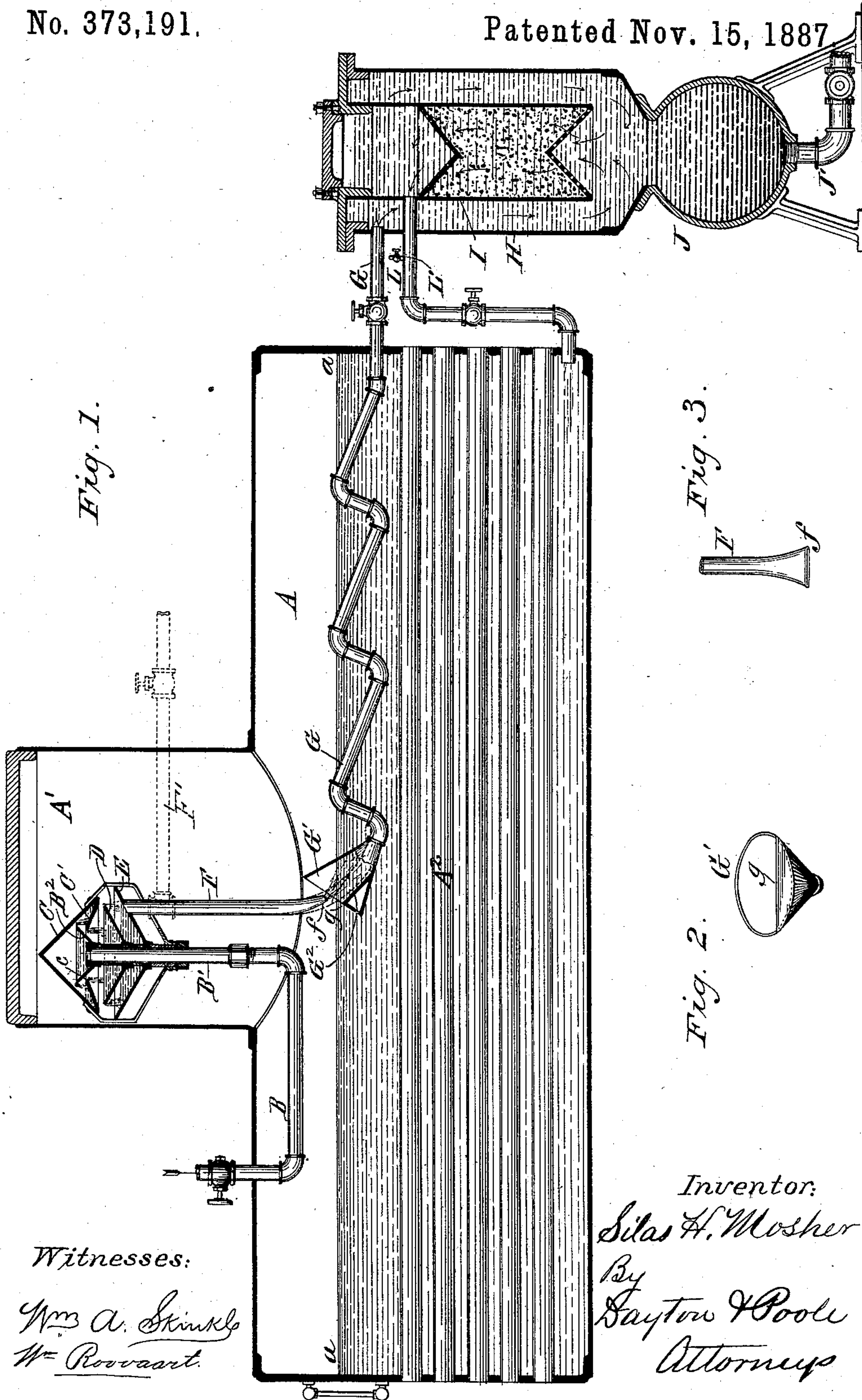


(No Model.)

S. H. MOSHER.
FEED WATER PURIFIER.

No. 373,191.

Patented Nov. 15, 1887



Witnesses:

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UNITED STATES PATENT OFFICE.

SILAS H. MOSHER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO
THOMAS J. WHEELER, OF SAME PLACE.

FEED-WATER PURIFIER.

SPECIFICATION forming part of Letters Patent No. 373,191, dated November 15, 1887.

Application filed October 12, 1886. Serial No. 215,977. (No model.)

To all whom it may concern:

Be it known that I, SILAS H. MOSHER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Feed-Water Purifiers for Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this
10 specification.

This invention has for its primary object to provide improved means for clarifying the feed-water introduced into steam-boilers, and to
15 thus prevent deposition of sediment and scale within the boiler. It also includes among its objects, as preferably constructed, to provide improved means for carrying off surface impurities, and particularly the scale that may
20 be detached from the boiler and brought to the surface of the water therein, either by itself or in conjunction with the means first mentioned for clarifying the water as it is introduced. The first-mentioned improvement may also be
25 employed without the second, if desired.

The nature of the invention will be understood from the following description and the accompanying drawings.

Figure 1 of the drawings illustrates a steam-boiler in vertical central longitudinal section,
30 having all my improvements applied thereto. Fig. 2 is an end view of the open funnel or mouth-piece located within the boiler and constructed with a dam, over which the surface impurities may flow into the pipe leading from
35 said mouth-piece out of the boiler to the settling-drum. Fig. 3 is a detail.

A is a steam-boiler, of which A' is the dome, and A² are the tubes.

40 B is a feed-water pipe leading from a pump or preferably from a heater into the boiler A desirably above the water-line therein, which water-line is represented by the line *a a*.

The pipe B by preference passes in a horizontal direction above the water-line to a point beneath the dome A', where it rises, as shown, the vertical extension being lettered B'. In this arrangement of the feed-pipe the upper end of the vertical part B' is open, and
45 is provided with a flaring mouth or cup, B², over the edge or rim of which the water is in-

tended to be discharged in a relatively-thin body.

C is a conical plate arranged over the bowl or wide mouth B², with its larger diameter
55 downward, and provided about its lower edge with an inwardly-directed flange, C', the free edge *c* of which extends beneath the upper edge of the flaring mouth B², so that the water discharged from said mouth B² will fall upon the
60 shelf C' and will overflow at the edge *c*. Beneath the inverted cone C is arranged a conical cup, D, opening upward and surrounding and supported by the vertical pipe B'. The water falling from the edge *c* of the shelf C'
65 descends into the cup D and finds its escape over the edge of said cup into a similar but larger cup, E, beneath it, and also surrounding and supported by the pipe B'.

F is a pipe leading from the lowermost cup, E, at a point below its upper edge, and forms
70 part of a duct for carrying the water out of the boiler to a settling-chamber. It is here shown in full lines as extending downward to a point a few inches above the water-line *a a*,
75 where it delivers into a separate part, G, of such outflow-pipe, and in dotted lines as continuous with the pipe G. The lower end of the pipe F, when separate from the pipe G, is desirably compressed, so as to give a rela-
80 tively wide and thin outlet, *f*, at its lower end, and the lower end of said pipe is also preferably curved in the direction of the pipe G, into which it discharges. The pipe G is provided with a flaring open end, G', arranged beneath
85 the end of the pipe F in position to receive the water discharged from the latter.

The pipe G, for the first object of my invention, may be indifferently located at or above the water-line *a a*, and may be continuous with
90 the pipe F; but, having reference to the second object of the invention—viz., to carry off the surface impurities of the water in the boiler—said pipe G will be located with its mouth G', desirably, in the position shown in
95 Fig. 1, or partly below the water-line *a a*. In this case the mouth G' of the pipe G is widened laterally or in a horizontal direction and provided with a dam, G², having its upper edge, *g*, located a distance of an inch or so below the water-line *a a* and parallel therewith.
100

The pipe G discharges outside the boiler A.

into a vertical drum, H, having therein a suspended filter, I, the bottom of which is perforated. The lower end of the drum H discharges into a settling-chamber, J, which is preferably of spherical form, and is provided at its lowest point with a valved outlet-pipe, J'. From the upper portion of the filter I a pipe, L, leads to the lower part of the boiler A.

The pipes G and L are provided with suitable valves between the boiler and the drum H, as shown, and in addition to the stop-valve the pipe L is provided with a pet-cock, L', to discharge air.

The primary invention herein set forth proceeds upon the well-established fact that the separation of the solids of water is promoted by heat, and the primary object of the construction above described is to expose the admitted water to a higher heat than that to which it is raised by an ordinary external heater before discharging it into the mass of water within the boiler. To this end the water is exposed repeatedly in thin falling bodies in the steam-space of the boiler as it descends from the rim of the mouth B² to the outlet of the pipe F, the steam occupying the steam-space of the boiler in which these parts are located being of much higher temperature than the water below it. As a consequence, when very impure water is introduced into the boiler, it has been found that the water discharged by the pipe F is thick with mud or sediment, this having been demonstrated by an experiment consisting in the attachment of a lateral branch, F', to the pipe F, leading out of the side of the dome, as shown by dotted lines in Fig. 1.

It is to be noted that the employment of a series of overflow-cups exposes the water in thin sheets in its descent without spraying it, and therefore without spattering it against the sides of the boiler or dome.

The drum H, having within it the smaller and concentric filter-shell I, presents an annular outer space into which the pipe G discharges and in which the water descends to the bottom of the filter. The principal part of the solid matter carried by the water is here precipitated and falls into the "mud-drum" or receptacle J, while the water rises through the filter, where it is further clarified, and finally passes through the pipe L into the boiler. The pipe G being open to boiler-pressure, the circulation is principally effected by change of temperature in the settling-drum H, except when the water-line is below the dam G², when of course it will be influenced by variation in head. The circulation is found to be entirely satisfactory, even while the water-level in the boiler is above the dam G²; but it is thought to be promotive of such circulation to incline the lower end of the pipe F, as shown, in order to give an impulse to the water in the direction of the pipe G.

When the open mouth G' of the pipe G is arranged in the position shown partly below the water-line, any impurities upon the sur-

face of the water will be drawn into said pipe and deposited in the settling-chamber H J. By locating this mouth of the pipe G beneath the dome it better gathers such floating impurities, because the withdrawal of steam from the dome tends to produce a surface-current from all directions toward this point. Location of the ascending-pipe B' and its attachments in the dome gives the advantage of a greater fall to the water and stronger impetus thereto as it enters the pipe G. It is, however, to be understood that the various parts mentioned may be elsewhere located in the boiler, if desired, and the pipe B may be without an upward extension, B', or may open downwardly.

It will be noticed that the pipe G is shown as being zigzag or deflected downwardly and upwardly in a vertical plane between its mouth and the head of the boiler, and that the descending sections are longer and more nearly horizontal than the ascending sections. This construction, or probably the first descent located on the mouth-piece G', is found in the practice to be promotive of better circulation, though a straight pipe G works successfully.

The drawings not being made to a scale, I may add that in a fifty-horse-power boiler having a thirty-six-inch dome I have made the cup E about fourteen inches in diameter and the cup D about twelve inches in diameter and other parts in proportion, substantially as shown, the space between the edge or rim of the cup D and the flange C' being about half an inch. The bell-mouth G' of the pipe G is about six inches wide, and the pipes are one and a half inch in diameter.

I prefer to make the mud-chamber J spherical in form, with the outlet at its lowest point for the purpose of facilitating the work of blowing it out. The chamber H should also be of conical construction at its lower end for the same purpose and to better conduct the precipitate into the chamber J.

The spherical form of the mud-chamber J enables the same to be made of cast-iron, and at the same time of suitable strength, while it gives both the narrow neck at the top for connection with the conical bottom of the filter-chamber H and ample interior capacity, together with a hopper-shaped bottom, to facilitate the discharge of mud therefrom by simply blowing off.

The first object of my invention will obviously be attained if the pipe G be a more direct continuation of the pipe F; but to attain the second object also it is needful to make it with a separate mouth at the water-line of the boiler, substantially as shown. Plainly, the pipe G may be separately used as a skimmer without using the inlet-pipe shown or (while using such inlet-pipe and its attachments) in connection with a pipe, F', leading to the settling-chamber independently of the pipe G—as, for example, by prolongation of the branch of the pipe F. (Shown in dotted lines.)

The dam g, or its equivalent wide and hori-

zontal bottom of the mouth G', submerged a short distance only below the surface of the water, is favorable to a more effective skimming of the water than the relatively-narrow and more deeply-submerged openings for such pipes heretofore employed.

I claim as my invention—

1. The combination, with a steam-boiler, of a feed-water inlet-pipe having its delivery end open in the steam-space of the boiler, two or more open cups arranged to successively receive the water from the feed-pipe and to discharge the same by overflow, an outflow-pipe leading from the lowermost of said cups out of the boiler, a settling-chamber connected with said outflow-pipe, and a pipe leading from the settling-chamber back into the boiler, substantially as and for the purposes set forth.

2. The combination, with a boiler, of an inlet feed-water pipe having its delivery end directed upwardly and provided with a bell-mouth, a superposed hood provided with an inner annular shelf at its lower margin, a cup, as D, placed below the shelf, a subjacent cup, as E, a pipe leading from said cup E and prolonged so as to convey the water from said cup E out of the boiler, a settling-chamber into which said outflow-pipe delivers, and a return-pipe leading from the settling-chamber back to the boiler, substantially as described.

3. The combination, with a boiler, of a feed-water inlet-pipe having its delivery end open in the steam-space of the boiler, two or more open cups arranged to successively receive the water from the feed-pipe and to discharge the same by overflow, a pipe leading downward from the lowermost of said cups, a separate prolongation of said outflow-pipe leading out of the boiler and having its receiving end at the normal water-line of the boiler, a settling-chamber connected with said prolongation of

the outflow-pipe, and a pipe leading from the settling-chamber back into the boiler.

4. The combination, with a steam-boiler, of a settling-chamber comprising an upright outer chamber, H; a spherical receptacle, J, below said chamber H and connected with the bottom of the latter, a filter supported in the upper end of the chamber H, a pipe leading from the boiler to the chamber H exterior to the filter, a return-pipe leading from the filter to the boiler, and a discharge-pipe leading from the bottom of the spherical chamber J, substantially as described.

5. The combination, with a steam-boiler, an external settling-chamber, and a return-pipe leading from said settling-chamber to the boiler, of an outflow-pipe leading from the water-line of the boiler to the settling-chamber, the said outflow-pipe being provided with an open mouth located at the water-level and bent in a vertical plane, so that portions thereof have an ascending and other portions a descending direction, substantially as shown.

6. The combination, with a steam-boiler, an external settling-chamber, and an outflow-pipe leading to said settling-chamber, of a mouth applied to said outflow-pipe, which mouth is relatively broad and has its lower edge horizontal and located slightly below the normal water-level of the boiler, and an induction-pipe arranged to deliver into said open mouth of the outflow-pipe, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

SILAS H. MOSHER.

Witnesses:

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WILLIAM ROOVAART.