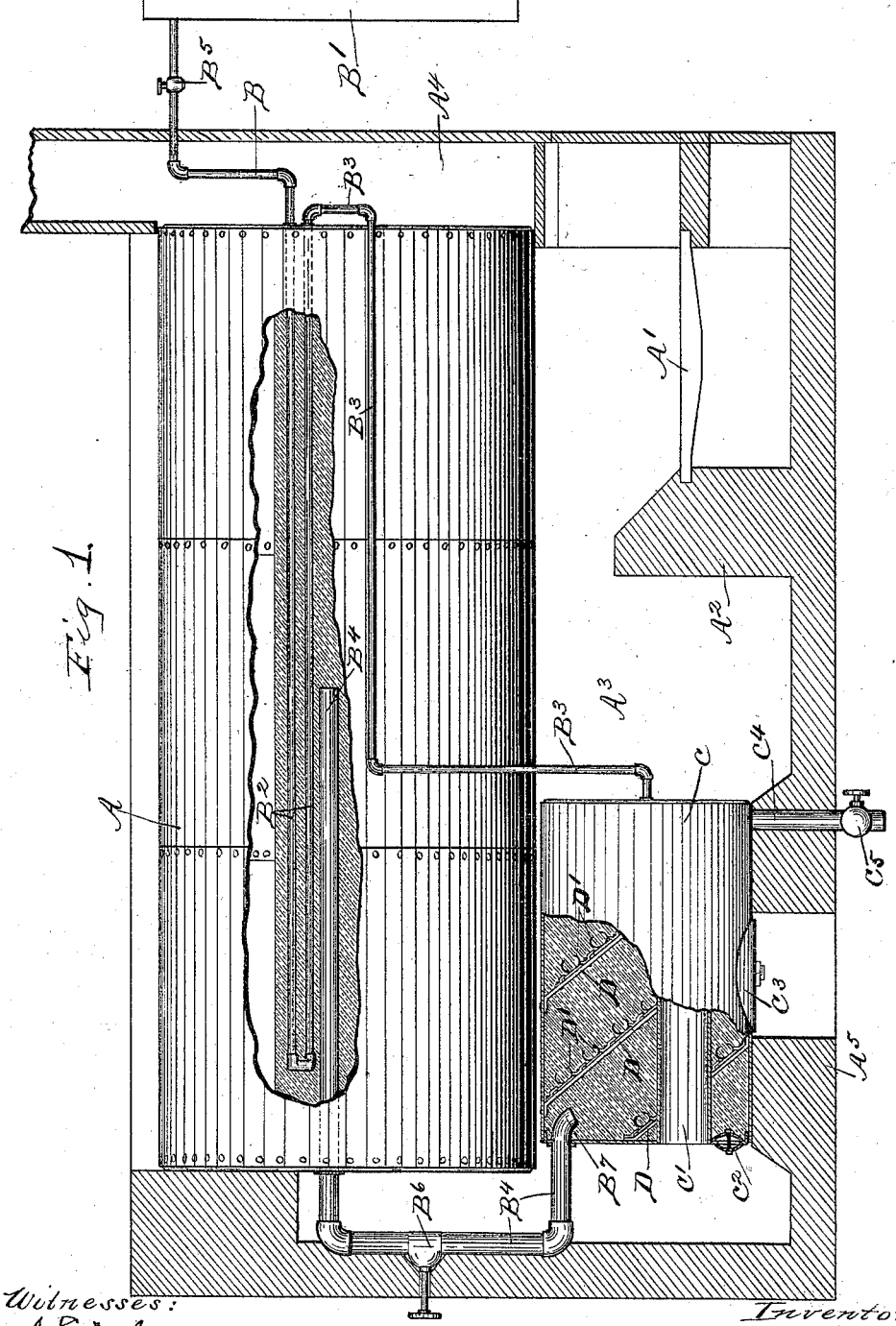


Fig. 1.

Witnesses:
A. E. Delaney
Geo. H. Gibson

Inventor:
Cole Stickle
by Mosher & Curtis
Attys.

(No Model.) 2 Sheets—Sheet 2.

C. STICKLE.

PURIFYING FEED WATER FOR STEAM BOILERS.

No. 526,330. Patented Sept. 18, 1894.

Fig. 2.

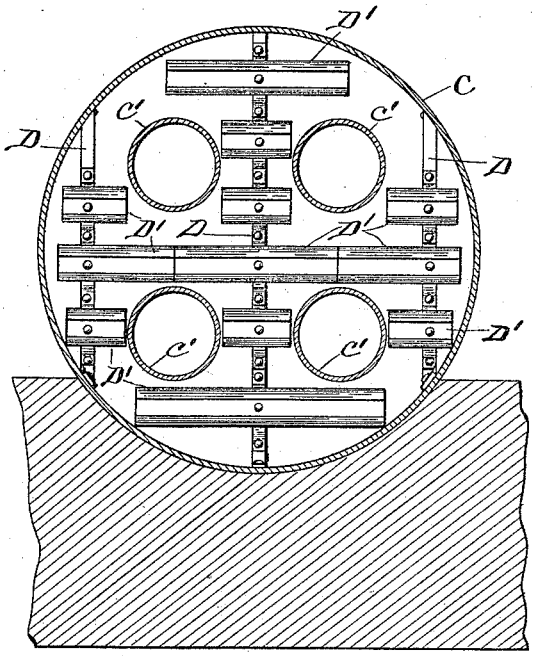
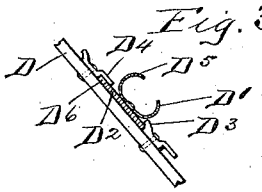


Fig. 3.



Witnesses:
A. E. Delaney
Geo. H. Gibson

Inventor:
Cole Stickle
by Mosher Curtis
attys.

UNITED STATES PATENT OFFICE.

COLE STICKLE, OF SALEM, NEW YORK.

PURIFYING FEED-WATER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 526,330, dated September 18, 1894.

Application filed November 27, 1893. Serial No. 492,048. (No model.)

To all whom it may concern:

Be it known that I, COLE STICKLE, a citizen of the United States, residing at Salem, county of Washington, and State of New York, have invented certain new and useful Improvements in Purifying Feed-Water for Steam-Boilers, of which the following is a specification.

My invention relates to such improvements and consists of the novel construction and combination of parts hereinafter described and subsequently claimed.

Reference may be had to the accompanying drawings, and the letters of reference marked thereon, which form a part of this specification.

Similar letters refer to similar parts in the several figures therein.

My invention relates to improvements in the method of, and apparatus for, purifying the feed-water of steam-boilers.

The invention has for its object the purification of the feed-water so that when it is deposited in the boiler, it shall be comparatively free from sediment and scale. I have ascertained that when water is supplied to a boiler through a small feed-pipe, little or no scale forms on the interior of the pipe, even when the feed-water is heated fully or approximately to the boiler-temperature; and that when the heated feed-water is discharged into a large body of superheated water, as into the boiler, that the scale is deposited or formed almost entirely within a radius of a few feet of the outlet of the feed-pipe. Thus when the feed-pipe is projected into the boiler to discharge near the middle of the same, the scale is deposited in large quantities near the middle of the boiler, while comparatively little is formed near the ends.

In carrying out my invention, the feed-water, after being heated by the exhaust steam in the usual manner, is still further heated until it reaches the boiler-temperature. It is then passed from the small feed-pipe, without decreasing its temperature, rapidly into a reservoir of water superheated to or above the temperature of the water in the boiler. In this reservoir the water is subjected to all the conditions attendant upon passing the feed-water into the boiler and both the reservoir water and feed-water being highly heated, the conditions are most favorable for the formation or deposit of scale. From this reservoir, which is below the level of the boiler, the feed-water is passed slowly into the boiler, leaving comparatively all of its impurities in the reservoir, which is made easy of access and can be easily and frequently cleaned.

Referring to the drawings, Figure 1 is a view partly in side elevation and partly in section of a steam-boiler provided with my improved apparatus for purifying the feed-water. Fig. 2 is a vertical cross-section of the depositing reservoir. Fig. 3 is a vertical section taken transversely of one of the depositing trays in the reservoir.

A— represents a common type of steam-boiler mounted above a furnace of which A′— is the grate, A^2— the bridge-wall, A^3— the combustion-chamber, and A^4— the chimney or escape-flue.

B— is the feed-pipe which leads from a heating device B′— which may be any known form of construction for utilizing the exhaust steam to partially heat the feed-water. The feed-pipe passes from such heating device into the front end of the boiler, and forming a loop B^2— within the boiler, passes out again through such front end. The loop is located below the water level in the boiler and has no outlet therein. The return arm of the loop is connected by the feed-pipe B^3— with a depositing-reservoir C— from which a feed-pipe B^4— leads into the boiler. The reservoir C— is located in the combustion-chamber below the boiler, and is preferably in the form of a cylindrical shell extending longitudinally of such chamber.

The construction of this reservoir constitutes an important feature of my invention. The reservoir is provided with a plurality of longitudinal flues C′— for the passage of the heated gases from the furnace therethrough; and with a hand-hole at C^2— and a manhole at C^3—. The lower portion of the reservoir is embedded in the masonry foundation A^5—

and the manhole is located at about the middle of the bottom side of the reservoir in a position to be wholly protected by the masonry from contact with the flames and heated gases of the combustion-chamber. The reservoir is also provided with a plurality of inclined stay-rods D— extending transversely of the reservoir, which are secured at their ends to the shell or wall of the reservoir. The stay-rods serve to support and strengthen the shell, and also serve as supports for a plurality of tray-sections D′— which extend horizontally across the reservoir-chamber.

The object of the trays is to receive and collect scale or sediment, especially that which is of a greater specific gravity than water, as formed or deposited upon the entrance of the feed-water into the reservoir. Another object of the trays is to form obstructions to deflect the water in its passage through the reservoir and prevent impurities of approximately the specific gravity of water from being carried along by the current of feed-water to the exit end of the reservoir. The tray-sections may be supported within the reservoir in any known manner.

I have shown the trays each riveted to a back-plate D^2— supported in seats or sockets formed by brackets D^3— secured to the stay-rods, and detachably held in their seats by the lips D^4— also secured to the stay-rods in position to overhang the upper edge of the respective back-plates. The lip is offset and secured to the stay-rod at a distance from its end to afford a recess D^6— of sufficient depth to permit the back-plate to be elevated until its bottom edge can be slipped over the bracket D^3—, whereupon the tray can be removed. The trays are arranged in alternate series, as shown, and are made in short sections, to facilitate their removal through the manhole for repairs and cleaning.

The feed-pipe B^4— which forms the outlet for the reservoir, is much larger in diameter than the feed-pipe B^3— which forms the inlet thereto, whereby I am able to pass the water from the reservoir to the boiler very slowly, its current velocity being much less than upon its entrance to the reservoir through the small pipe B^3—. By thus reducing the velocity of the flow from the reservoir, the force of the current is insufficient to carry with it the impurities which fall by gravity into the trays or upon the bottom of the reservoir. The slow upward movement of the water from the reservoir affords ample time for the heavier impurities to settle. The lighter form of impurities, which is of the same or less specific gravity than water, adheres readily to the heated surfaces with which it comes in contact, such as the shell or flues of the reservoir. I have shown the trays each provided with an overhanging top D^5— to arrest such impurities as tend to rise with the water, while the lower part of the tray is trough-shaped to receive the impurities which fall or settle by gravity. The overhanging top of each tray is in the form of an inverted trough. I am thus able by my improved apparatus, above described, to subject the feed-water to the most favorable conditions for the deposit of scale in the reservoir, on account of the superheated condition of both the feed-water and water in the reservoir, which greatly facilities the formation and deposit of scale.

The cleaning of the reservoir is an easy matter compared with the cleaning of the boiler, as in a large plant the reservoir is made of sufficient size to permit the entrance of a man to remove the deposited scale, and to remove, and replace the trays after they have been cleaned.

As a means for washing out the reservoir, I provide a blow-off pipe C^4— leading from the reservoir, having a valve C^5—, and a valve B^5— in the feed-pipe by which the feed-supply to the reservoir can be shut off, thereby causing the boiler-pressure to create a back-flow through the pipe B^4 and the reservoir, when the blow-off valve is opened. The back-flow from the boiler being of small volume as compared with the body of water in the reservoir, is not sufficient to cause the desired agitation in the reservoir. I have therefore provided the feed-pipe B^4— with a valve B^6— by which the back-flow can be cut off until the reservoir has been emptied by gravity through the blow-off-pipe whereupon the valve B^6— can be opened to wash out the reservoir. The end B^7— of the pipe B^4— is deflected toward the bottom of the reservoir to subject the heaviest deposits, which settle and form upon the bottom of the reservoir, to the full force of the jet from the boiler.

What I claim as new, and desire to secure by Letters Patent, is—

1. The herein described method of treating feed-water for steam-boilers, which consists in heating rapidly moving water to the boiler-temperature, passing the heated water below the boiler level into a considerable body of superheated water, and feeding by a slowly ascending current from such body of water into the boiler, substantially as described.

2. In a water-purifying apparatus for steam-boilers, the combination with a depositing reservoir, of an inlet-pipe and controlling valve, a blow-off pipe and controlling valve, and a boiler-supply pipe and controlling valve, substantially as described.

3. The combination in a purifying reservoir for steam-boilers, of a drum having a manhole, a feed-water inlet-pipe connected with one end of the drum, a boiler-pipe connected with the other end of the drum, and a series of detachable arresting-trays supported transversely within the drum, substantially as described.

4. In a feed-water purifier, the combination

with a superheating reservoir of a series of open troughs and a series of inverted troughs, supported within the reservoir, substantially as described.

5. In a feed-water purifier, the combination with a depositing reservoir, of a tray having an open trough on one edge and an inverted trough on the opposite edge, and means for supporting the tray within the reservoir, substantially as described.

In testimony whereof I have hereunto set my hand this 14th day of November, 1893.

COLE STICKLE.

Witnesses:
FRANK C. CURTIS,
A. E. DELANEY.