(No Model.)

C. F. BAKER.

SCALE PREVENTER FOR BOILERS.

No. 382,748. Patented May 15, 1888.

Fig. 1.

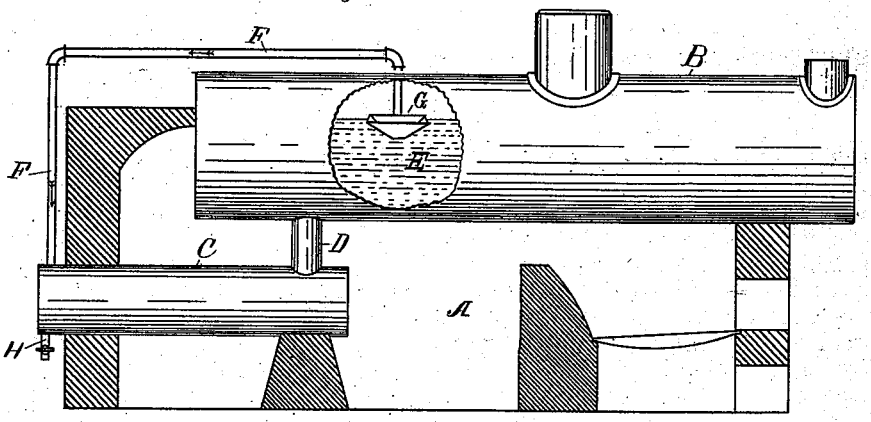


Fig. 4.

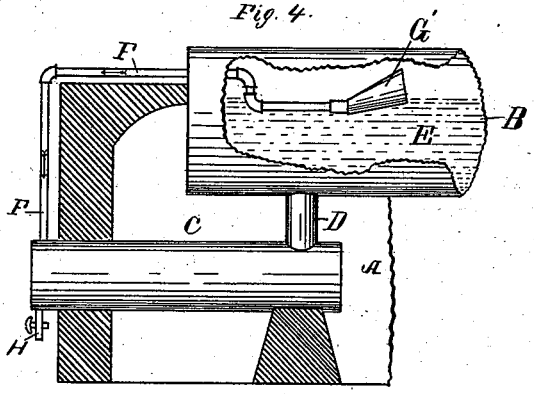


Fig. 2.

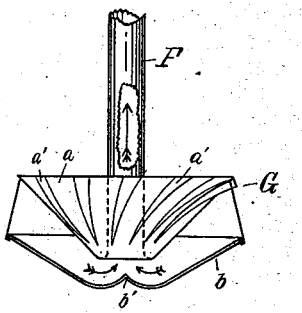
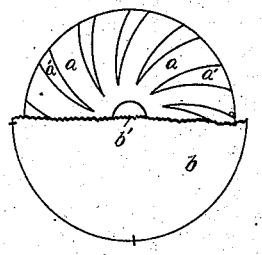


Fig. 3.



Witnesses.
John Morris.
Emma F. Elmore.

Inventor,
Charles F. Baker.
By his Attorney
Jas. F. Williamson.

UNITED STATES PATENT OFFICE.

CHARLES F. BAKER, OF MINNEAPOLIS, MINNESOTA.

SCALE-PREVENTER FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 382,748, dated May 15, 1888.

Application filed September 2, 1887. Serial No. 248,565. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. BAKER, a citizen of the United States, and a resident of the city of Minneapolis, county of Hennepin, State of Minnesota, have invented a certain new and useful Scale-Preventer for Boilers, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to the purification of water, and has for its general object to remove from water foreign materials held in solution. It is in the nature of an improvement on what are known to the trade as "boiler-cleaners;" but is applicable generally to water filters or purifiers. It was designed more especially to prevent scaling in steam-boilers; and it consists of the construction hereinafter fully described and particularly claimed.

In the drawings, like letters referring to like parts throughout, Figure 1 is a longitudinal section of a steam-boiler furnace, giving a view in side elevation of a steam-boiler embodying my invention, a part of the boiler being broken away. Figs. 2 and 3 are details in cross-section and plan view, respectively, of my preferred form of skimmer or mouth-piece for the outflow-pipe; and Fig. 4 is a view similar to Fig. 1, part of the furnace and boiler being broken away, showing a different form of mouth-piece.

A is the furnace.

B is the boiler.

C is the mud-drum, suitably supported under the boiler within the interior of the furnace with one end projecting outward through the end wall of the furnace.

D is the drum-leg connecting the top of the mud-drum with the bottom of the boiler.

E represents water in the boiler B. From the top of the outer end of the mud-drum to a point slightly below the water-level in the boiler extends a pipe, F, which serves as an outflow-pipe. To the end of the pipe F, within the boiler, may be attached a suitable mouth-piece or skimmer, as G or G'. To the bottom of the outer end of the mud-drum is attached a blow-off, H.

The mouth-pieces or skimmers G G' are both of a special construction. The one marked G is composed of a truncated cone, *a*, having spiral corrugations *a'* on its outer surface, starting from the large and ending near the small end, and a cone-shaped or concave deflector or water-guide, *b*, rigidly attached to the part *a* and held a short distance below the small end of the same. The cone *a* encircles the end of the outflow-pipe F and has its small end coterminous with the mouth of said pipe and continuous with the walls of the same. The central part of the deflector or guide *b* may have its central part turned inward and upward into a sharp conical point, as shown at *b'*. When this form of mouth-piece is used, the outflow-pipe F terminates within the boiler in a vertical branch, and G is so attached thereto that the large end of the cone *a* will be slightly above the water-level and the small end considerably below the same, and the deflector *b* is so attached to *a* that its large end or upper edge will be just below the water-level. The effect of this construction is to make all the water come into the mouth-piece between the peripheries of the large ends of the two cones, and in virtue of the corrugations *a'* a spiral motion is given to the water causing an eddy or downward suction, thus more effectually drawing off the scum and all foreign material. The mouth-piece marked G' is in shape like half a truncated cone divided on the central vertical plane from end to end. The flat part is made the bottom. It is attached to the mouth of the outflow-pipe at a slight upward inclination with the outer edge of the flat part below the low-water level, and the curved part is large enough at its outer end to extend above high-water level. Both of these mouth-pieces work well and add to the efficiency of the construction; but they are not absolutely essential. They may be dispensed with entirely. The outflow-pipe F would then have its mouth just below the water-level, substantially as it would appear in Fig. 4 if the mouth-piece G' were removed.

The operation is as follows: Heat having been applied to the boiler, circulation will take place from the water-level in the boiler to the top of the mud-drum, through the outflow-pipe, and back to the bottom of the boiler through the drum-leg D, owing to the different temperatures of the water in the two vessels. This circulation will take place whether the construction used be as shown in Fig. 4 or

Fig. 1, or even if the mouth-pieces G or G′ be entirely dispensed with. The water in the boiler is under pressure. It therefore boils at a high temperature. The lower forward and under side of the mud-drum is entirely cut off from the direct application of heat. The rear end of the drum and the mud-drum leg are encompassed by the products of combustion. More or less of the top of the forward part of the drum is touched by the products of combustion. The result is that the water in the forward end of the drum is comparatively cold, the water at the water-level in the boiler is extremely hot, and the water in the mud-drum leg has a temperature between the two; hence, in obedience to the law of gravity and the action of heat on liquids, circulation must take place, whether the outflow-pipe F enters the boiler vertically or horizontally makes not the slightest difference. At the boiling-point, in accordance with well-known laws, all foreign material held in solution will be set free, and in virtue of the ebullition caused by the direct application of heat to the boiler will rise to the top of the water. The circulation constantly skims off the top surface, carrying with it the foreign material into the mud-drum. The water in the drum is comparatively quiet, being free from ebullition, owing to the absence of the direct application of heat to the under side of the same; hence the foreign matter received therein settles to the bottom and may be blown off at will.

The advantages of my construction are great. The circulation is much stronger. It is more rapid and more perfect. There is never any clogging or failure of the circulation. It is continuous. The products of combustion from the furnace-grate pass around the drum-leg and over the top of the drum; hence the top of the drum is the hottest, and there is always an upward current in the drum-leg.

The mud-drum is made to serve the double function, preserving all its well-known advantages as a settling-vessel in the best position to catch all foreign matter held in suspension, and adding thereto the function of receiving and holding matter held in solution. By using the mud-drum in this manner, located inside the furnace, loss of heat by radiation is avoided. The water once heated the temperatures remain comparatively constant, the water in the drum being only a few degrees below that in the boiler. There is thus effected a great economy in fuel. The only part of the construction exposed to loss by radiation is the outflow-pipe, which may be incased in suitable non-conducting material.

The construction is extremely simple and capable of easy attachment to any boiler. By actual and continuous usage I have demonstrated its efficiency for the ends in view. Scaling is entirely prevented, and there is a large economy in fuel.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In scale-preventers for boilers, a mouth-piece for the outflow-pipe, consisting of a truncated cone provided with spiral corrugations on its water-receiving and directing surface, and having its small end coterminous with the end of said outflow-pipe, as and for the purpose set forth.

2. In scale-preventers for boilers, a mouth-piece for the outflow-pipe, consisting of a truncated cone provided with spiral corrugations on its outer surface extending from its larger to its smaller end, supported vertically with its small end below and its large end above the water-level, and having its small end coterminous with the end of said outflow-pipe.

3. In scale preventers for boilers, a mouth-piece for the outflow-pipe, consisting of a spirally-corrugated truncated cone supported vertically with its small end below and its large end above the water-level, in combination with a disk or cone-shaped deflector or guide rigidly attached to said corrugated cone and supported directly under the same, and having its large end just below the water-level, as and for the purpose set forth.

4. In combination, boiler B, mud-drum C, drum-leg D, connecting the top of the latter to the bottom of the former, the outflow-pipe F, extending from the interior of the boiler to the mud-drum, and the mouth-piece G *a a′ b b′*, as described, attached to the end of the pipe F, within the boiler, as and for the purpose set forth.

5. In scale-preventers for boilers, a mouth-piece for the outflow-pipe, consisting of a truncated cone supported vertically with its small end below and its large end above the water-level and a disk or cone-shaped deflector supported below and rigidly connected to said truncated cone, and having its larger end near to but slightly below the water-level, substantially as described.

CHARLES F. BAKER.

In presence of—
EMMA F. ELMORE,
JAS. F. WILLIAMSON.