

No. 626,526.

Patented June 6, 1899.

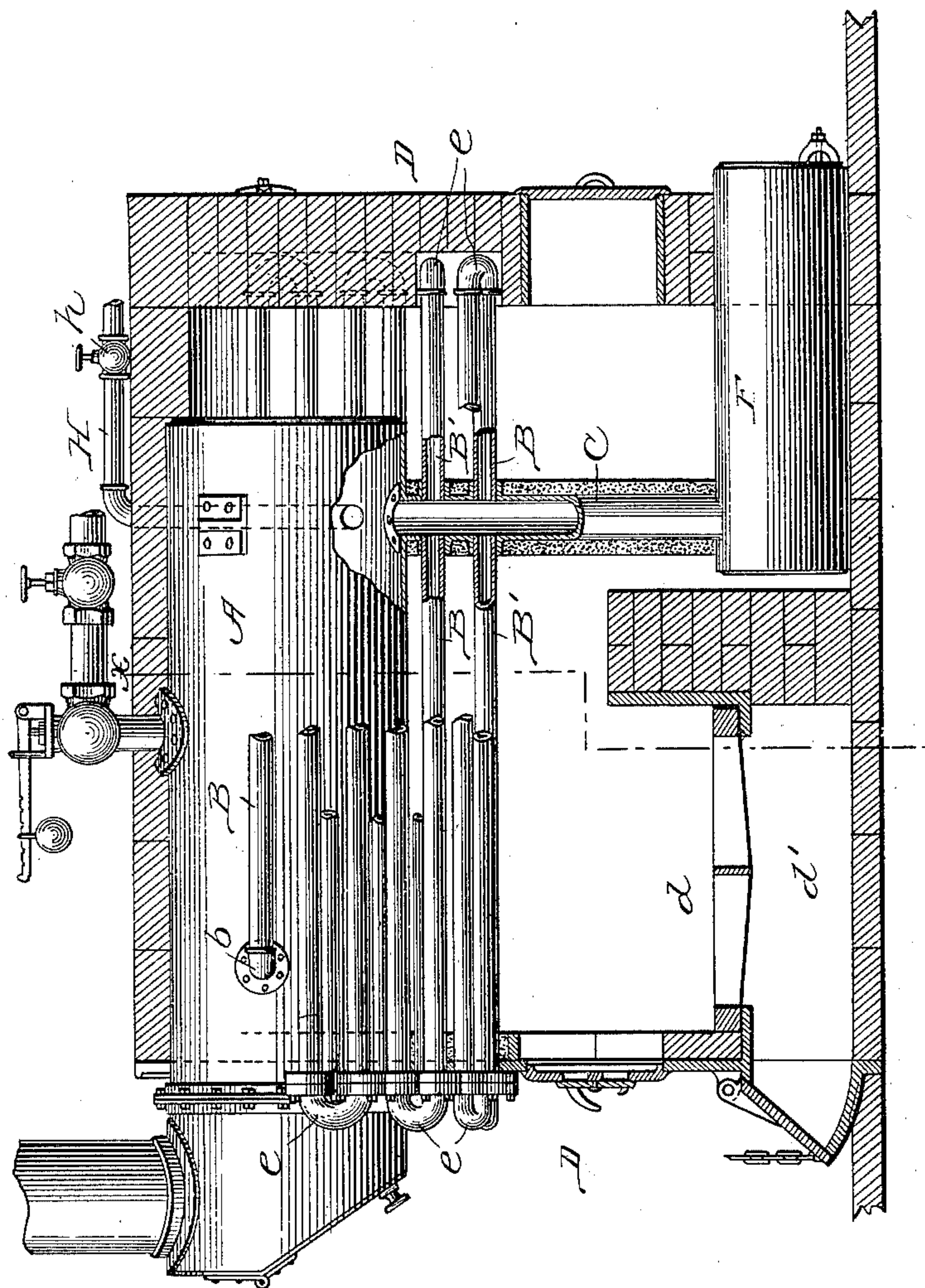
P. W. BURKE.  
STEAM BOILER.

(Application filed Dec. 22, 1898.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



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2 Sheets—Sheet 2.

Fig. 3.

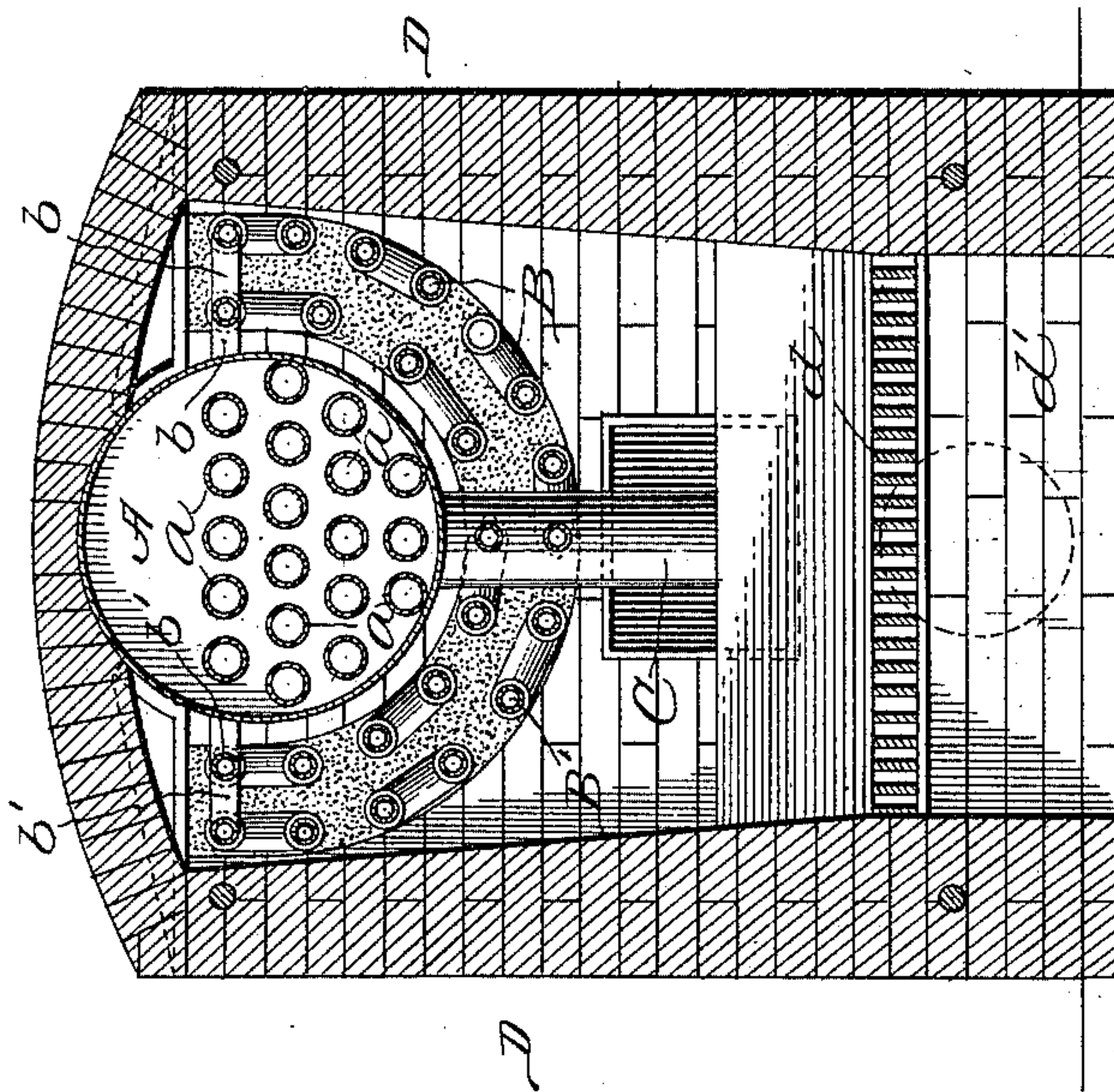
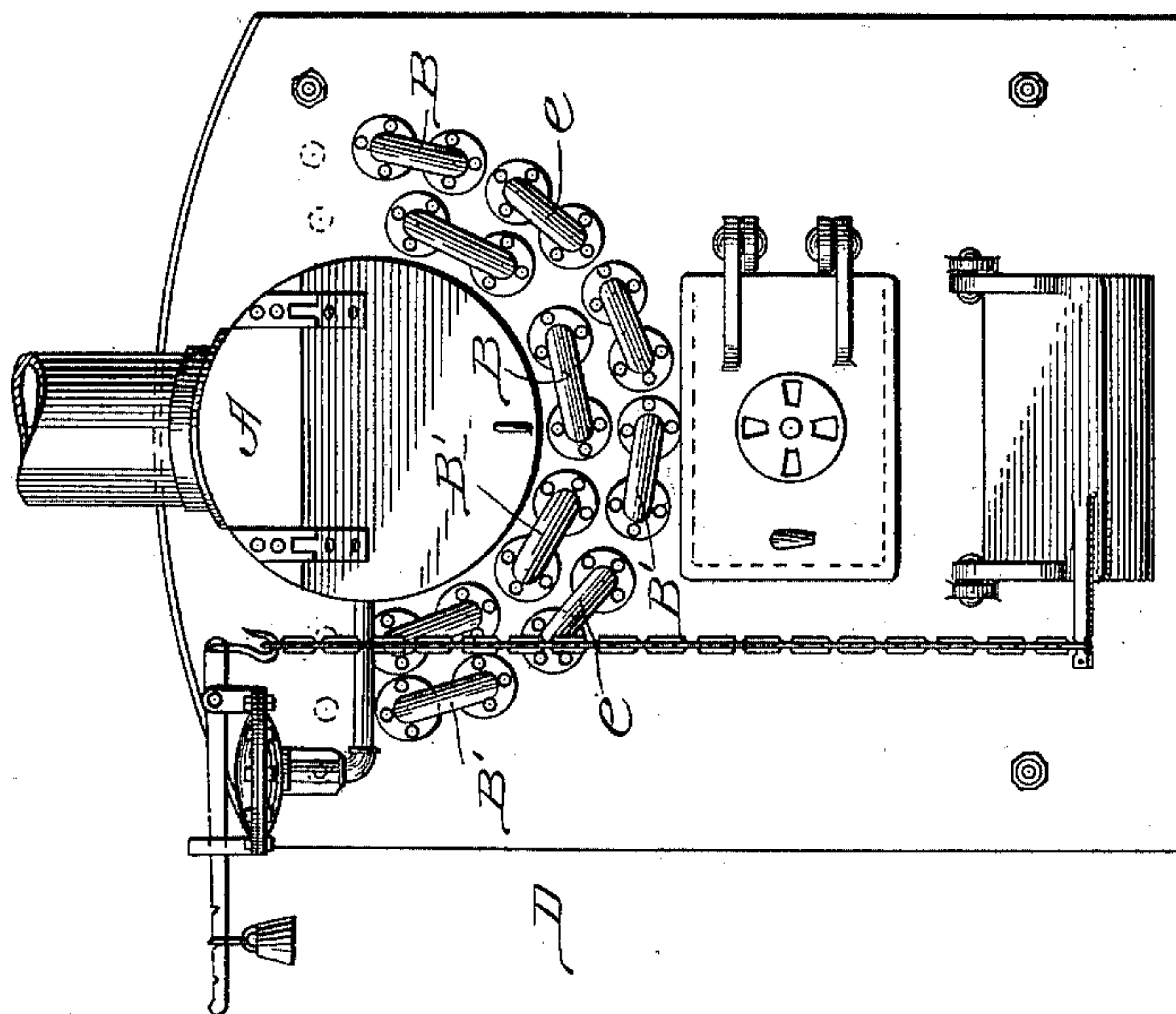


Fig. 2.



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# UNITED STATES PATENT OFFICE.

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## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 626,526, dated June 6, 1899.

Application filed December 22, 1898. Serial No. 700,035. (No model.)

*To all whom it may concern:*

Be it known that I, PERCY W. BURKE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a combined fire-flue and water-tube circulating-boiler.

The object of my invention is to provide a simple and effective construction of steam-boiler by means of which the steaming capacity of the ordinary flue-boiler is greatly increased, a rapid circulation of water is secured, and all the impurities contained in the water are delivered down into a mud-drum below the circulating system, so that they will be readily deposited as sedimentary matter and left undisturbed by passing currents. These advantageous results are secured by a simplified construction and arrangement of water-circulating tubes having return-bends and connecting near one end on each side of a flue-boiler below the water-line and directly with a water-leg which leads from the bottom and opposite end of the boiler down into a mud-drum, as will now be more particularly described by reference to the accompanying drawings, in which—

Figure 1 represents a side elevation partly in section and with part of the tubes broken away. Fig. 2 represents a front end elevation. Fig. 3 represents a transverse vertical section on line *x x*, Fig. 1.

The fire-tube or flue boiler A, having tubes *a*, is set in the furnace-walls D in the usual manner, and on each side of the same within the walls are arranged and connected my circulating water-tubes B and B'. Near the rear end of the boiler is provided the bottom opening *a'*, at which is connected the mud-drum leg C, extending downward and connecting with the mud-drum F at the rear of the furnace. The furnace D is constructed with the usual grate *d*, ash-pit *d'*, and bridge-wall E.

I preferably arrange and connect two sets of circulating coils or serpentines on each side of the boiler, and they connect with the interior of the boiler on each side below the wa-

ter-line by means of the short horizontal tubes *b* and *b'*, as shown in Fig. 3.

The coils are constructed of lap-welded tubes, connected together at their ends by the malleable-iron return-bends *e*. These return-bends *e* rest in a suitable channel in the rear wall, and the channel is packed with an asbestos-cement or a fire-resisting mortar, as indicated in Figs. 1 and 3. The sets of coils marked B, which are on the right-hand side of the boiler A, connect at both the front and rear of the leg C, and the left-hand set of coils (marked B') also connect at both the front and rear of said water-leg, as shown in Fig. 1. Both sets of coils on each side connect at the top with the water-tubes *b b'*, opening into the front of the boiler below the water-line. It is not essential that the sets of coils connect at the front and rear of the leg C, but they should connect on opposite sides thereof. By this construction cross-currents are produced which arrest the sedimentary matter and favor its deposit into the mud-drum. The feed-water pipe H, having a valve *h*, connects with the tubular boiler A, preferably near its rear end, and discharges just above the opening of the water-legs C, as shown in Fig. 1. The feed-water being heavier than the water in the boiler, it flows down into the leg, helping the circulation.

The mud-drum F may be of the usual construction and provided in practice with a blow-off pipe (not here shown) leading into the ash-pit. Since the feed-water is delivered into the main boiler A and the water-tubes B and B' connect directly with the mud-drum leg C just below the boiler A, there is no circulation of water in the mud-drum, whereby the deposit of sedimentary matter in the latter is very much favored.

Water being supplied to the boiler A, it will fill the mud-drum, the leg C, and the circulating-pipes B B' and rise to the desired height above the tubes *a* and the pipe connections *b b'* in the boiler A. The furnace being properly fired, the water in the tubes B B' directly above the grate will be heated first and caused to circulate through the tubes and discharge into boiler A through the lateral connecting-pipes *b b'*, thus establishing a circulation through boiler A from the front thereof to the rear and down into the mud-drum



leg, from which it again passes into the circulating-tubes B B'. As the water is heated the impurities therein become heavier than the hot water and will readily settle through the leg C into the mud-drum F. Here the impurities are readily deposited, as they are undisturbed by any circulating currents. While the impurities settle by gravity through the leg C, the purer water continues to flow into and through the tubes B B' and thence through the boiler A, carrying along other impurities to the leg C, where the precipitation and deposit of the heavier matters, which would tend to form scale, continuously go on, as above described. At suitable intervals the deposited matter is blown off from the mud-drum.

The construction and arrangement of parts in my invention are distinguished from others heretofore proposed generally by simplicity and cheapness without impairing efficiency, and particularly by the provision of return-bends in the circulating-pipes and connection of the latter directly with the mud-drum leg, whereby the opposing currents produced will arrest sedimentary matter and favor its deposit down through the leg into the mud-drum.

My circulating-coils may be attached to any tubular boiler and to the mud-drum leg leading down to the mud-drum, as shown, at a small expense, and thereby increase the heating-surface of the boiler about forty-five per cent., also creating a rapid circulation and delivering all impurities into the mud-drum, thereby keeping the boiler free from scale and other impurities. The steaming capacity of the boiler will be much increased, and therefore forced firing and resulting smoke will be done away with.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a fire-tube or flue

steam-boiler, of a mud-drum below the same, a mud-drum leg connecting the boiler with said drum, and water-circulating pipes having return-bends connecting near the top at one end of the boiler, and directly with said leg below the boiler, whereby the heavy impurities will be deposited in the mud-drum and left undisturbed by the water circulated above the same, substantially as described.

2. The combination with a fire-tube or flue steam-boiler, of a mud-drum below the same, a mud-drum leg connecting the boiler with said drum, water-circulating pipes having return-bends connecting near the top, at one end of the boiler, and directly with said leg on opposite sides, below the boiler, and a feed-water pipe connecting with said flue-boiler and discharging near the opening of the mud-drum leg, whereby the heavy impurities will be deposited in the mud-drum and left undisturbed by the water circulated above the same, substantially as described.

3. The combination with the fire-tube or flue steam-boiler, of a mud-drum below the boiler, the mud-drum leg C, connecting the bottom of the boiler at the rear with said drum, one or more water-circulating coils as B, B', composed of tubes having return-bends, connecting at the upper end with the front end directly of the boiler, and at the lower end with said leg C on opposite sides, and a feed-water pipe connecting directly with said flue-boiler, whereby the impurities will be carried by the circulating currents and deposited in the mud-drum and left undisturbed by the currents of water circulated above, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

PERCY W. BURKE.

Witnesses:

WILLIAM HUNT,  
CHARLES MCAULIFFE.