No. 721,329. PATENTED FEB. 24, 1903.

C. W. ROBINSON.

FURNACE.

APPLICATION FILED DEC. 4, 1902.

NO MODEL.

Fig. 1.

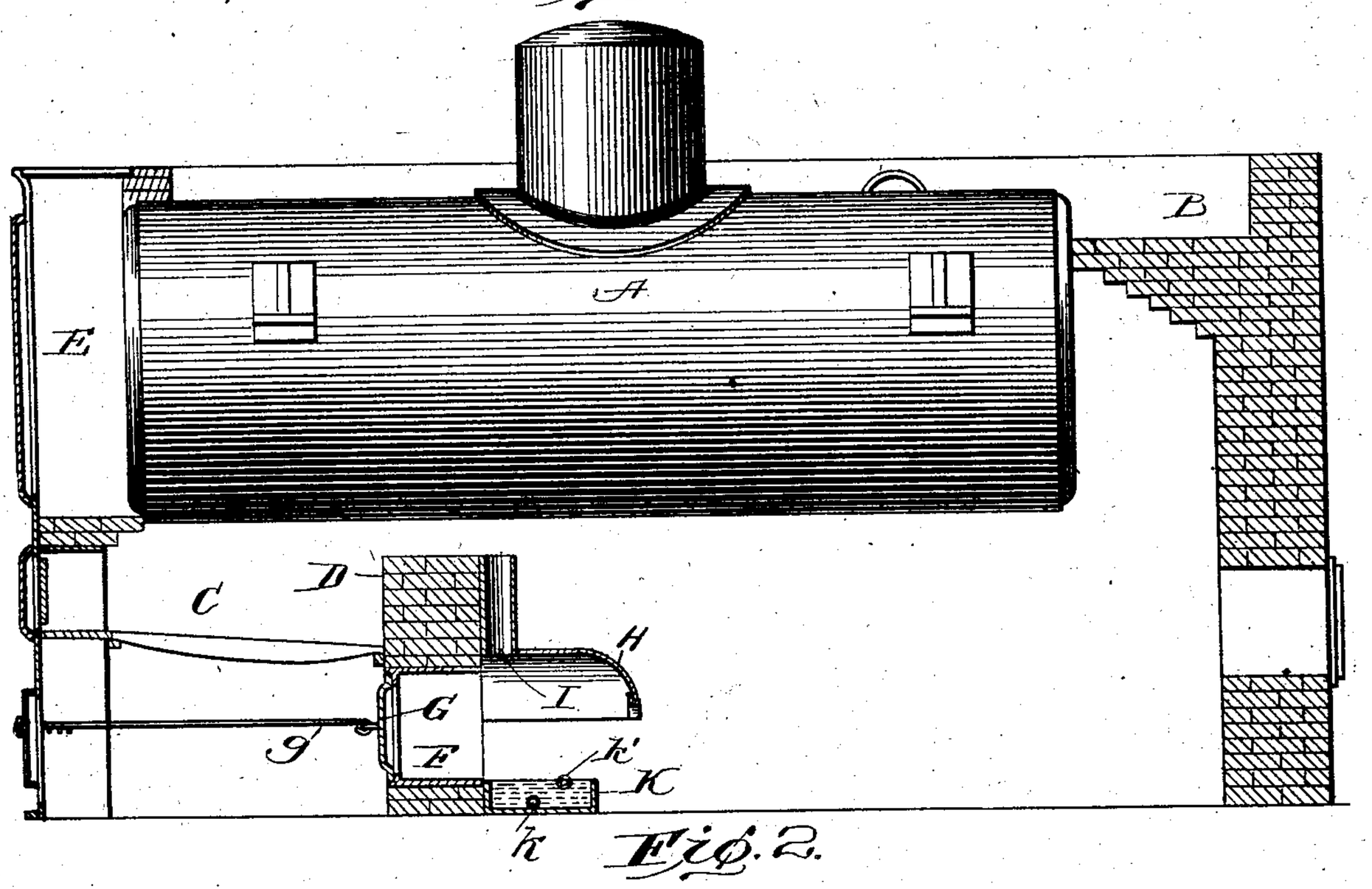
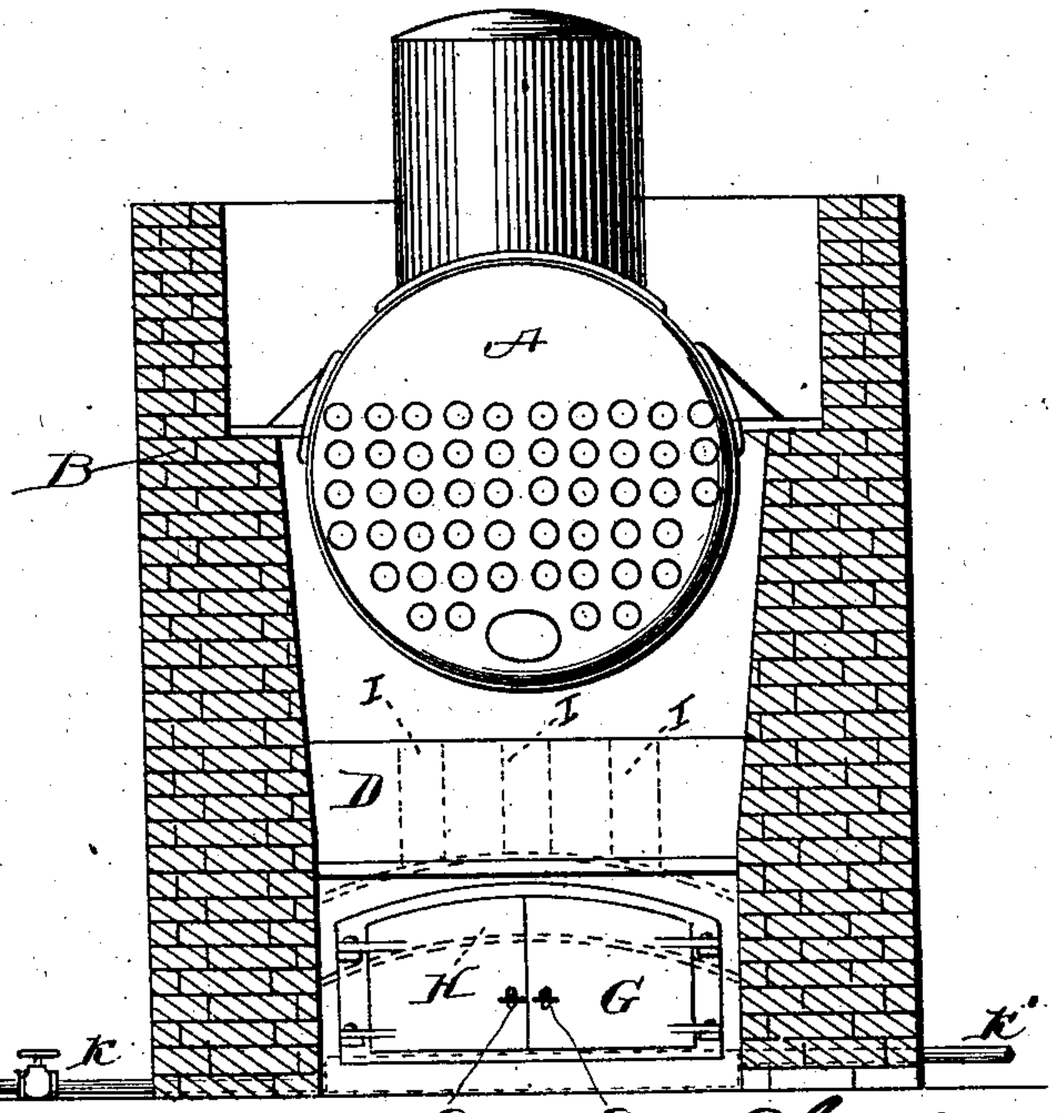


Fig. 2.



Witnesses.

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UNITED STATES PATENT OFFICE.

CHARLES W. ROBINSON, OF WASHINGTON, DISTRICT OF COLUMBIA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 721,329, dated February 24, 1903.

Application filed December 4, 1902. Serial No. 133,924. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. ROBINSON, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements designed to prevent the escape of smoke from the stacks of furnaces, the invention being more particularly though not exclusively applicable to steam-boiler surfaces having horizontal or equivalent types of bodies requiring a bridge-wall and combustion-chamber in rear of the same.

The objects of the invention are to provide a structure in which the elements constituting the visible and objectionable portion of the smoke shall be consumed or deposited in the combustion-chamber, leaving the products which escape from the stack practically free from combustible or solid and visible elements.

The invention consists in certain novel details of construction and combinations and arrangements of parts, all as will be now described, and pointed out particularly in the appended claims.

Referring to the accompanying drawings, Figure 1 is a section longitudinally of a steam-boiler furnace embodying the present improvements, the boiler being in elevation. Fig. 2 is a section at right angles to Fig. 1, taken through the fire-box and looking toward the rear.

Like letters of reference in both figures indicate the same parts.

The structure in connection with which the present invention is illustrated is of conventional form, embodying a cylindrical boiler A, mounted in a setting B, the fire-box and grate C being located under one end of the boiler and the products of combustion passing from the fire-box over the bridge-wall D into the combustion-chamber and thence through the boiler-flues into the smoke-box E at the forward end of the boiler and from which point they are led off to the stack. (Not shown.) The bottom of the combustion-chamber and bottom of the ash-pit are preferably at about the same level, and a relatively large opening is formed through the bridge-wall connecting the two, said opening, however, being closed by damper-doors adapted to be controlled from the front of the furnace, so as to be readily opened or closed to a greater or less extent, as occasion demands. As shown, a metal (cast-iron) frame F is built in the bridge-wall below the level of the grate, and doors G, hinged to said frame and controlled by rods *g*, extending out to the front of the furnace, are employed to accomplish the desired end. Extending back from the top of the opening formed by the frame F is a hood or arch H, the rear edge of which preferably extends down to point approximately level with the horizontal center line of the opening, but some distance in rear thereof. Passages or openings I are formed through the hood or arch, preferably three in number, one at the center and the others half-way between the central one and sides of the furnace, as shown in dotted lines, Fig. 2. These openings are preferably on the rear side of the bridge-wall, and preferably, though not necessarily, discharge near the top thereof in order to supply hot air for the promotion of combustion at the point where the air and gaseous and other products from the fire will commingle to promote combustion to the best advantage.

Beneath the hood or arch and with its top about on a level with the bottom of the opening in the bridge-wall is a water pan or reservoir K, open at the top and provided with means whereby a circulation of water may be maintained, such means preferably consisting of an inlet-pipe *k* and an overflow-pipe *k'*, whereby the temperature of the water may be kept comparatively low and the pan kept full at all times, inasmuch as the best results are largely dependent upon the presence of a body of water open to the air entering for supplying fresh oxygen and open to the combustion-chamber or products passing over the bridge-wall and commingling in the said chamber.

Practice demonstrates that with fuel which ordinarily creates a vast amount of smoke, such as bituminous coal or resinous wood, if the dampers G be partially opened, the extent of the opening depending upon the character of the fuel, a large portion of the products escaping as visible matter is eliminated, and with the reservoir full of water and kept at a relatively low temperature by circulation practically all of such products are eliminated. With the reservoir in use, as stated, it is found that a much larger deposit of solid matter occurs in the bottom of the combustion-chamber than is otherwise the case, and consequently it is desirable that said chamber should be relatively large and the bottom where this deposit occurs removed from the direct influence of the gaseous currents, whereby the deposit is permitted to accumulate without disturbance.

While I do not wish to be confined to any theory of operation, it is my present belief that the fresh heated air from the ash-pit commingles with substantially the proper proportions of the gaseous products from the fire in the chamber beneath the hood or arch to be instantly ignited from the fire upon their issuance above said commingling-chamber, a sufficient proportion of water-vapor being taken up to augment this result. The inflammable mixture is heated in its passage through the discharge-ducts and by its combustion heats and burns a large proportion of the combustible matter passing over the bridge-wall. The gases from this combustion being lighter than the remaining combustible matter pass off through the boiler-flues and stack, while the combustible matter being heavier settles down in the combustion-chamber and finds its way back into the commingling-chamber beneath the hood or arch. The body of water greatly augments the result desired, due, I believe, to the fact that the lower stratum in the chamber is kept at a relatively low temperature, and any solid matter once entering this stratum does not again tend to rise into the currents of gases which would sweep the same up the stack, and consequently settles to the floor, when it may be removed at will. The water-reservoir being located under the hood or arch is out of the direct line of fall of such solid matter, and while some of the solid matter will be deposited in the reservoir it will not ordinarily be sufficient to fill the same nor arrest the circulation of water therethrough.

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

1. In an apparatus for the purpose specified, the combination with the fire-box, ash-pit and combustion-chamber separated from the fire-box and ash-pit by a bridge-wall over which the products from the fire pass into said combustion-chamber, of a dampered opening from the ash-pit through the bridge-wall and hood extending from the top of said opening out into the combustion-chamber and forming a commingling-chamber and discharge-ducts from said commingling-chamber extending up through the hood in position to discharge commingled air and gaseous products into the gaseous products passing over the bridge-wall; substantially as described.

2. In an apparatus for the purpose specified, the combination with the fire-box, ash-pit and combustion-chamber separated from the fire-box and ash-pit by a bridge-wall over which the products from the fire pass into said combustion-chamber, of an opening from the ash-pit through the bridge-wall, a damper for controlling the passage of air through said opening and a hood extending from the top of said opening out into the combustion-chamber and down to a level below the top of said opening to form a commingling-chamber for air entering through the opening and products from the combustion-chamber and discharge-ducts from said commingling-chamber extending through the upper portion of the hood in position to discharge commingled air and gaseous products into the gaseous products passing over the bridge-wall; substantially as described.

3. In an apparatus for the purpose specified, the combination with the fire-box, ash-pit and combustion-chamber separated from the fire-box and ash-pit by a bridge-wall over which the products from the fire pass into said combustion-chamber, of a dampered opening for permitting ingress of air in rear of the fire-pot and a water-reservoir open at the top to the products of combustion in the combustion-chamber and to the air admitted in rear of the fire-pot; substantially as described.

4. In an apparatus for the purpose specified, the combination with the fire-box, ash-pit and combustion-chamber separated from the fire-box and ash-pit by a bridge-wall over which the products from the fire pass into said combustion-chamber and an opening leading from the ash-pit through the bridge-wall, of a water-reservoir located in rear of the bridge-wall and open at the top to the products of combustion in the combustion-chamber and to the air admitted through the bridge-wall and a hood extending from the bridge-wall out over the water-reservoir with ducts leading through the top of the hood; substantially as described.

5. In an apparatus for the purpose specified, the combination with the fire-box, ash-pit and combustion-chamber separated from the fire-box by a bridge-wall having an opening therein between the ash-pit and combustion-chamber, and a damper for said opening, of a hood extending from the top of said opening into the combustion-chamber and

down to approximately the level of the middle of the opening, ducts through the upper portion of the hood for the passage of commingled air and products from the fire, a water-reservoir having an open top located beneath the hood and induction and eduction pipes for maintaining a circulation of water through the reservoir; substantially as described.

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Witnesses:
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