

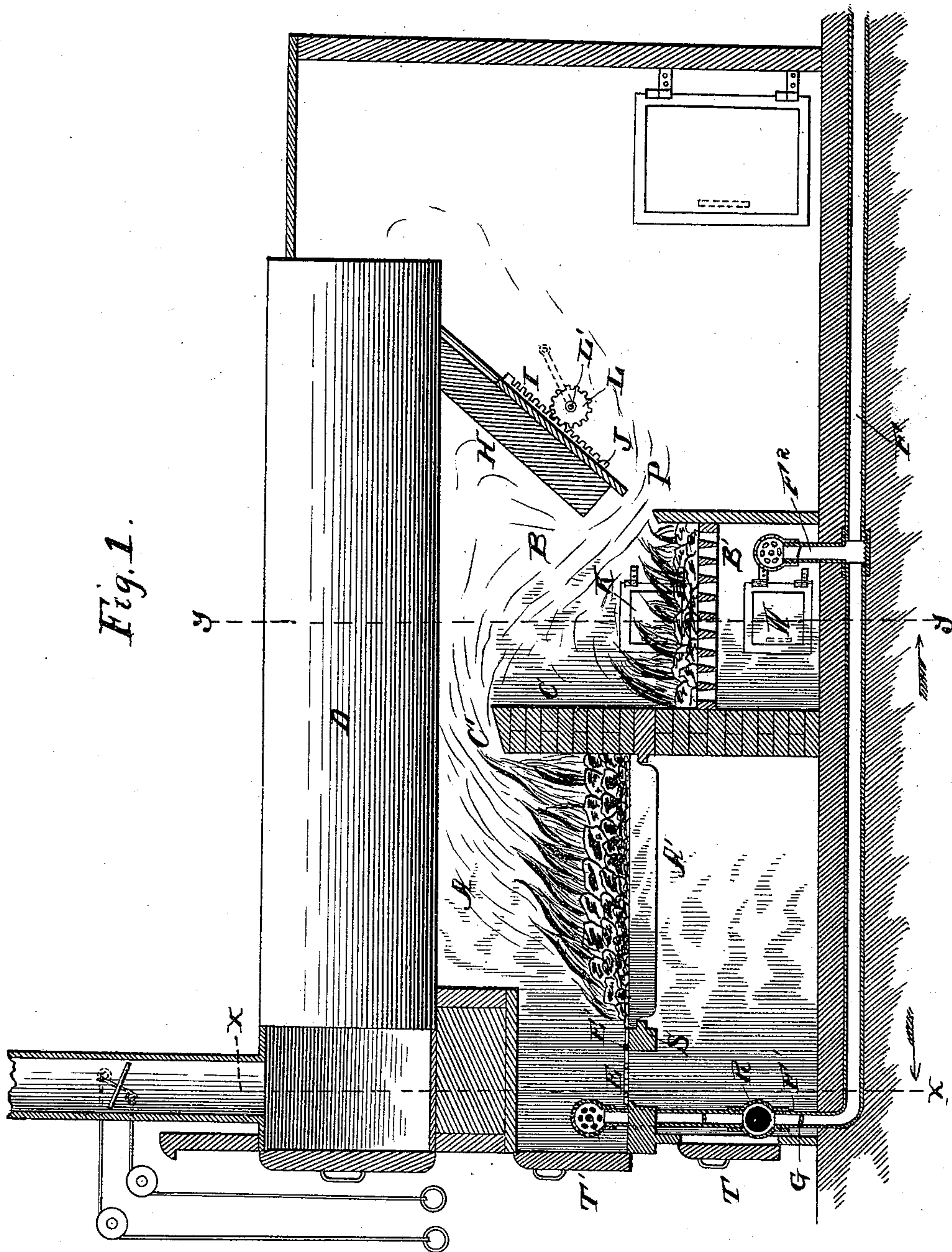
(No Model.)

2 Sheets—Sheet 1.

F. TROWBRIDGE.
STEAM BOILER FURNACE.

No. 451,961.

Patented May 12, 1891.



Witnesses:
J. B. McGinn.
W. D. Burroughs

Inventor:
Frank Trowbridge
By his Attorneys
Edson & Frost

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

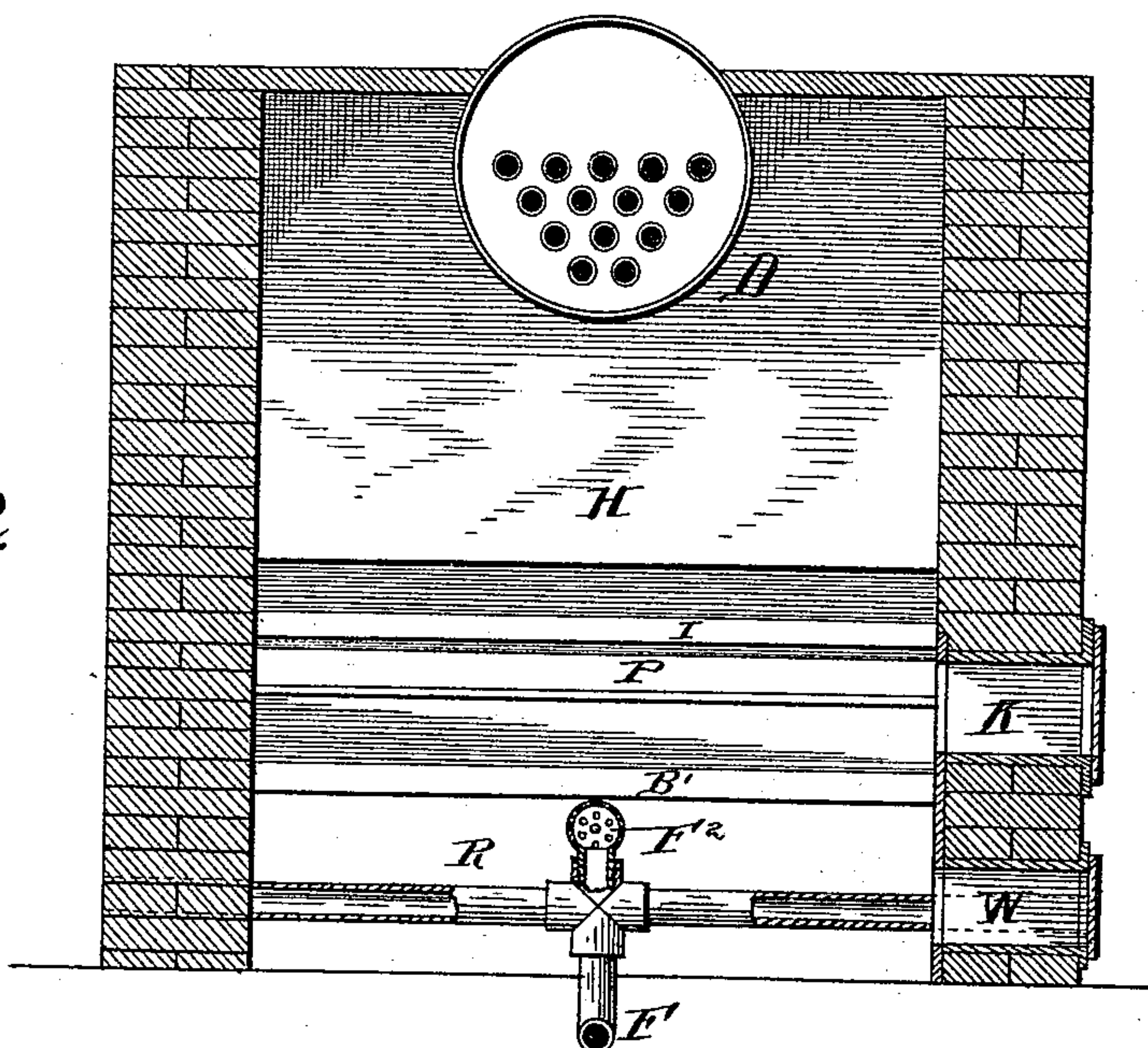
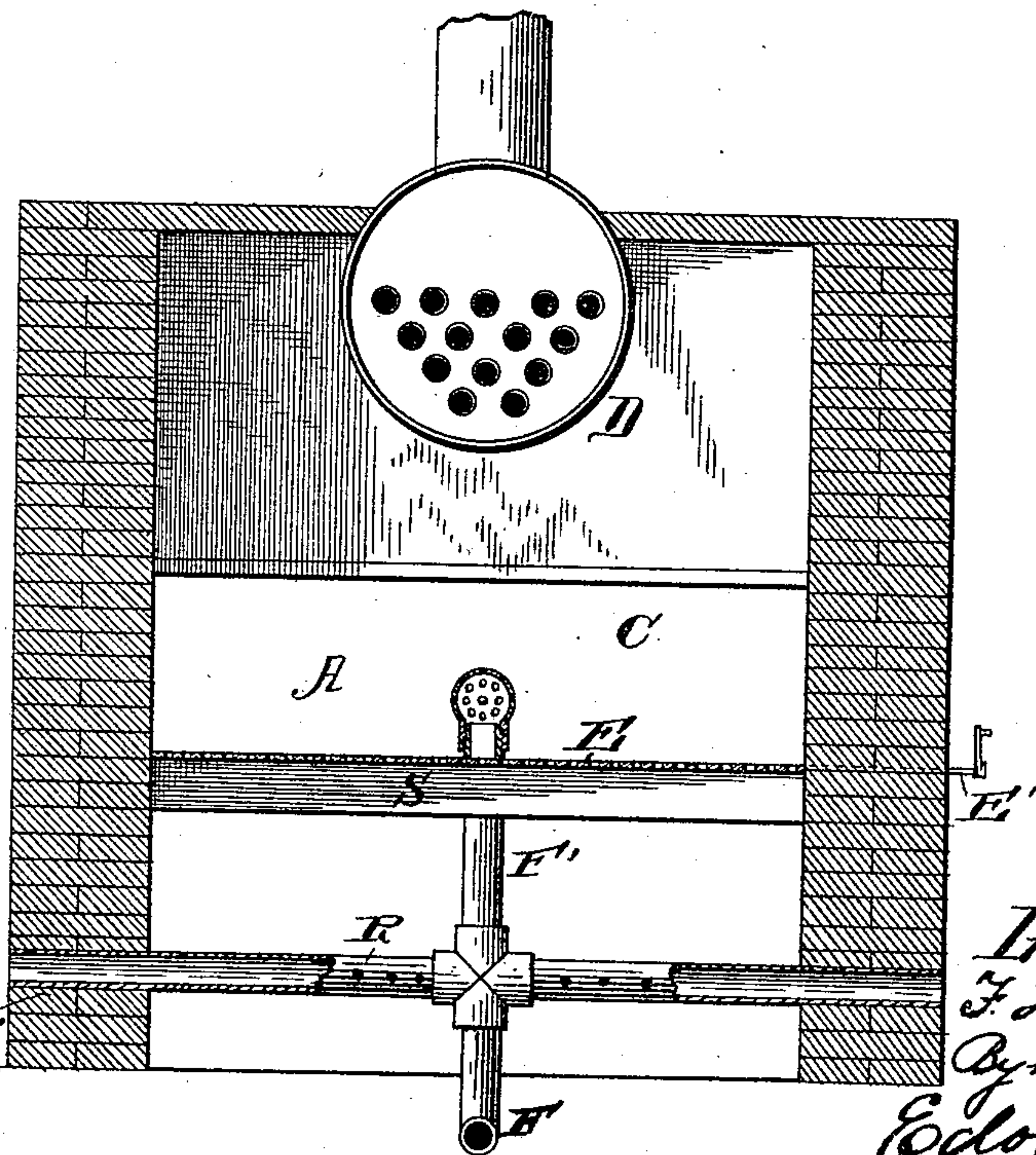


Fig. 3.



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UNITED STATES PATENT OFFICE.

FRANK TROWBRIDGE, OF FOND DU LAC, WISCONSIN, ASSIGNOR OF ONE
HALF TO C. E. DICKINSON, OF SAME PLACE.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 451,961, dated May 12, 1891.

Application filed December 20, 1890. Serial No. 375,301. (No model.)

To all whom it may concern:

Be it known that I, FRANK TROWBRIDGE, a citizen of the United States, residing in Fond du Lac, in the county of Fond du Lac and State of Wisconsin, have invented certain new and useful Improvements in Steam-Boiler Furnaces; 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.

My invention relates to improvements in steam-boiler furnaces; and the object of my invention is to provide a furnace in which the gases generated in the combustion-chamber and the products of combustion from said chamber are consumed and the heat utilized for generation of steam in the boiler instead of being permitted to escape into the outer air, as is the case with ordinary devices now in use; and a further object that I have in view is to simplify and cheapen the construction of the furnace without sacrificing any of the advantages of the same.

With these ends in view my invention resides in the combination, with a primary fire-box or combustion-chamber of a furnace, of an auxiliary superheating-chamber into which the gaseous emanations and smoke from the combustion-chamber are passed, said auxiliary chamber being provided with means for consuming such gases and products of combustion; and it further consists in the primary and auxiliary chambers and devices for admitting air and regulating the quantity thereof to the combustion and superheating chamber.

My invention further resides in the peculiar construction and arrangement of parts, as will be hereinafter more fully described and claimed.

In order that others may understand my invention, I have illustrated the same in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal sectional view through a furnace constructed in accordance with my invention. Fig. 2 is a transverse sectional view on the line $x x$ of Fig. 1, and Fig. 3 is a similar view on the line $y y$ of Fig. 1.

Like letters of reference denote corresponding parts in all the figures of the drawings, referring to which—

A designates the primary combustion-chamber of the furnace, and B the auxiliary superheating-chamber, situated in rear of the primary combustion-chamber and separated therefrom by a bridge-wall C, which rises vertically to a point below the boiler D, but leaving a passage or opening C' for the passage of smoke and other gaseous emanations.

Across the chamber A is arranged a burr S, between which and the bridge-wall C is secured a grate A'. To the front edge of the burr S is pivotally connected a perforated plate E, arranged to close the space between the grate and the front wall of the chamber A, and to said plate E is connected one end of an operating-shaft E', which extends through the side wall of the furnace, and at its outer end is provided with a suitable handle, so that the shaft E' can be rocked and the cut-off or plate E raised or lowered to open or close said space between the front of the grate A' and the front of the furnace.

Access is had to the primary combustion-chamber through two doors T T', the former being situated above the grate A' and the latter below the plane of said grate A'.

Within the auxiliary superheating-chamber B is secured a grate B', and access is had to said chamber through the doors K W, the former door being arranged above and the latter door being below the plane of the grate B'. The rear wall of this auxiliary superheating-chamber is deflected or inclined for a portion of its length, as at H, and on the rear side of said inclined portion are secured suitable ways, between which operates a door or cut-off I. On the rear side of this door or cut-off I is provided a rack or toothed bar J, with which meshes a pinion L, which is carried on the inner end of a shaft L', suitably journaled in the walls of the furnace. The outer end of the shaft L' projects beyond the side wall of the furnace, and it is provided with a suitable handle, by means of which said shaft and its attached pinion L may be operated to raise or lower the cut-off or door I, and thus open or close the opening P in the rear wall of the auxiliary chamber.

F designates a cold-air pipe, which extends continuously from end to end of the furnace in the foundation or base thereof, and which communicates at one end with the open air outside of the building in which the furnace

is placed. This pipe F is provided with two upwardly-extending branches F' F², the former opening into the combustion-chamber A, while the latter opens into the auxiliary superheating-chamber B below the grate therein. Each of these branches F' F² is provided with right-angled perforated branches R, which extend horizontally and open through the side walls of the furnace to admit air into the interior thereof. There are two of these branches in the pipe F', one above the grate A' and the other below said grate A'. The vertical pipes F' F² are also provided with dampers G, by means of which the admission of air to or the exclusion of air from the interior of the furnace can be regulated at the will of the attendant.

It will be observed that the primary combustion-chamber A is situated under the forward end of the boiler, while the auxiliary superheating-chamber B is situated in rear of the combustion-chamber, so that the smoke and gases generated in the primary combustion-chamber must pass through such auxiliary superheating-chamber in order to reach the discharge-opening P, through which the gases and smoke can escape to the flue or chimney.

The operation of my invention may be briefly stated as follows: A coal fire is made in the combustion-chamber, and a fire is also started in the auxiliary superheating-chamber. The dampers G are turned to admit fresh air to the combustion-chamber above and below the grate A' and below the grate B' in the auxiliary chamber. The air combines with the smoke and gases in the primary combustion-chamber, which induces a draft through the chambers and promotes combustion, and as the gaseous emanations and smoke from the combustion-chamber A pass over the bridge-wall C they impinge against the inclined portion H of the rear wall of the auxiliary chamber, and are thus deflected into the auxiliary chamber, where they are consumed by the intense heat arising from the fire in that chamber.

The residuum of the products of combustion after their consumption in the two chambers is technically known as "white ash," which passes through the opening P into the chimney. (Not shown.) The quantity of air admitted to the primary combustion-chamber A to mix with the products of combustion therein and promote the draft can be increased, if desired, by raising the plate E.

I have found it very desirable and beneficial to burn coke in the auxiliary chamber B to secure an intense heat, for the reason that the gases which ordinarily arise from the combustion of coal have already been extracted from that product and that the heat produced from coke is very intense; but I do not confine myself to the use of this particular substance, as others may be found to possess the desirable qualities to an equally efficient or greater extent.

I am aware that changes in the form and proportion of parts and details of construction may be made without departing from the spirit or sacrificing the advantages of my invention, and I therefore reserve the right to make such changes and alterations as fairly fall within the scope of my invention.

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

1. In a steam-boiler furnace, the combination of a primary combustion-chamber having the front supporting-bar S, the perforated plate arranged between the bar S and the front of the furnace, the supply-pipe located in the ash-pit of said combustion-chamber, the perforated air-pipe arranged in the primary chamber above and in front of the perforated plate, and the auxiliary superheating-chamber communicating with the primary chamber, substantially as described.

2. In a steam-boiler furnace, the combination of a primary combustion-chamber, the auxiliary superheating-chamber communicating therewith, the air-supply pipe, the perforated air-pipes arranged in the front part of the primary chamber above and below the grate therein, respectively, and the perforated air-pipe arranged below the grate in the auxiliary superheating-chamber, substantially as described.

3. In a steam-boiler furnace, the combination of the primary combustion-chamber, the auxiliary superheating-chamber separated from the primary chamber by the intervening bridge-wall, the inclined deflector arranged in the auxiliary chamber in the path of the products of combustion, with its lower end terminating substantially in rear of the grate in said auxiliary chamber, said deflector being below the top of the bridge-wall and forming with the walls of the auxiliary chamber an outlet for the heat and waste products of combustion, and the adjustable gate secured to the back of the inclined deflector and adapted to vary the size of the outlet for the heat and other products of combustion, substantially as shown and described.

4. In a steam-boiler furnace, the combination of a primary combustion-chamber, an auxiliary superheating-chamber separated therefrom by an intervening bridge-wall, the inclined deflector arranged in the auxiliary chamber in the path of the products of combustion, having a discharge-opening P, a cut-off for closing said discharge, and the air-supply pipes in the two chambers, substantially as described.

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

FRANK TROWBRIDGE.

Witnesses:

W. H. BOWE,
WM. WILLIS.