

No. 634,978.

Patented Oct. 17, 1899.

M. P. BOSS.
WATER TUBE BOILER.

(Application filed Jan. 17, 1899.)

(No Model.)

Fig. 1.

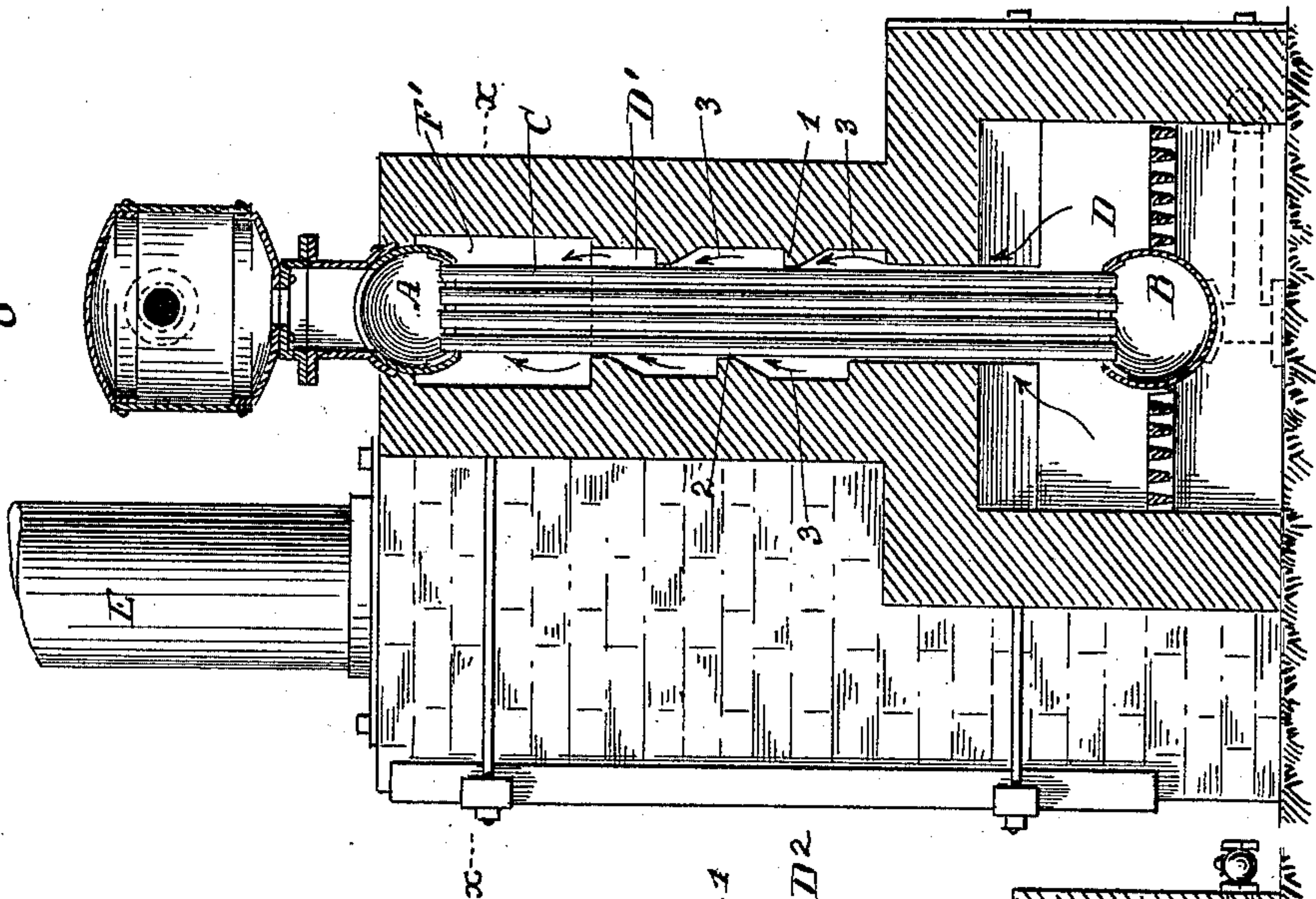


Fig. 2.

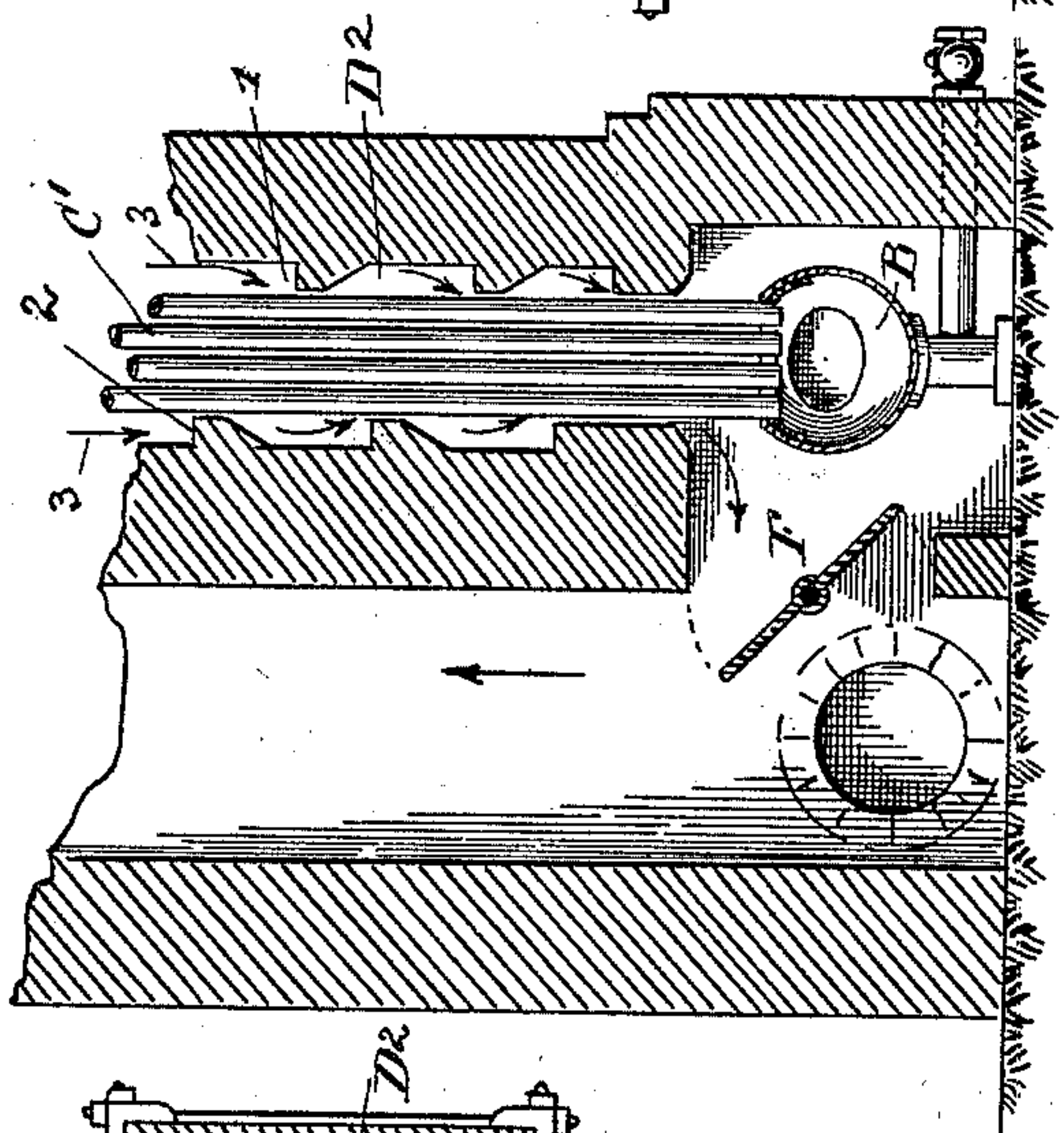
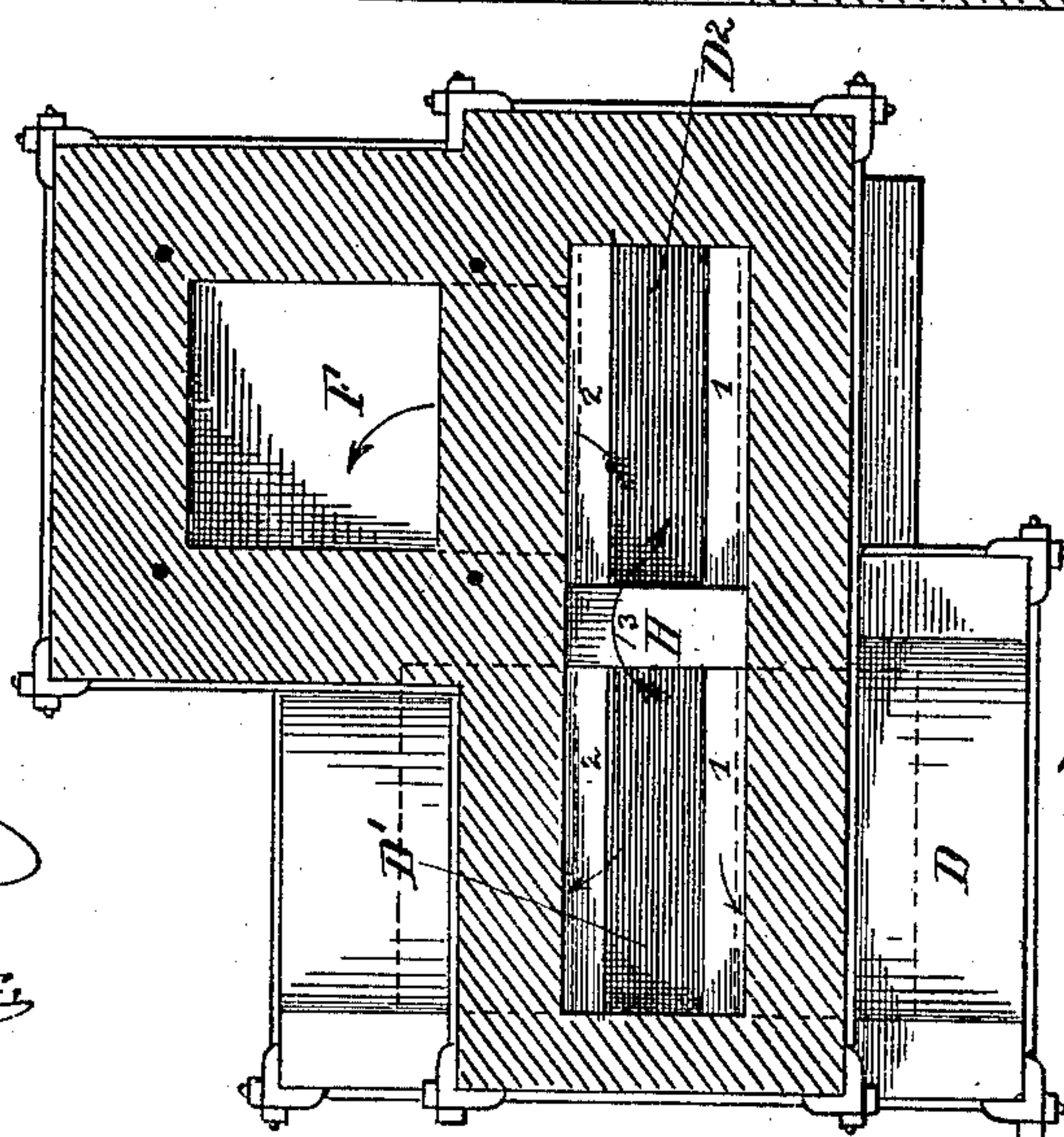


Fig. 3.



Witnesses.

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UNITED STATES PATENT OFFICE.

MARTIN P. BOSS, OF SAN FRANCISCO, CALIFORNIA.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 634,978, dated October 17, 1899.

Application filed January 17, 1899. Serial No. 702,428. (No model.)

To all whom it may concern:

Be it known that I, MARTIN P. BOSS, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Water-Tube Boilers; and I do hereby declare that the following is a full, clear, and exact description thereof.

The present invention relates more especially to the construction of the flues of water-tube boilers, and more particularly to that character of boilers fully shown and described in the application for Letters Patent filed by me in the United States Patent Office on the 26th day of September, 1898, which application bears Serial No. 691,932.

In my aforesaid application for Letters Patent the flues within which the water-tubes are arranged are so constructed as to permit the flame to ascend and descend without obstruction, and as a consequence I have ascertained by practical working that the circulatory water does not receive the full benefit of the heat of the flame or products of combustion surrounding or enveloping the water-tubes.

The object of the present invention is to create a saving in fuel required to properly heat the water circulating through the water tubes and cylinders of the boiler, while at the same time obtaining the maximum efficiency of the hot products of combustion carried through the flues; and it consists in so arranging the flues that the flame or products of combustion will be somewhat retarded during travel from the fire-chamber to the chimney and be driven against the water-tubes throughout the entire length thereof. To this end the flue-walls are made zigzag or staggered, so that the flame and hot products of combustion will be arrested as carried there-through and deflected against the water-tubes arranged therein. By thus impeding the flames and hot products of combustion during travel the heat is confined for a longer period within the flues, and the same is better directed against the water-tubes grouped or nestled therein, thus acting as though the heating-surfaces of the water-circulating pipes were increased.

In order to comprehend the invention, reference must be had to the accompanying

sheet of drawings, forming a part of this application, wherein—

Figure 1 is a vertical cross-sectional view of the boiler, the same being taken through the fire-chamber and first series of tubes. Fig. 2 is a similar view of boiler, taken through the last series of flues and the base of the chimney; and Fig. 3 is a longitudinal cross-sectional top plan view taken on line xx , Fig. 1.

In the drawings the letters A and B are the two cylinders connected by the separated series or groups of tubes C C'.

D is the fire-chamber, and F the base of the chimney.

The group of tubes C and C', it will be noticed, are separated by a wall H, which forms the flues D' D², within which the groups of tubes C C' are located. At the upper portion these flues are enlarged or widened out in order to provide or form a flue F in proximity to the upper cylinder B, said widened flue extending across the two series or groups of tubes, thus providing ample capacity for the hot currents to pass from series C to series C'.

The foregoing parts are the same in arrangement and operation as the corresponding parts set forth and described in my aforesaid application, Serial No. 691,932, to which reference is hereto made. Hence detailed description thereof is deemed unnecessary in the present application.

For the purpose of retarding the travel of the flame and hot products of combustion through the water-tube flues D' D² in order to confine the same and drive it during travel directly against the group or series of tubes C C', located therein, each flue is constructed with the inwardly-projecting shelves or shoulders 1 2, which are so arranged as to alternate from side to side of the flue. The clearance or passage-way thus left between the water-tubes and the inner wall of the flues is of such a character that the flame or hot products of combustion will not travel in a straight line, but be deflected from side to side during travel thereof through the flues within which the water-tubes are situated. This construction of the walls of the flues D' D² causes the flame or hot products of combustion to travel in a zigzag or staggered direc-

tion and during travel to be thrown directly against the water-tubes situated in the flues, thus subjecting the tubes to the full effect of the flames or products of combustion during travel from the fire-chamber to the chimney and permitting the maximum efficiency of heat to be obtained by such retardation of the flame or hot products of combustion within the flues. Where the flame or hot products of combustion simply envelop the water-tubes and flow or travel through the flues uninterrupted, much heat is lost to the circulating water within the tubes, which is recovered or conserved by constructing the flues as herein described, as the flame or hot products of combustion are forced to flow in a zigzag, staggered, or serpentine pathway and during the entire travel constantly thrown against the water-tubes situated within the flues. Consequently with the same amount of fuel better results are obtained by this construction of the flues than where the tubes are simply enveloped by the flame or hot products of combustion, hence permitting the boiler to be worked more economically. This feature is of importance in this class of mechanics and will be highly appreciated by users in such portions of the country where fuel is exceedingly expensive or high.

In operation the travel of the flame or hot products of combustion from the fire-chamber D to the chimney E is the same as that described in my aforesaid pending application, Serial No. 691,932, excepting that the same travels through the flues in a zigzag or staggered direction, as indicated by arrow 3—*i. e.*, the same is first drawn against shoulder or projection 1, thence deflected against shoulder 2, thence upward against second shoulder or projection 1, and so on upward through the first flue C, being drawn across through flue F' and downward through flue C' toward the chimney, during its downward travel alternately impinging against shoulders or projections 2 1.

While the travel of the flame or hot products of combustion is retarded, the shoulders or projections 1 2 are so arranged proportionate to the length of the flues C C' as not to interfere with the draft of the chimney.

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

1. A water-tube boiler having a plurality of series groups or nests of water-tubes connecting two water-cylinders, said series groups or

nests being separated and their spaces in which they are confined forming flues which communicate successively to give alternate currents in opposite directions, each flue being provided with shoulders on its opposite sides extending transversely of and substantially into contact with said water-tubes, the shoulders on one side being staggered relative to the shoulders on the other side, whereby the flame or current of hot products of combustion is caused to travel in a zigzag direction through said water-tubes, substantially as described.

2. In a water-tube boiler of the described character, the combination with the water-tube space, of a partition subdividing the same into distinct flues, a series or group of water-tubes located in each flue, a staggered, zigzag or serpentine passage-way for the flame or hot products of combustion in each water-tube flue extending longitudinally of said water-tubes, and of a connecting-flue for the said water-tube flues.

3. In a water-tube boiler of the described character, of a plurality of water-tube flues, a series or group of water-tubes located in each flue, a series of shoulders or projections secured to the side walls of each flue at points diagonally opposite each other and extending transversely of and substantially into contact with the water-tubes so as to form a zigzag, staggered or serpentine pathway between the water-tubes and the walls of the flues through which the flames or hot products of combustion are conveyed, and of a flue forming connection between the water-tube flues.

4. The combination with a water-tube boiler, of a furnace having a flue within which a group of the boiler-tubes is located, the opposite inner walls of said flue being provided with inwardly-projecting shoulders or ledges extending transversely of and substantially into contact with the water-tubes, those on one wall being staggered with relation to those on the opposite wall, whereby the products of combustion will be caused to follow a zigzag path through said flue, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses, this 31st day of December, 1898.

MARTIN P. BOSS.

Witnesses:

C. F. PATTON,

W. H. ARMSTRONG.