

(No Model.)

J. T. OBENCHAIN.
BOILER CLEANING APPARATUS.

No. 404,425.

Patented June 4, 1889.

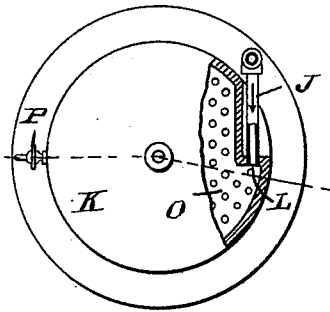


Fig. 2.

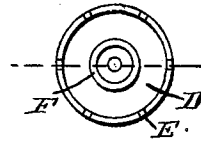


Fig. 3.

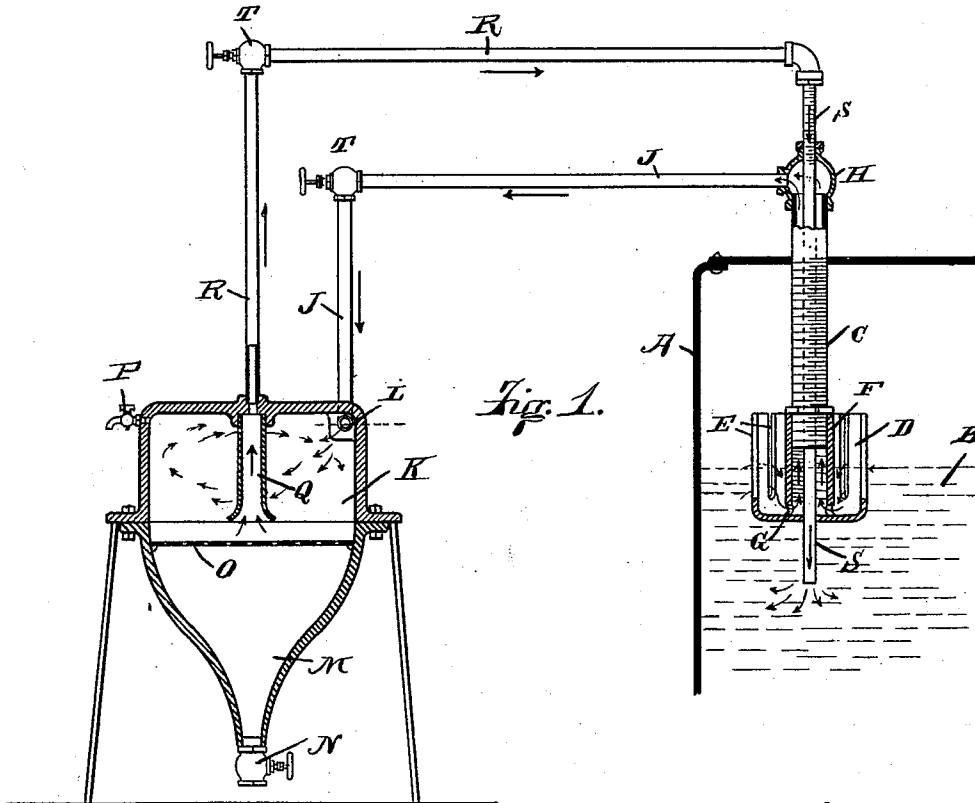


Fig. 1.

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BOILER-CLEANING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 404,425, dated June 4, 1889.

Application filed January 4, 1889. Serial No. 295,382. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. OBENCHAIN, of Logansport, Cass county, Indiana, have invented certain new and useful Improvements in Boiler-Cleaning Apparatus, of which the following is a specification.

This invention pertains to that class of devices in which the foul water in the upper levels in the boiler is caused to pass out from the boiler and into a precipitator where the heavier matters are left, the purified water returning again to the boiler.

My improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a vertical section illustrating my apparatus in connection with a boiler; Fig. 2, a plan of the precipitator, with a portion shown in horizontal section; and Fig. 3, a plan of the skimmer.

In the drawings, A indicates in vertical section the shell of the boiler; B, the water in the boiler; C, a large vertical pipe screwed downwardly through the top of the boiler and reaching thereinto or near to the water-line, this pipe being hereinafter termed the "skimmer-pipe;" D, the skimmer in the form of a cylindrical cup secured upon the lower end of the skimmer-pipe in such adjusted position of height as may be called for, the cup being so adjusted vertically as to be about half-way immersed in the water in the boiler when the water is at its average level; E, vertical slots in the wall of the skimmer, these slots being open at the top and extending downwardly to about the bottom of the skimmer-cup, these slots presenting a practically uniform area of opening from top to bottom; F, a central hollow hub projecting upwardly from the solid floor of the skimmer-cup, this hub being threaded to receive the skimmer-pipe on which the skimmer may be screwed up or down, as desired, the position, after adjusting, being fixed by a lock-nut on the skimmer-pipe; G, a series of apertures in the wall of the hub F, at the foot of the hub, these apertures placing the interior of the hub in communication with the interior of the skimmer-cup; H, a pipe-T upon the upper end of the skimmer-pipe; J, a pipe leading from this T to the precipitator and serv-

ing to place the precipitator in communication with the interior of the skimmer-pipe C; K, the precipitator, being a tight circular napiform vessel disposed at any convenient position contiguous to the boiler; L, the inlet of the pipe J to the precipitator, the same being tangentially disposed at the inner periphery of the vessel just below its roof, such inner periphery forming the smooth and truly circular inwall of the vessel; M, the base of the precipitator of cyma-reversa contour; N, a clean-out valve at the base of the precipitator; O, a horizontal septum in the precipitator; P, a cock discharging outwardly horizontally from the extreme upper part of the precipitator; Q, a centrally-disposed pipe reaching from the roof of the precipitator downwardly thereinto and having its open lower end preferably bell-mouthed; R, a pipe leading upwardly from the pipe Q and thence horizontally to over the skimmer-pipe C; S, a pipe leading from the pipe R downwardly through the T H, thence centrally downward through the skimmer-pipe C and through the skimmer-hub and tightly through the skimmer-bottom and into the boiler, at some distance below the bottom of the skimmer; and T, regulating-valves in the pipes J and R.

When heat is applied to the water in the boiler, the effect is to produce currents of circulation in the water, the impurities in suspension moving with these currents. The currents are upwardly directly over the fire, thence horizontally to the colder end of the boiler, thence downwardly, and back horizontally to the hot portion of the boiler, and so on and on. The foreign matters in freest suspension will take the form of scum upon the top of the water and will move with the circulatory current from the hotter to the cooler end of the boiler. Purifying devices operating by means of skimmers, therefore, deal with the scum at the surface of the water in the boiler, and, preferably, at the cooler end of the boiler, where the currents take a downward turn.

The skimmer-cup D will be surrounded by scum; which will find its way within the cup through the open slots. Upon entering the cup the scum becomes to a greater or less degree protected from the effect of the general circulatory currents in the water surrounding

the cup, and therefore there will be more or less tendency for the matters in suspension to precipitate themselves to the bottom of the cup. The skimmer-pipe C leads from the cup outwardly to the precipitator, and there is an outwardly-flowing current through this pipe, the effect of which current is to draw up out of the cup those matters which have accumulated therein. By reason of the location of the apertures G, it follows that the effect of this outward current is mainly expended upon those matters which by reason of their superior gravity have tended to settle when within the cup. The cup thus becomes cleared of such matters as rapidly as they enter.

The water-level of the boiler is subject to constant variations, and it is desirable that such variation should not affect the settling capacity of the skimmer. The inflow to the skimmer is not from the general body of water surrounding the skimmer, but from the scum arising upon the surface of the water; consequently, as the water rises in the boiler the stratum of scum rises with it. The inflow of scum to the skimmer is dependent upon the area of the skimmer-slots E, considered in connection with the depth of the scum. The slots being of uniform area throughout their depth, it follows that they maintain a uniform working throughout the variations of water-level. If, however, the thickness of scum increases, then more of the length of the slot becomes effective and the capacity of the skimmer accordingly increased.

The steam, water, and foreign matters passing from the skimmer outwardly through pipe C go by pipe J and connection L to the precipitator. The inlet L being arranged tangentially at the top of the precipitator, the matters are so discharged into the precipitator as to form a vortex therein. Were the precipitator simply full of the matters, the same matter would leave the precipitator and go to the boiler with that entering the precipitator from the boiler except such extremely-heavy matter as might precipitate in the precipitator in spite of the normal currents therein. This would be the case if the pipe J delivered the matter to the precipitator in the ordinary manner; but the connection L producing the vortex gives to the heavier matters the greater momentum. This momentum causes these heavier matters to move around the inner walls of the precipitator and to be acted upon by gravity which draws them down these walls out of the range of influence of the general circulatory currents within the precipitator. The heavier matters consequently find their way to the base of the precipitator, whence they may be from time to time withdrawn through the valve N. The septum O is not at all essential, and in practice is not always used. Its office is to free the lower part of the precipitator to some extent from the effect of the circulatory current. The

heavier matters which have once passed through the perforations of the septum, while they would rise again under the influence of circulatory currents in the absence of the septum, will not be acted upon with sufficient force to cause them to search their way upwardly through the perforations of the septum. Being thus held for a time free from motion, gravity takes effect and causes them to settle through the comparatively stagnant water below the septum.

The circulatory currents carry the contents of the precipitator therefrom through the pipes Q, R, and S to the boiler, except such heavier matters which have been precipitated through the action of the precipitator-walls and the septum. The pipe Q, forming the outlet from the precipitator, reaches well downwardly into the same, and consequently water cannot leave the precipitator until it has for some time been subjected to the vortex action against the walls. In other words, water leaving the precipitator is water which has entered at a higher level and sunk to a lower level, and has, in the meantime, been subjected to the vortex action.

When the device is first started, the upper portion of the precipitator will form an air-chamber; but this air may be gotten rid of by temporarily opening the cock P, after which everything works normally, if the valves T are adjusted to secure the proper relation between circulatory current and capacity of skimmer-slots. Oil carried over to the precipitator will accumulate in the upper part of the same, and may be drawn off by the cock P. Water going from the precipitator to the boiler passes down pipe S, which is centrally disposed within the skimmer-pipe, and pipe S discharges immediately below the skimmer. The result of this arrangement is that the inlet to the boiler and the outlet therefrom are secured by means of a single hole in the boiler-shell, and that the discharge from the pipe S accelerates the currents in the neighborhood of the skimmer, and that the temperatures of the incoming and outgoing water are much assimilated. It will be found in practice that too strong a circulatory current is not compatible with good performance. The incoming colder water in the pipe S being surrounded by the outgoing hotter water in the skimmer-pipe C, the heat of the water in the two pipes tends toward assimilation.

In applying the apparatus the skimmer-pipe C is screwed down through a tapped hole in the boiler as far as the thread upon the pipe will permit and a pipe-connection with the boiler thus secured. The skimmer is then screwed upon the skimmer-pipe to proper height and fixed, if needed, by a lock-nut.

I claim as my invention—

1. In a boiler-cleaner, the combination, substantially as set forth, with a precipitating-chamber, a pipe leading thereto from the

boiler, and a pipe leading therefrom to the boiler, of a skimmer within the boiler, having the form of a cup whose peripheral wall is provided with vertical slots having a uniform effective area throughout their vertical depth, said first-mentioned pipe projecting downwardly into said cup and communicating with the interior thereof near the floor of the cup.

2. In a boiler-cleaner, the combination, substantially as set forth, with a precipitating-chamber, a pipe leading thereto from the boiler and a pipe leading therefrom to the boiler, of a skimmer within the boiler and attached to said first-mentioned pipe and having the form of a cylindrical cup whose peripheral wall is provided with vertical slots having a uniform effective area throughout the vertical depth, said first-mentioned pipe projecting downwardly into said cup and communicating with the interior thereof near the floor of the cup.

3. In a boiler-cleaner, the combination, substantially as set forth, with a precipitating-chamber, a pipe leading thereto from the boiler, and a pipe leading therefrom to the boiler, of a skimmer having the form of a cup with a vertically-slotted periphery and communicating with said first-mentioned pipe near the bottom of the cup only and below the level of the lower ends of said slots.

4. In a boiler-cleaner, the combination, substantially as set forth, with a precipitating-chamber, a pipe leading thereto from the boiler, and a pipe leading therefrom to the boiler, of a skimmer having the form of a cup with a vertically-slotted periphery, and having a central hollow hub connected with said first-mentioned pipe, and having apertures leading from the base of the cup to within the base of the hub.

5. In a boiler-cleaner, the combination, substantially as set forth, with a precipitating-chamber, and a pipe leading therefrom to the boiler, of a vertical skimmer-pipe having a threaded portion projecting downwardly into the boiler, a pipe connecting the said skimmer-pipe with the precipitator, and a slotted cup shaped skimmer screwed upon the lower end of said skimmer-pipe and vertically adjustable thereon.

6. In a boiler-cleaner, the combination, substantially as set forth, of a precipitating-chamber, a skimmer within the boiler, a pipe leading from said skimmer vertically through the boiler-shell and thence to the precipitator, and a pipe leading from the precipitator to said vertical pipe and passing downwardly within the same and through the skimmer and into the boiler-space below the skimmer.

7. In a boiler-cleaner, the combination, substantially as set forth, of a precipitating-chamber, a skimmer within the boiler, a pipe **T** outside the boiler over the skimmer, a skimmer-pipe connecting the **T** with the skimmer, a pipe connecting the precipitator with said **T** and skimmer-pipe, and a pipe passing from below the skimmer upwardly through said skimmer and skimmer-pipe and out of said **T**, and thence to the precipitator.

8. In a boiler-cleaner, the combination, substantially as set forth, of a skimmer, a precipitating-chamber having a circular inwall, a pipe leading from said chamber to the boiler below the skimmer, and a pipe leading from the skimmer to said chamber and connected with said chamber at an outer point, and arranged to discharge tangentially against and cause the discharge to follow the complete circle of said inwall.

9. In a boiler-cleaner, the combination, substantially as set forth, of a skimmer, a precipitating-chamber, a pipe leading from the skimmer to the outer portion of the precipitating-chamber, and a pipe leading from the boiler-space below the skimmer to a point in the precipitating-chamber below the point of connection with said first-mentioned pipe.

10. In a boiler-cleaner, the combination, substantially as set forth, of a skimmer, a precipitating-chamber, a pipe leading from the skimmer to a tangential inlet at the outer portion of the precipitating-chamber, a centrally-disposed pipe projecting downwardly from the roof of the precipitating-chamber, and a pipe connecting said pipe with the boiler-space below the skimmer.

11. In a boiler-cleaner, the combination, substantially as set forth, of a skimmer, a napiform precipitating-chamber having a completely circular inwall, a clean-out valve at the base of the chamber, a pipe leading from the skimmer to the precipitating-chamber and discharging tangentially against the circular inwall thereof, and a pipe leading from the precipitating-chamber to the boiler-space below the skimmer.

12. In a boiler-cleaner, the combination, substantially as set forth, of a skimmer, a precipitating-chamber, a horizontal perforated septum in the chamber, a clean-out valve at the base of the chamber, a pipe connecting the skimmer with the chamber above the septum, and a pipe leading from the boiler-space below the skimmer to the chamber above the septum.

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Witnesses:

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