(No Model.)

J. F. HOTCHKISS.

BOILER CLEANER.

4 Sheets—Sheet 1.

No. 276,411.

Patented Apr. 24, 1883.

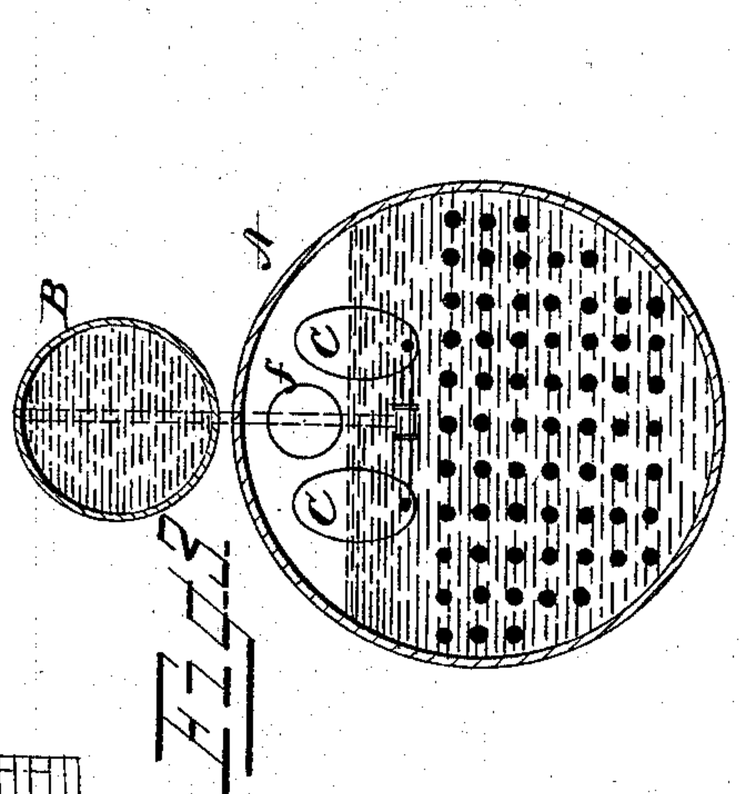

FIG. 2.

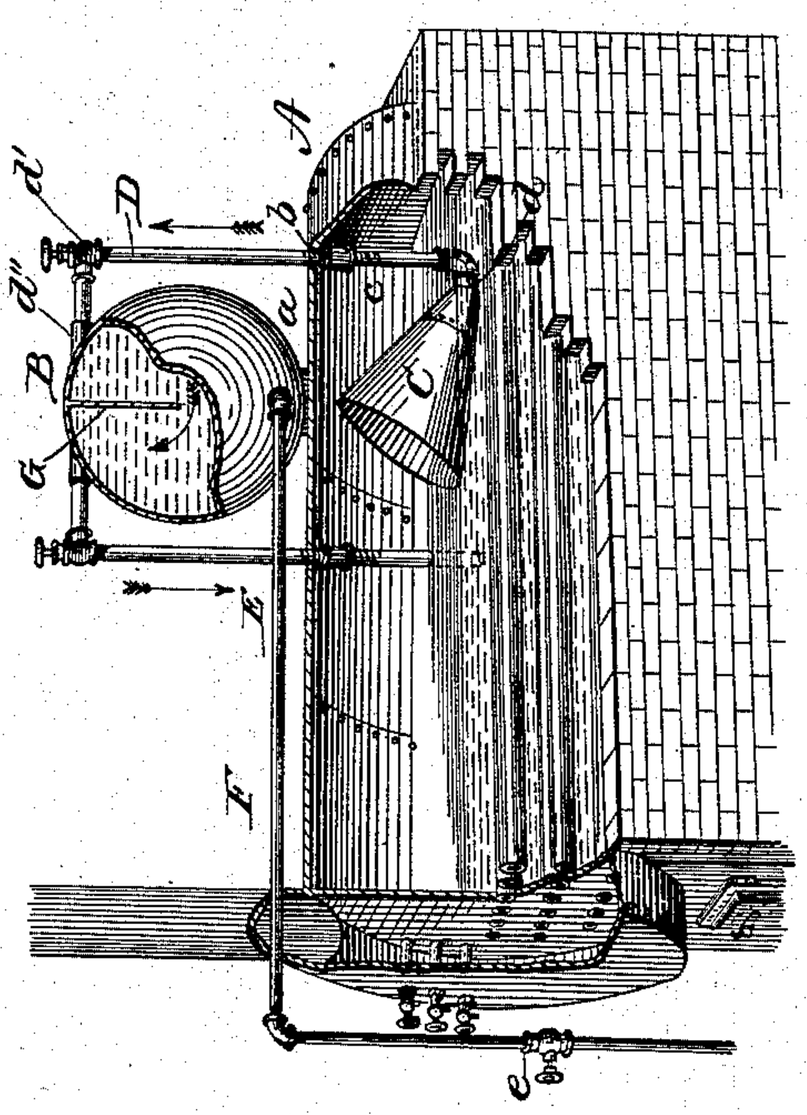

FIG. 1.

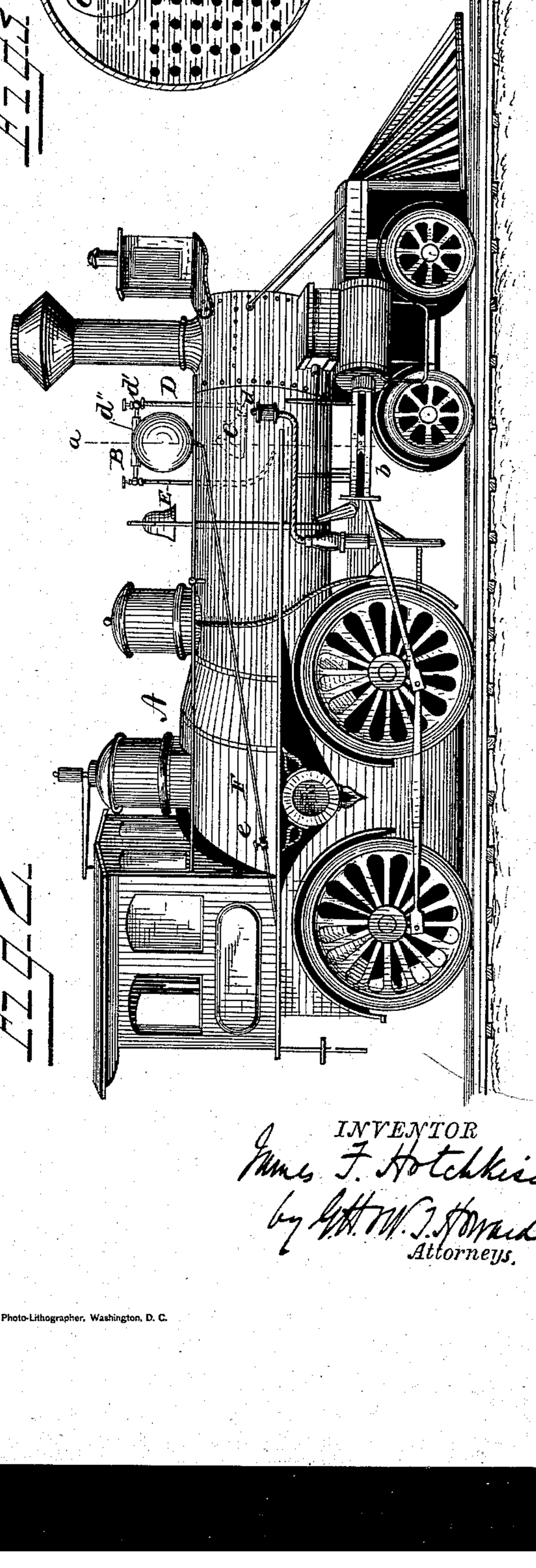

FIG. 3.

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(No Model.)

4 Sheets—Sheet 2.

J. F. HOTCHKISS.

BOILER CLEANER.

No. 276,411. Patented Apr. 24, 1883.

Fig. 4.

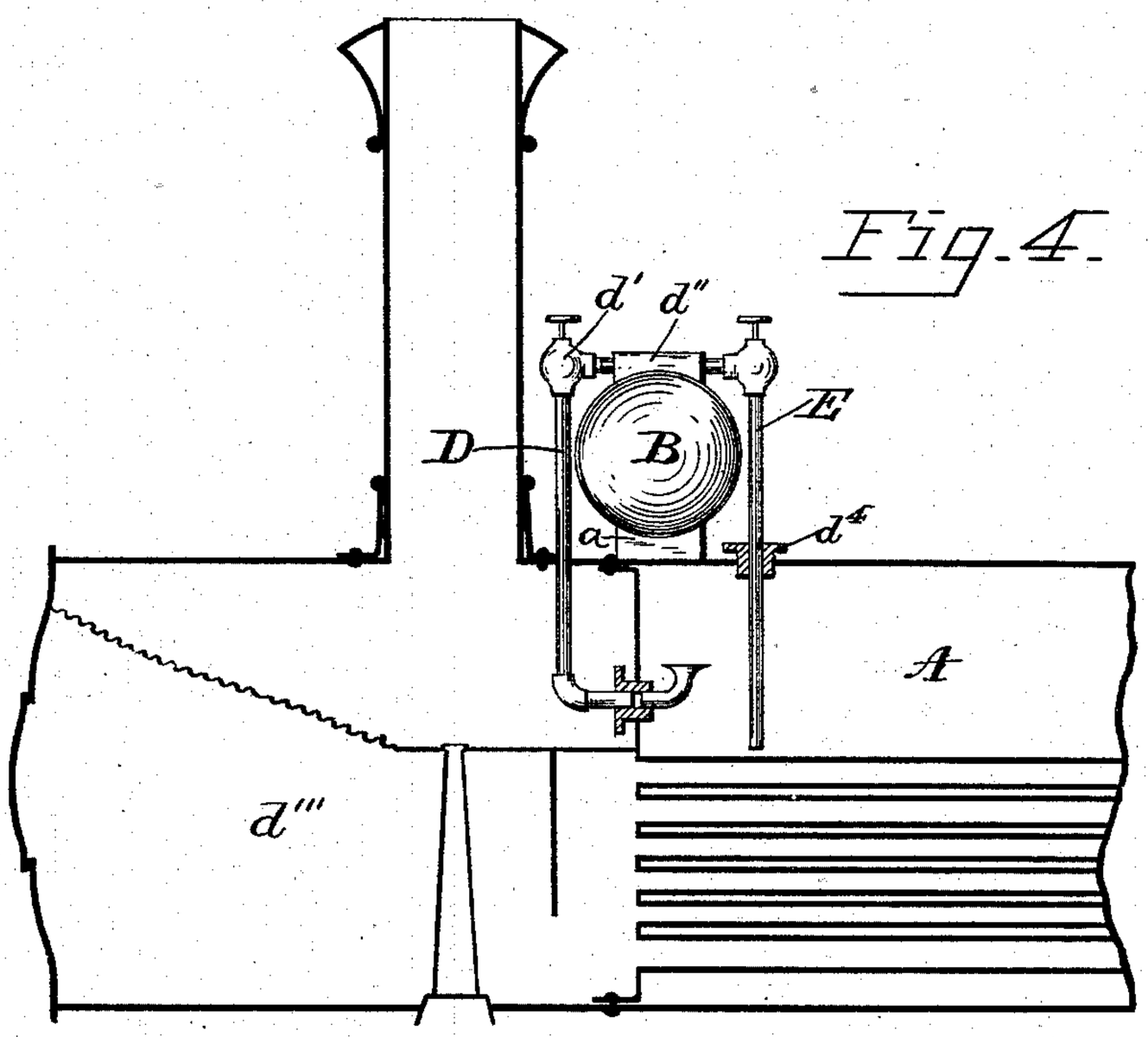


Fig. 5.

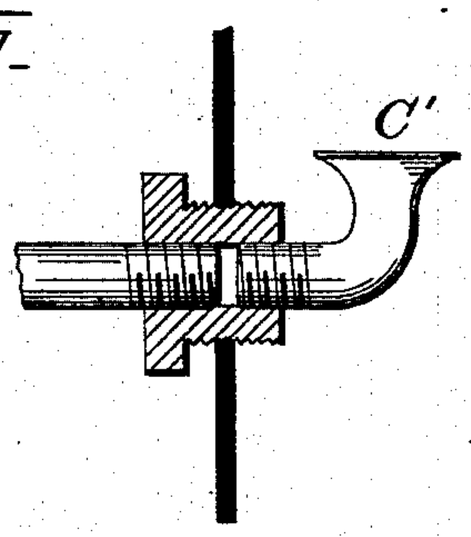
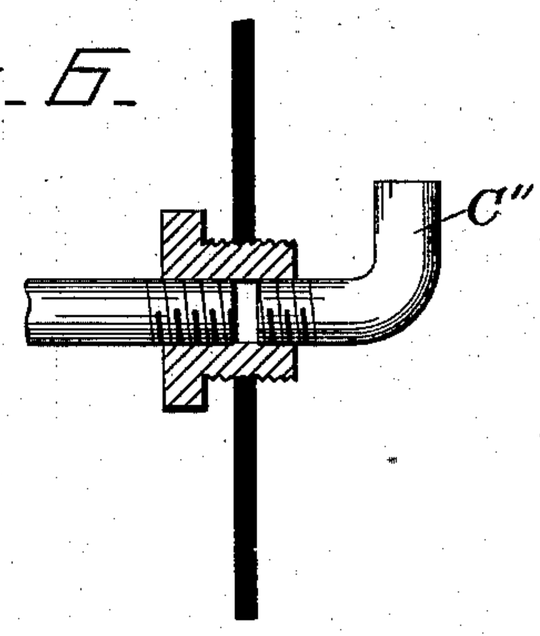


Fig. 6.



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4 Sheets—Sheet 3.

BOILER CLEANER.

No. 276,411. Patented Apr. 24, 1883.

FIG. 3.

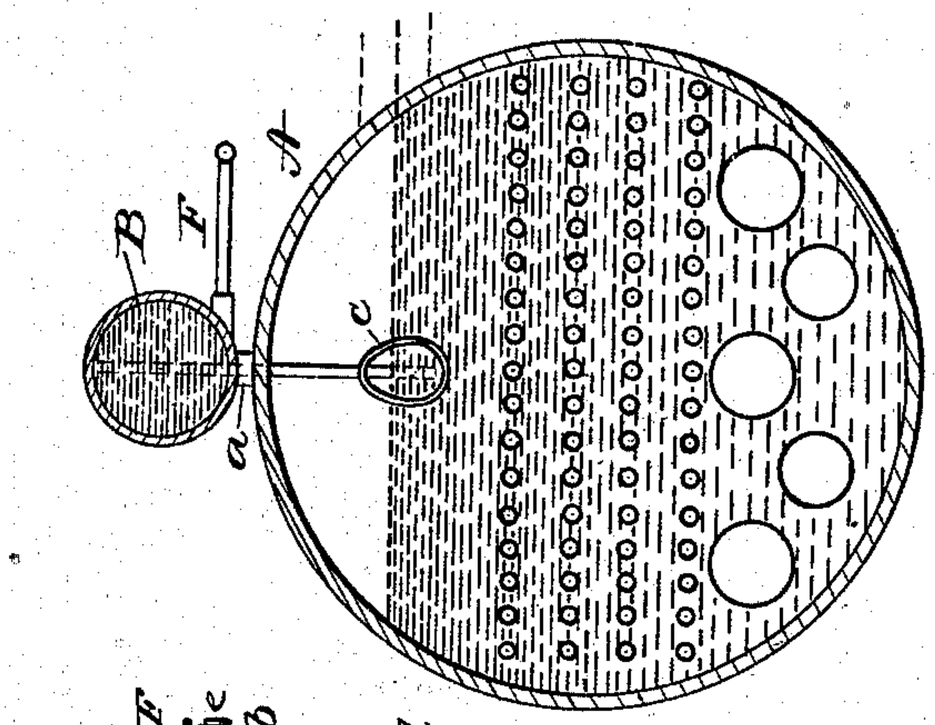

FIG. 4.

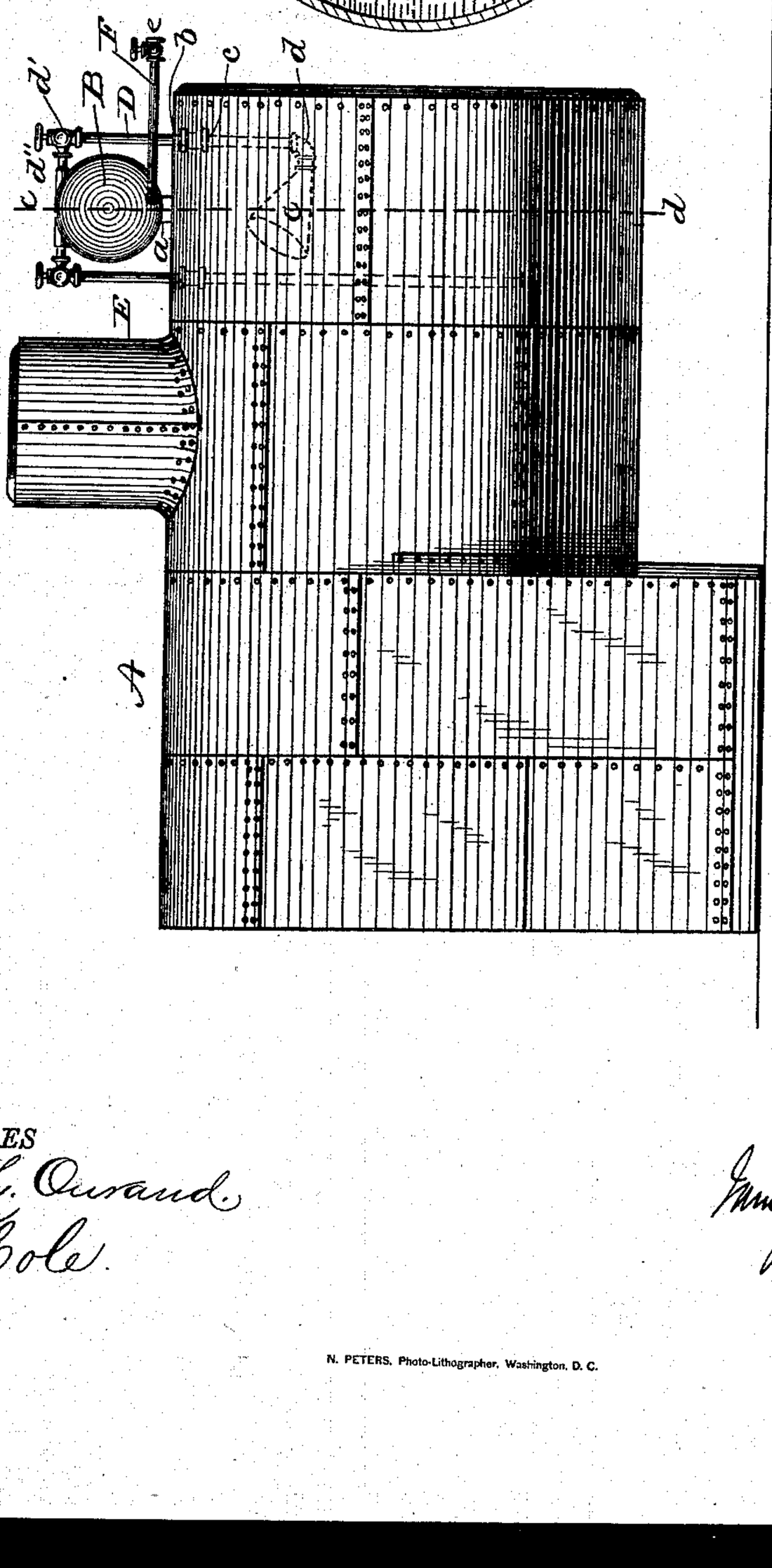

FIG. 5.

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J. F. HOTCHKISS.

BOILER CLEANER.

No. 276,411. Patented Apr. 24, 1883.

Fig. 9.

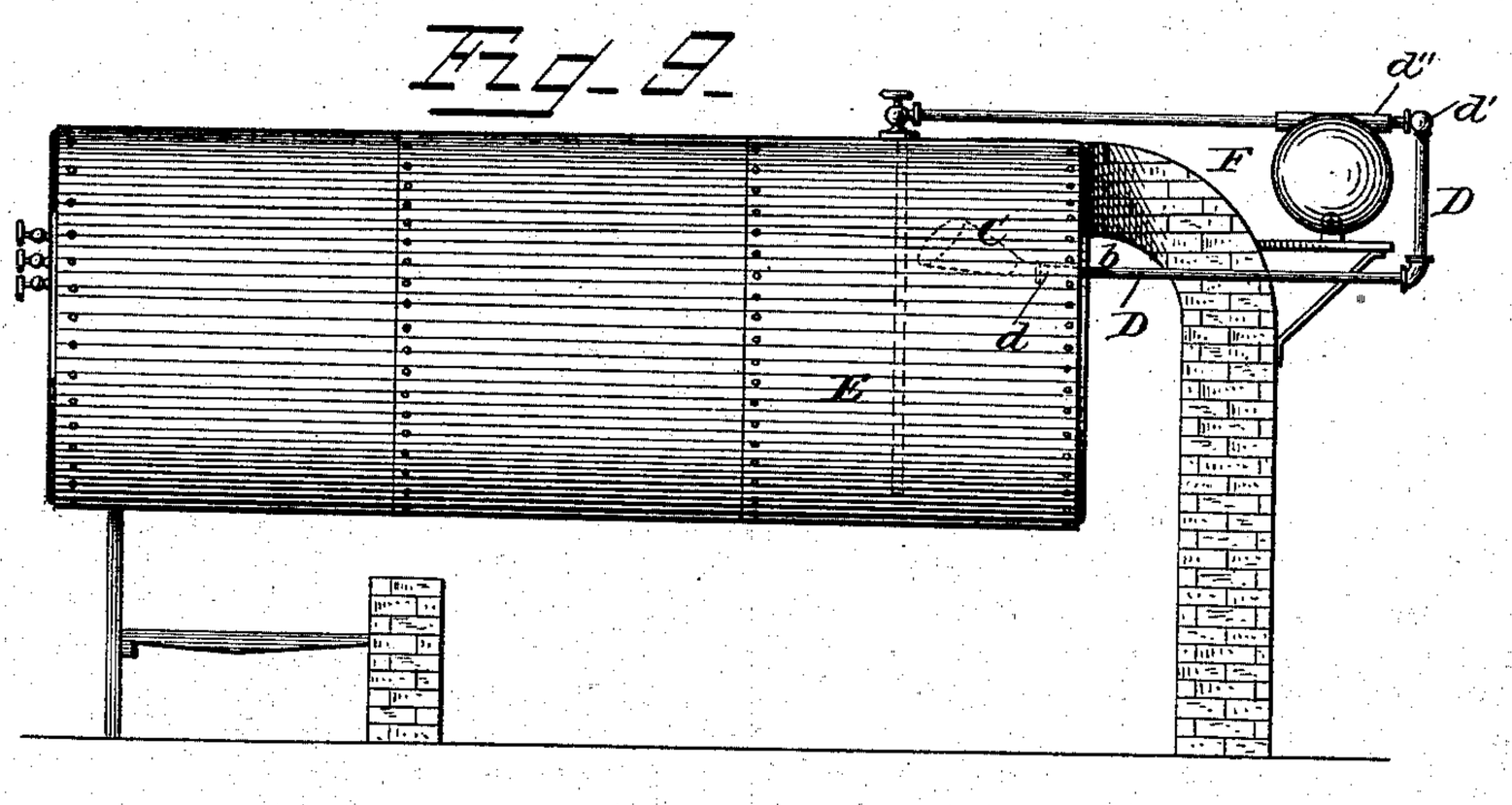


Fig. 10.

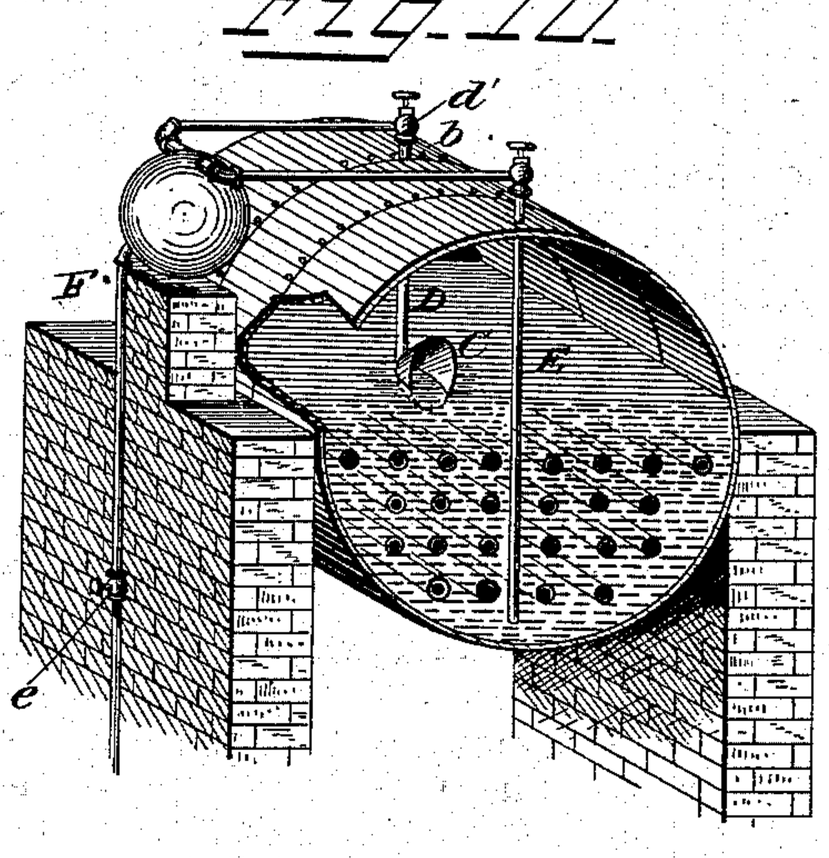


Fig. 11.

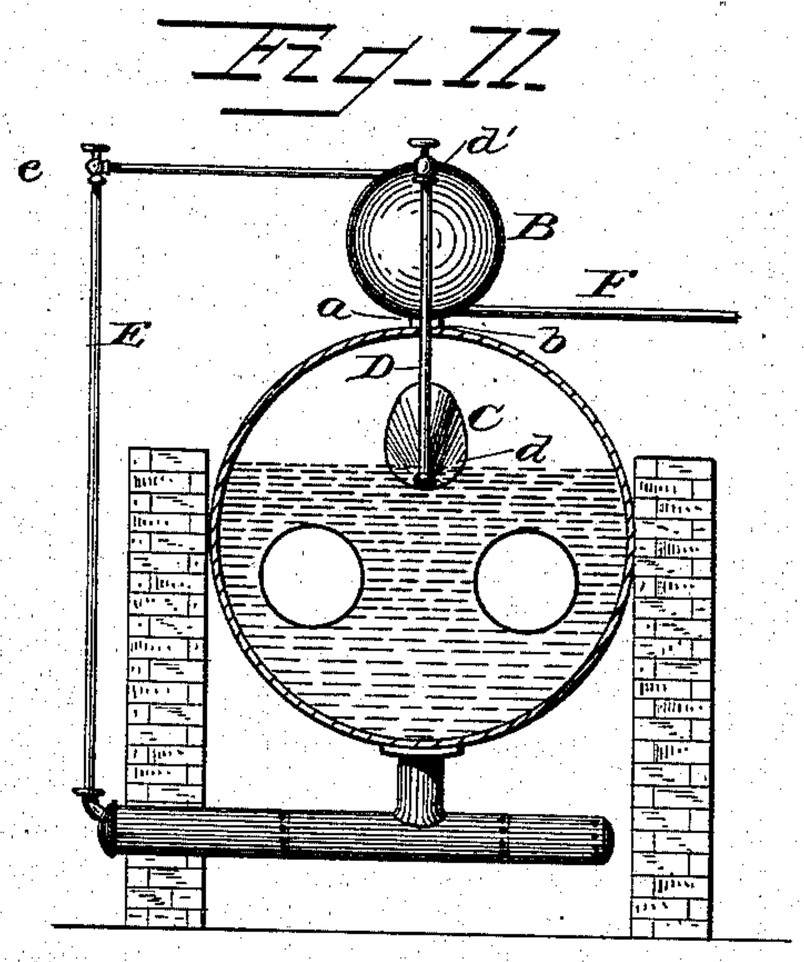


Fig. 12.

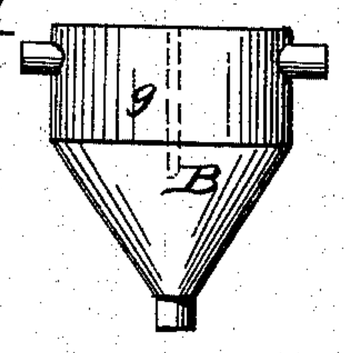
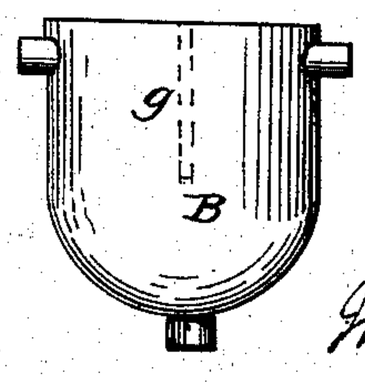


Fig. 13.



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UNITED STATES PATENT OFFICE.

JAMES F. HOTCHKISS, OF PLAINFIELD, NEW JERSEY.

BOILER-CLEANER.

SPECIFICATION forming part of Letters Patent No. 276,411, dated April 24, 1883.

Application filed July 12, 1882. (No model.)

To all whom it may concern:

Be it known that I, JAMES F. HOTCHKISS, of Plainfield, in the county of Union and State of New Jersey, have invented certain Improvements in Boiler-Cleaners, of which the following is a specification, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to an improvement upon that described in Patent No. 166,782, granted August 17, 1875, to Thomas O. Kemp, assigned to me, and reissued under No. 7,916, October 16, 1877, and patented in Canada November 15, 1873, under No. 2,862.

The invention described in that patent consists in an improved method of removing impurities or foreign matters found in the water of steam-boilers, and which are thrown to the surface by the ebullition thereof, together with the mechanical appliances for carrying said method into effect, as fully described in the said reissued patent.

The operation of the invention is dependent upon the action of the laws of gravity as applied to waters of different temperatures and to substances of different specific gravities.

The method employed consists in carrying the impurities raised to the surface by ebullition below that surface, and then upward into a reservoir with an ascending current induced by the displacement of a descending cooler body of water passing from said reservoir, the said impurities being deposited in the reservoir by precipitation.

The present invention consists in improvements in the construction of the apparatus, whereby the efficiency of its operation is greatly increased, simplicity and cheapness of manufacture are obtained, and the liability of disarrangement of the parts reduced to the minimum.

The invention is applicable to all classes of boilers, as stationary, locomotive, and marine.

In the drawings, Figure 1 is a view in perspective, showing the attachment of the apparatus to an ordinary tubular boiler. Fig. 2 shows its attachment to a locomotive-boiler. Fig. 3 is a transverse section on enlarged scale on the line *a b* of Fig. 2. Figs. 4, 5, and 6 show modified forms of the invention as applied to a locomotive-boiler. Fig. 7 shows the attachment of the apparatus to a marine boiler. Fig. 8 is a transverse section on line *c d* of Fig. 7. Figs. 9, 10, and 11 show different arrangements of the apparatus, and Figs. 12 and 13 modifications in the construction thereof, as hereinafter described.

Similar letters of reference indicate similar parts in the respective figures.

A is the boiler, upon which, as shown in Figs. 1, 2, 3, 4, 7, 8, and 11, is placed the reservoir B, resting upon the base *a*. The reservoir is a cast-iron spherical vessel of about eighteen gallons capacity. It is nine-sixteenths of an inch in thickness and weighs about two hundred and fifteen pounds. It occupies when in position, with its pipes attached, a space twenty-eight to thirty inches long, twenty-four inches wide, and twenty-six inches high.

C is a funnel, which is placed in the boiler so that its bottom edge is not higher than the low-water level. In boilers not over sixteen feet long it is advisable to place the funnel as near the back-head (or that farthest away from the fire) as possible. In longer boilers the mouth should be about one-fifth of the length of the boiler from the back-head. The funnel is made of sheet-iron. Its mouth or opening is twelve by fifteen inches across its greater and lesser diameters, and it can be inserted in any ordinary man-hole; but should the man-hole be too small the funnel may be bent, and after insertion restored to its normal state.

D is the upflow-pipe, suitably tapped into the shell of the boiler at *b*, and coupled at *c* to a separate section, which connects at *d* with the apex of the funnel C. The upper end of the pipe D unites with a valve, *d'*, into which a separate and horizontal section of the pipe is screwed, the other end of the section being tapped into the nozzle *d''* of the reservoir B. The return-pipe E is similarly connected to the reservoir B and to the shell of the boiler. The lower end of the return-pipe extends as far below the lower edge of the funnel as the arrangement of flues and tubes will allow. The end preferably should not be placed less than two inches below the said edge of the funnel,

and where possible should extend to a point about eight inches from the bottom of the boiler.

F is the blow-off pipe, which is connected with the lower part of the reservoir B, and may be carried in any direction and to any convenient point of discharge. It is preferable to place a valve in the pipe, as shown by *e*, within reach of the engineer.

G is a deflector, cast as a part of the upper portion of the reservoir B, and extending within the same to about its center, as shown. The purpose of this deflector will be hereinafter described.

In Fig. 3, which represents in cross-section the application of the apparatus to a locomotive-boiler, two funnels are shown uniting with an inverted T-pipe. The arrangement of the reservoir and upflow, return, and blow-off pipes is substantially the same as in the application to the stationary boiler. The mode of application can be varied, however. For instance, the upflow-pipe can enter the smoke-arch, making connection with either one or two funnels through the front head of the boiler. The return-pipe may be introduced through the boiler on the side near the check-valve, as shown in Fig. 3, or may be passed through the top of the shell in the more ordinary manner. As shown in Fig. 3, the two funnels are arranged so that one is on each side of the dry-pipe *f*, the funnels connecting with the single upflow-pipe. Where the dry-pipe is not placed centrally and longitudinally of the boiler a single funnel may be used.

In Figs. 4 and 5 a different construction and arrangement of funnel is shown for special application to locomotive-boilers, to which, from the inaccessibility of their interiors and cramped space, the introduction of the ordinary funnel might be objectionable. A bushing, *d'''*, is screwed into the tube-sheet, and into this the pipe end of the funnel (here lettered C′) is screwed, the upflow-pipe being tapped into the other end of the bushing. The hole in the tube-sheet made to receive the bushing is large enough to admit the funnel end. A similar bushing, d^4, is screwed into the shell of the boiler, and to this the sections of the return-pipe E are connected. In Fig. 6 the funnel is shown dispensed with, the receiving end of the pipe being represented by C″.

The application of the apparatus to a marine boiler, as represented in Figs. 7 and 8, will be sufficiently well understood therefrom and from the preceding description, and need not be further explained.

Fig. 9 shows the apparatus placed at the back of a stationary boiler when the low ceiling of the room would not allow of its being placed on top.

Fig. 10 shows the reservoir placed on a side wall of the boiler, as in cases where the location of the steam-drum, man-hole, &c., would prevent its being applied in the ordinary manner.

Fig. 11 indicates the connection of the return-pipe to a mud-drum, which under some circumstances may be advantageous.

The apparatus may be attached in many ways in addition to those represented in the respective figures, and which might be suggested by the construction of the boiler, its arrangement in the room, &c. Thus, for instance, the mode of attachment of the apparatus to an ordinary flue, cylinder, or upright boiler would be governed by the exigencies of the case. As upright boilers vary greatly in the disposition of their internal parts, no general rule can be laid down for the application of the apparatus to them, and special directions might be necessary in each case, while the general principle of the invention and the substantial construction of its parts would be adhered to. The difficulty found in keeping upright boilers clean and of obtaining access thereto renders the use of the apparatus therewith specially important.

Fig. 12 shows a modification in the shape of the reservoir. As here represented, the upper part is cylindrical, while the lower connecting portion is funnel-shaped, the blow-off pipe joining with the bottom of the funnel.

Fig. 13 shows a further modification, the lower part of the reservoir being of spherical construction.

The operation of the apparatus is as follows: As soon as the water in the boiler becomes heated, currents are established. These currents are formed by the hotter, and therefore lighter, water flowing upward and away from the source of the greatest heat, while the colder and denser water flows to the source of heat to replace the other and in its turn become heated. In all boilers where fire is applied at one end the currents established will be upward and from the fire on the surface, and downward and toward the fire in the lower part of the boiler. Communication being established between the boiler A and reservoir B, the water forced into said reservoir is subject to a pressure common to both it and the boiler-water, and as long as its density and specific gravity remain the same as those of the water in the boiler, (consequent upon equal temperature,) there will be an equilibrium established in the boiler, reservoir, and pipes, and no circulatory motion through the same will occur; but as a body of water removed from actual contact with the greater body of heated water in the boiler, the reservoir-water begins to cool, and, gathering density in cooling, overcomes the equilibrium established and commences to descend the return-pipe. At the same moment the funnel admits an inflowing upward column of water, which seeks to again establish the former equal condition, and the circulation once begun will continue indefinitely. As the impurities are thrown to the water-level by ebullition they are received within the funnel and carried below the water-level, up the pipe D, and deposited in the reservoir B. The fall of the

temperature of the water holding the impurities in suspension causes them to be precipitated to the bottom of the reservoir, and the water returned to the boiler is practically clear. The circulation continuing, all the water of the boiler ultimately passes through the reservoir, where it is kept still and free from the agitating currents in the boiler. The most favorable conditions are therefore insured for the precipitation and deposit of sediment. The sediment, once deposited in the reservoir, can be removed through the blow-pipe as often as necessary.

In order to prevent agitation of the water within the reservoir by obstructing the current of water through the same, I provide the deflector G, before referred to, the deflector serving to check the flow of water, insuring a still place for the precipitation of sediment, and inducing the downward movement thereof.

It is well known that deposits and incrustations seek the quietest part of a boiler, and my invention provides a quiet place for their accumulation outside of the boiler itself and removed from heat and its agitating effects, whence they can be readily removed as fast as they accumulate without loss of water.

With the shape of the reservoir shown in the Reissued Patent No. 7,916, before referred to, the sediment being spread over a wide area in the reservoir, it cannot be as readily and effectually removed as with the use of a reservoir constructed in accordance with my invention.

It is apparent that a spherical or equivalent shape of the lower part of the reservoir permits of the accumulation of sediment within a small area, and that it is readily discharged through the connecting lower pipe without loss of water. A spherical reservoir is also much more compact, admits of greater pressure, and is much cheaper than the one shown in the reissued patent.

The addition to the reservoir of the deflector is also an important improvement. In order to allow air to pass from one side of the deflector to the other, I have found it necessary to perforate the upper part thereof. One small hole is sufficient. In the absence of such provision the reservoir in operation becomes air-bound.

Another advantage in the use of the deflector is, that the length of the course taken by the water through the reservoir is increased, and this, together with the retardation of the water by the deflector, gives greater time for the precipitation of sediment than would be allowed were a lively and direct current through the reservoir permitted. The deflector also, as before stated, directs the course of the sediment downward, and the sediment, once having been given this direction, will not again take an ascending course.

Another advantage of this invention over that described in the reissued patent consists in the placing of the mouth of the funnel so as to face the firing end of the boiler, whereby to obstruct and receive the surface current flowing from the said end of the boiler. The current in the present invention is direct and unopposed, whereas with the apparatus described in the reissued patent there are two opposing currents.

Having described my invention, I claim—

1. In a sediment-collector for steam-boilers, a spherical reservoir or its equivalent having a base-piece and a blow-off pipe connected with the lower part of said reservoir, combined with a funnel suspended within the boiler with its mouth in the line of water and steam, an upflow-pipe attached to said funnel and to the reservoir, and a return-pipe united to the reservoir and reaching into the boiler to a plane below that in which the lower edge of the funnel is placed, substantially as and for the purposes set forth.

2. In a sediment-collector for steam-boilers, the combination, with a spherical reservoir or its equivalent provided with an internal deflector and with a blow-off pipe, of a funnel suspended within the boiler with its mouth in the line of water and steam and facing the firing end of the boiler, and upflow and return pipes and suitable valves, all arranged substantially as and for the purposes set forth.

3. As an element in a sediment-collector or boiler-cleaner, a reservoir provided with a deflector perforated at its upper part to prevent air-binding, as specified.

4. In a sediment-collecting apparatus for steam-boilers, the combination, with the boiler tube-sheet and an externally and internally threaded bushing, of a sediment-receiving funnel or pipe and an upflow-pipe, each screwed into an end of the bushing at opposite sides of the tube-sheet, substantially as and for the purposes set forth.

In testimony whereof I have hereunto set my hand this 14th day of June, 1882.

JAMES F. HOTCHKISS.

Witnesses:
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GEO. P. JACOBS.