E. REYNOLDS.

Feed-Water Heater for Steam-Boilers.

No. 223,816. Patented Jan. 27, 1880.

Fig. 1

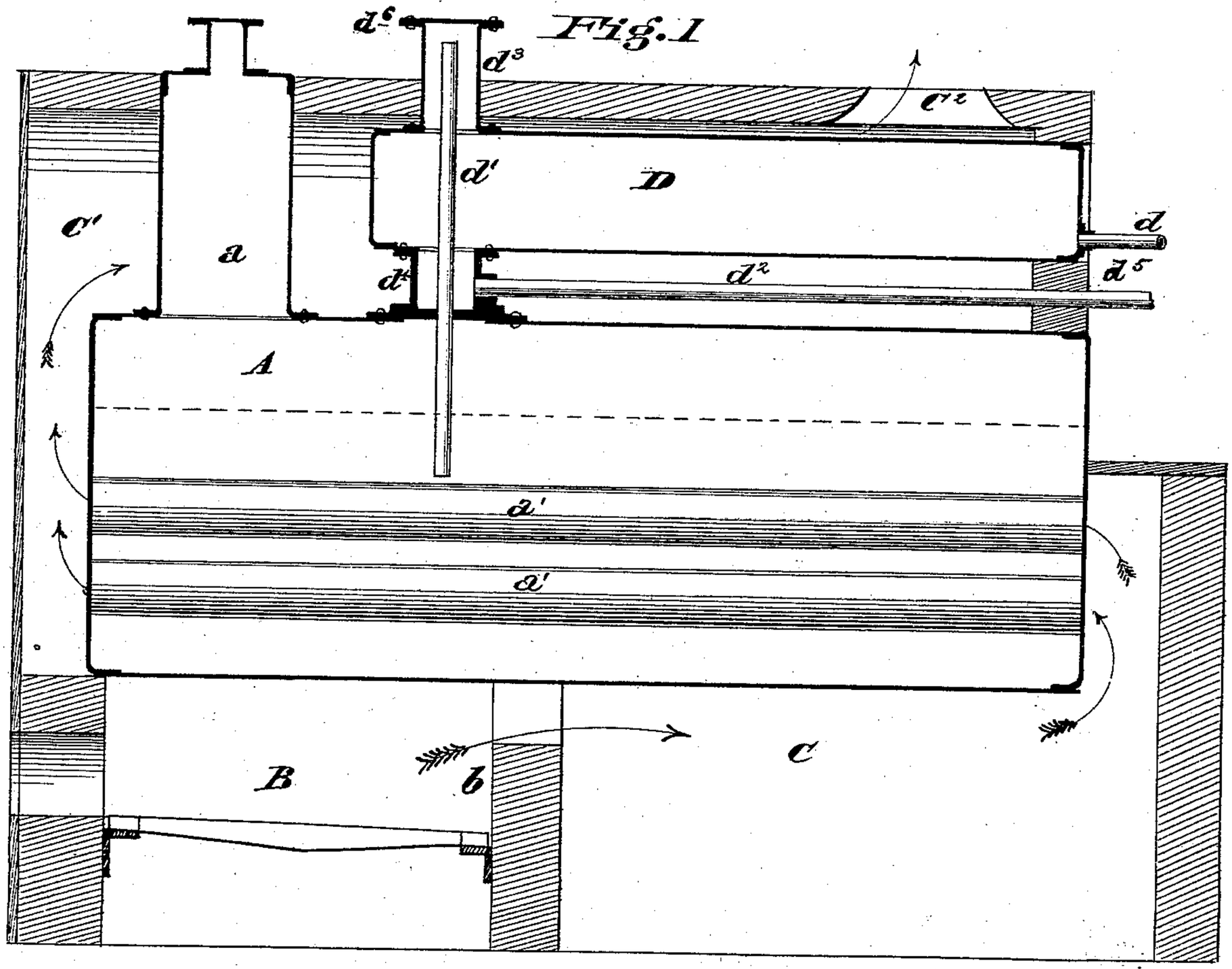
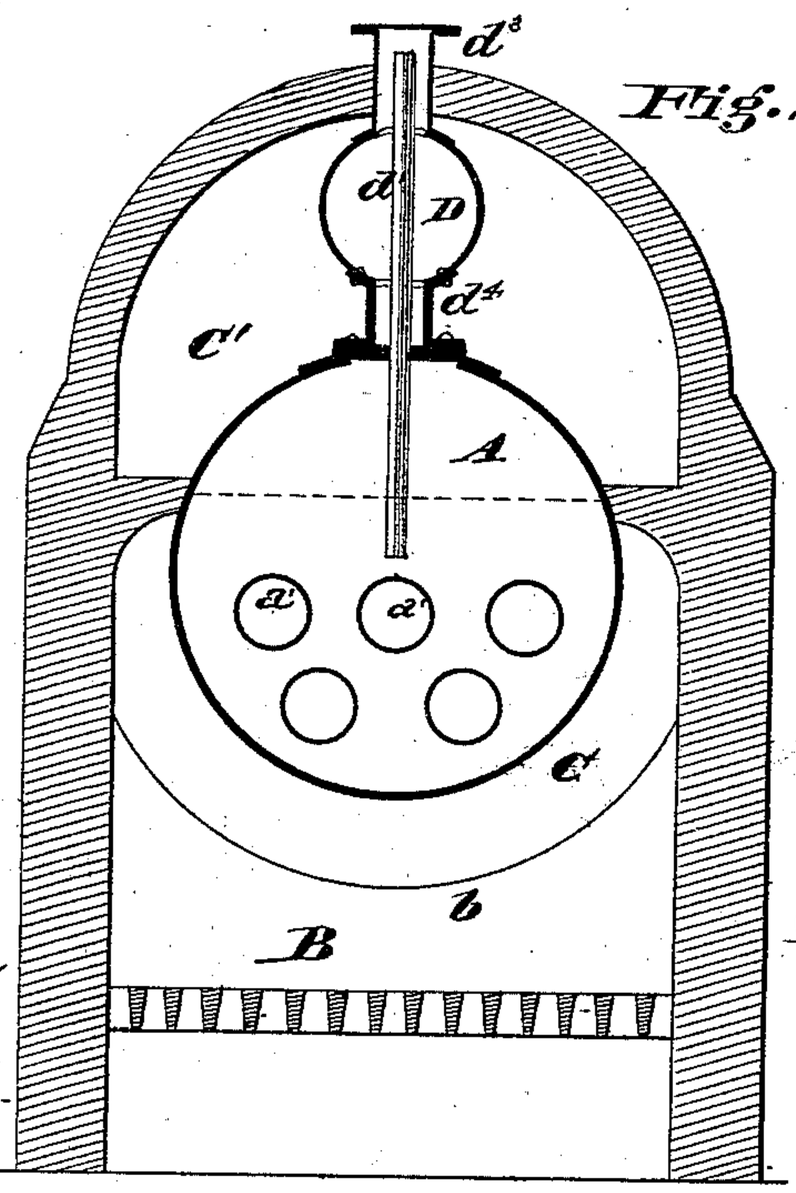


Fig. 2



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EDWIN REYNOLDS, OF MILWAUKEE, WISCONSIN.

FEED-WATER HEATER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 223,816, dated January 27, 1880.

Application filed November 28, 1879.

To all whom it may concern:

Be it known that I, EDWIN REYNOLDS, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Feed-Water Heaters for Steam-Boilers, of which the following is a specification.

My invention relates to that class of feed-water heaters for steam-boilers where the heat of the waste gases of combustion are utilized to elevate the temperature of the water before it is forced into the boiler; and it consists in so constructing the heater and feed-pipe leading from the heater to the boiler that all or nearly all of the organic matter in the feed-water is precipitated into the mud-well or bottom of the heater and blown out or removed through the hand-hole from time to time, thus preventing the usual accumulation of scales on the tubes or flues and the accumulation of mud on the bottom of the boiler. At the same time the temperature of the feed-water is nearly, if not quite, equal to that of the steam and water contained in the boiler.

All feed-water heaters heretofore constructed for the purification of the water and removal of the organic matter have relied entirely upon the heat of the exhaust-steam from an engine to produce the separation from the water of the soluble salts and precipitation of the earthy matter, and all feed-water heaters heretofore designed to utilize the heat resident in the waste furnace-gases as they pass to the chimney have had no provision for the retention of the organic matter, which might be precipitated in the heater, and for the removal of the same from time to time.

It is well known that the precipitation of organic matter in the feed-water is more rapid and more complete the higher the temperature of the water, and that the precipitation is more complete the slower the rate of transfer of water through the heater, or, what is the same thing, the separation of the organic matter is more or less complete according to the time the water is acted upon by the heat.

In my construction I make the heater much larger than usual and set it directly above the boiler. The rear end of the heater is supported by a cast-iron saddle, and the forward end of the heater is supported on the mud-well, which in turn is bolted to a cast-iron saddle set on the shell of the boiler. To the lower part of the mud-well I connect a horizontal pipe running back over the top of the boiler, and provided at any convenient point with a valve or cock, to clear the mud-well whenever necessary. Opposite to the mud-well, upon the upper side of the heater, I attach a short stand-pipe, of wrought or cast iron, furnished with a flange and removable cap. This stand-pipe is made of sufficient length to pass entirely through the brick arch over the boiler, for convenience in the removal of the cap, and clearing the mud-well of any obstructions that might lodge therein and resist the action of the blow-off. The feed-pipe, through which the water from the heater passes to the boiler, is set in the center of the mud-well and rises nearly to the cap on the stand-pipe, only sufficient room being allowed between the end of the pipe and the cap to furnish a free water-way. The feed-pipe descends into the boiler and is terminated a few inches below the water-line.

In the accompanying drawings, Figure 1 is a sectional elevation of a steam-boiler and brick setting, showing my improved heater and manner of connecting it with the boiler; and Fig. 2 is a view, in cross-section, of a boiler and setting on the line of axis of descending feed-pipe.

Similar letters of reference indicate corresponding parts.

A is an ordinary return-flue boiler set in brick-work, and provided with the usual fire-chamber B, bridge-wall *b*, and gas-chamber or flue C behind the bridge-wall. C′ is a flue over the top of the boiler, connected, by means of the uptake C^2, with the chimney. *a* is the ordinary steam-dome of a single boiler, and *a′* *a′* are the return-flues. D is the feed-water heater, which, in this instance, consists of a long cylinder of wrought-iron set horizontally over the boiler on the saddle d^5 and mud-well d^4. *d* is the feed-pipe through which the cold water is pumped into the heater. *d′* is the feed-pipe descending into the boiler, and d^2 the blow-off pipe tapped into the side of the mud-well. d^3 is the stand-pipe, provided with the removable cap d^6.

As shown more clearly in Fig. 2, the heater

is entirely surrounded by the hot gas as it passes to the chimney, and the quantity of water contained in the heater is relatively large when compared with the quantity of water in the boiler.

It will be observed that the heater is always full of water under a pressure equal to that of the steam in the boiler, and that evaporation cannot occur so long as the lower end of the descending feed-pipe is below the surface of water in the boiler, when, if the water in the heater has the temperature of the steam and water in the boiler, a very limited evaporation would occur, as the steam passing up the feed-pipe from the boiler would fill the small space between the end of the feed-pipe d' and the stand-pipe and check vaporization.

The construction of the stand-pipe and feed-pipe d' is such that the heater cannot be emptied of water so long as the level of water in the boiler is slightly above the lower end of the feed-pipe.

I am aware that the introduction of a feed-water heater into the final flue connecting the furnace with the uptake or chimney is not new, and this I do not claim.

Having described my invention, what I claim, is—

1. In feed-water heaters for utilizing the heat in the waste furnace-gases as they pass to the chimney, the combination, with the boiler A, of the heater D, arranged above said boiler, and having at or near its front end a depressed mud-well, d^4, a horizontal pipe, d^2, extending from the mud-well rearwardly over the boiler, a pipe, d, connecting with the heater for supplying the same with feed-water, and a pipe extending from the heater to the boiler, all constructed and arranged substantially as and for the purpose described.

2. In feed-water heaters for utilizing the heat in the waste furnace-gases as they pass to the chimney, the cylindrical heater D, in combination with the stand-pipe d^3, with removable cap d^6, and feed-pipe d', for the purpose and as described.

3. In feed-water heaters for utilizing the heat in the waste furnace-gases as they pass to the chimney, the cylindrical heater D, in combination with the feed-pipe d, feed-pipe d', blow-off pipe d^2, stand-pipe d^3, and mud-well d^4, for the purpose and as described.

In testimony whereof I have hereunto set my hand this 20th day of November, 1879.

EDWIN REYNOLDS.

Witnesses:

OTTO PUPIKOFER,

LOU. R. HURD.