(No Model.) 2 Sheets—Sheet 1.

G. FARR.

GAS CONSUMING FURNACE.

No. 286,286. Patented Oct. 9, 1883.

Fig. 8.

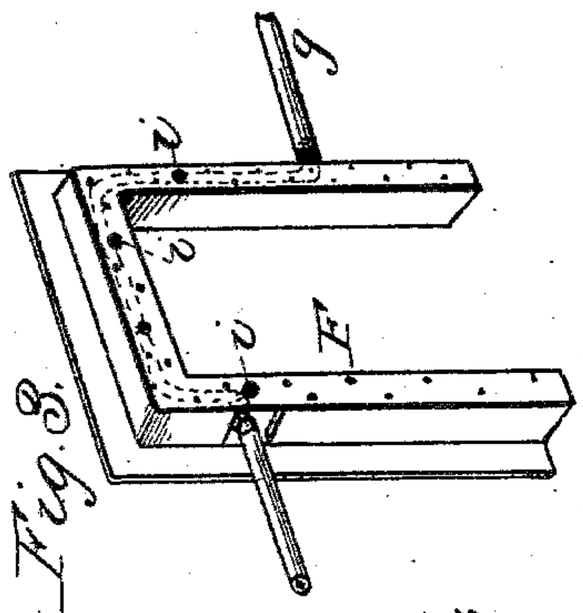

Fig. 2.

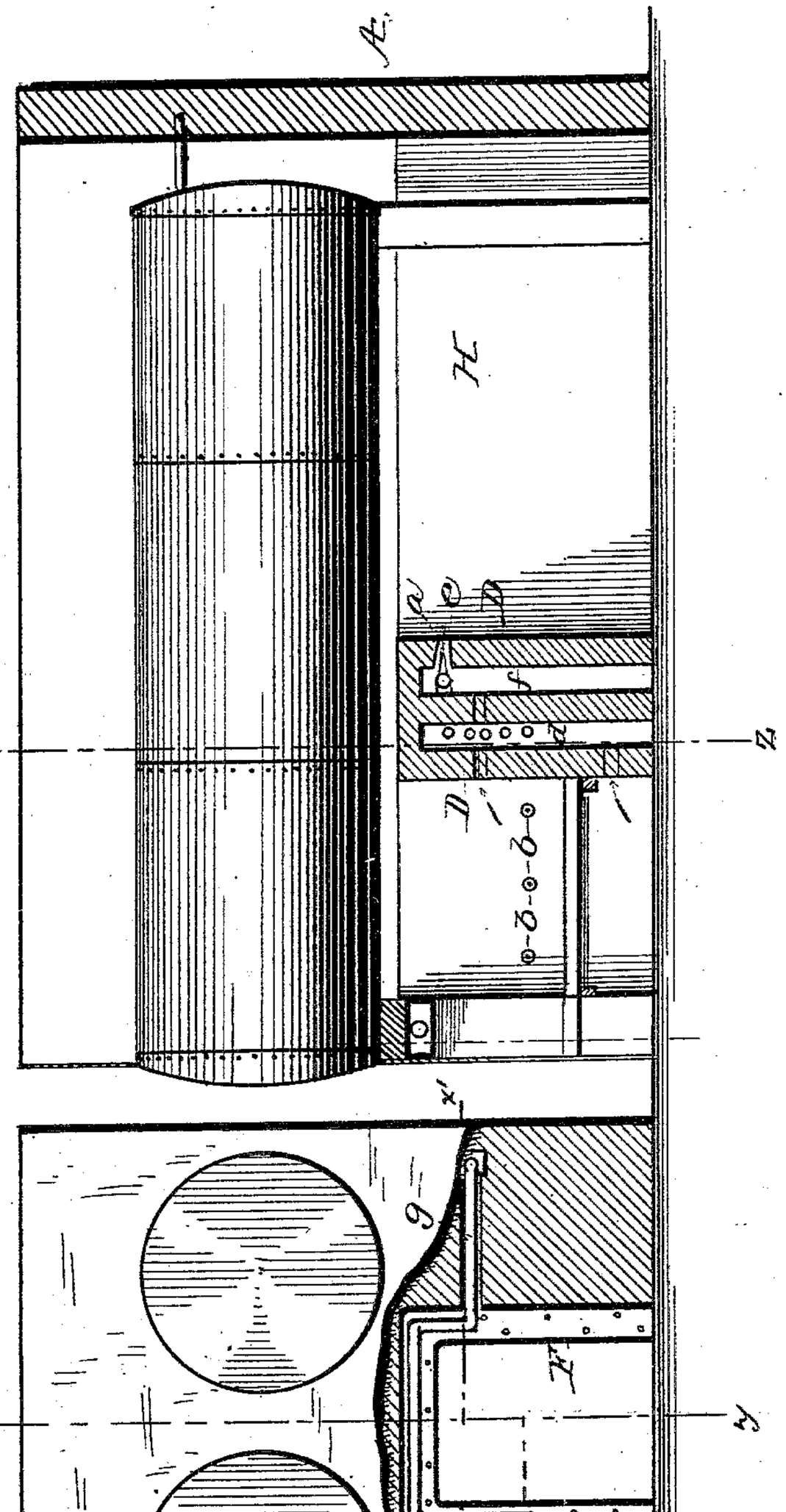

Fig. 1.

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Edward C. Ellis

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 4.

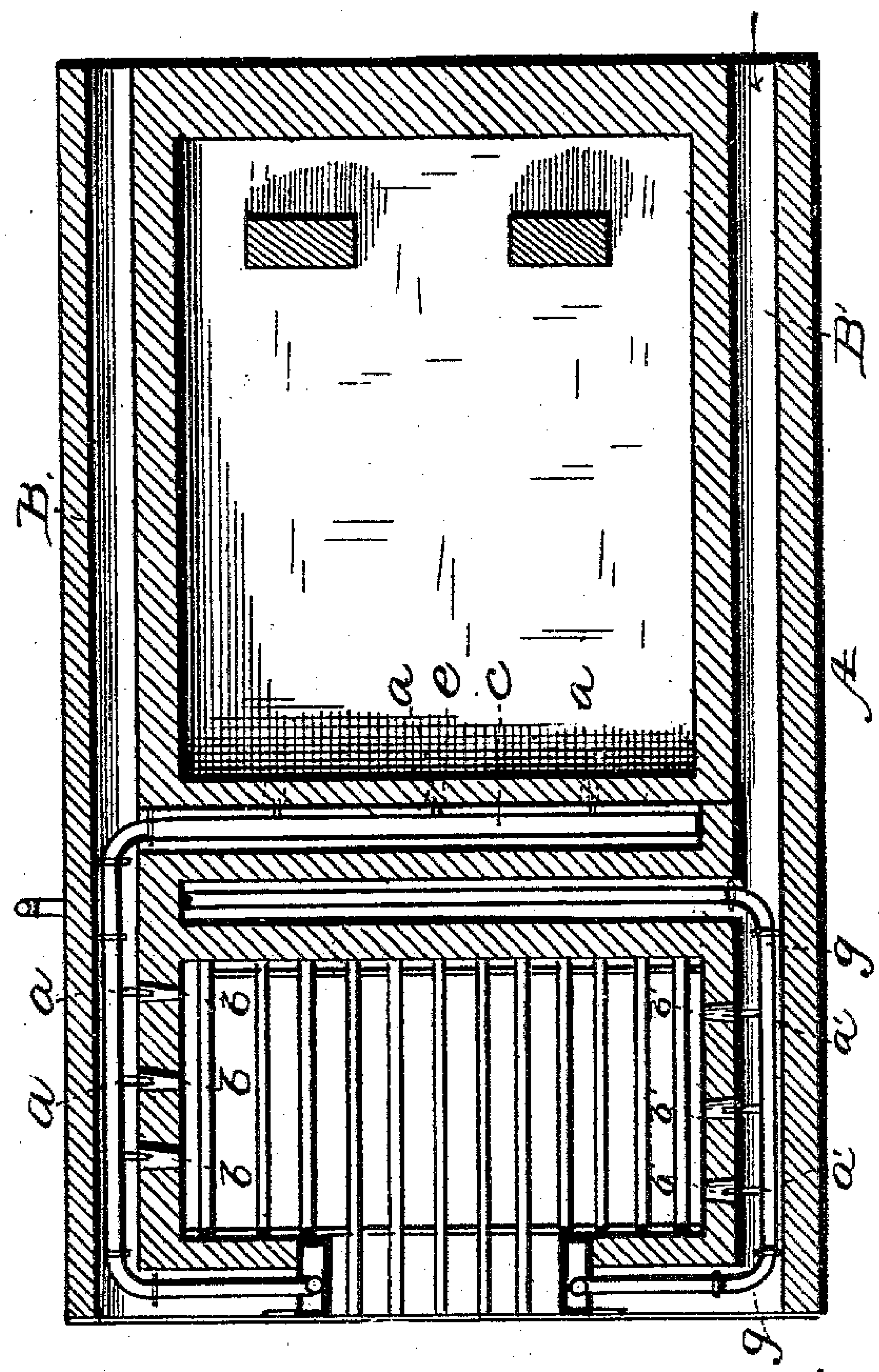


Fig. 6.

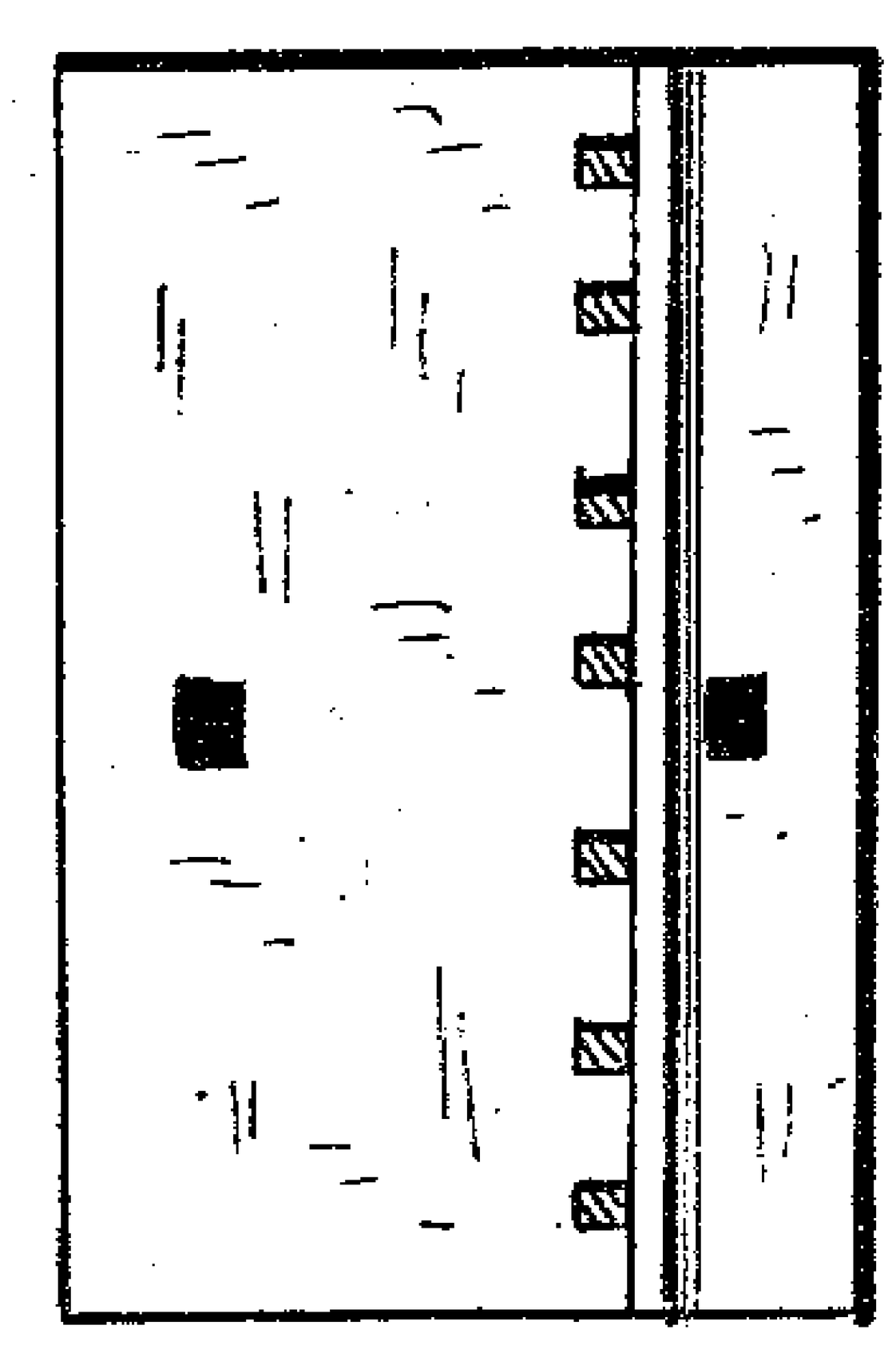
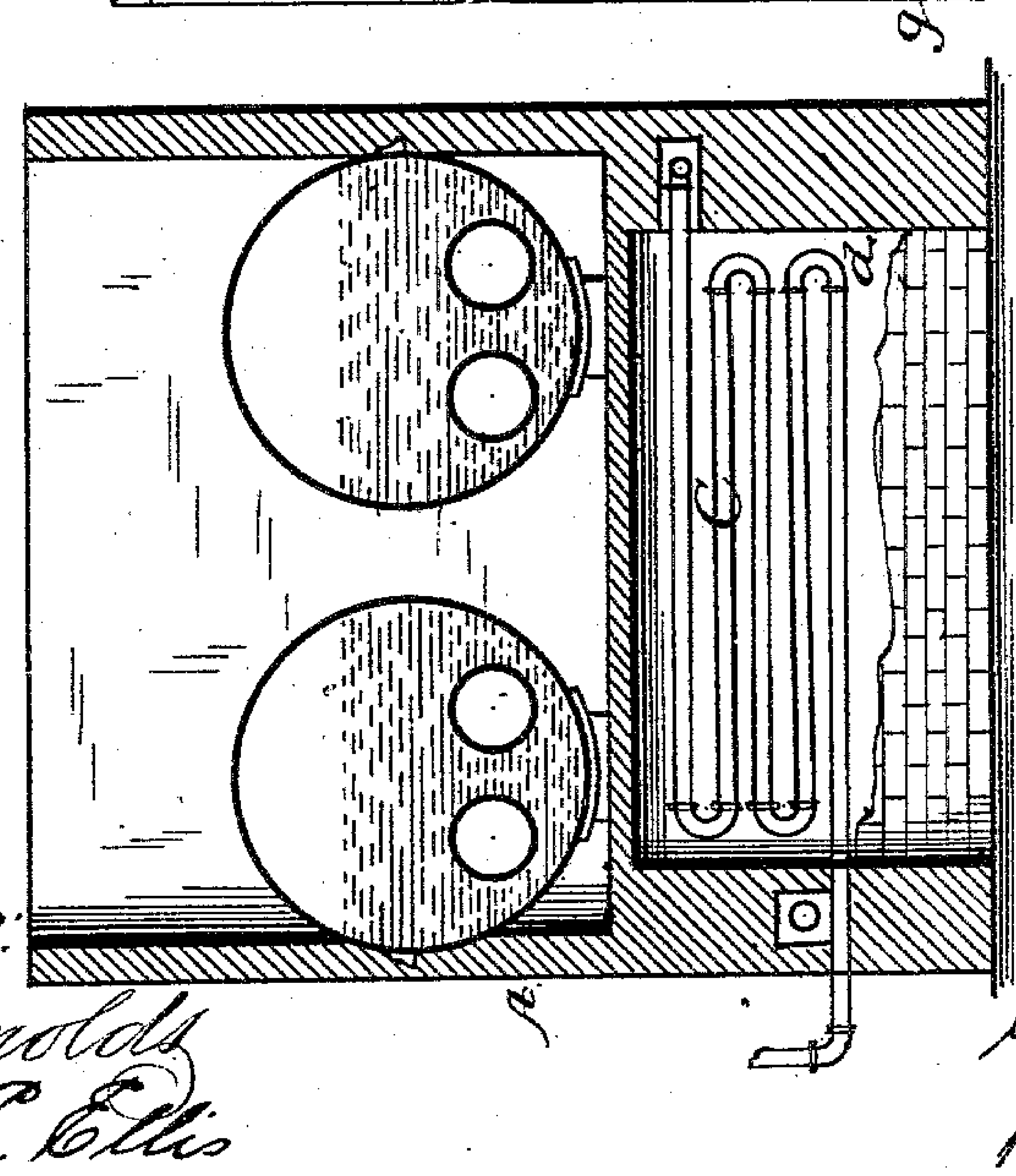


Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE FARR, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF TO JAMES RUSSELL WHITTEMORE AND MYRON SPICKERMAN, BOTH OF SAME PLACE.

GAS-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 286,286, dated October 9, 1883.

Application filed August 9, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE FARR, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Gas-Consuming Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to steam-boiler furnaces; and the object of the invention is to provide means for more perfectly causing the combustion of the fuel and of the gases evolved or generated from such fuel under the influence of heat, so that all combustible matter of the fuel shall be utilized and turned to account for heating purposes, and so that no smoke or sooty matter shall escape from the furnace, whereby fuel is economized and the smoke nuisance is avoided.

Another object is to provide means for keeping the hollow-iron door-frames sufficiently cool to prevent them from warping and twisting out of shape by reason of the heat of the furnace, and at the same time heat the air entirely therethrough.

In carrying out my invention I construct air-heating passages or flues in the side walls and bridge-wall of the furnace, and place a steam-superheating coil of pipe in a space of the bridge-wall, and connect with such coil branch pipes having injecting-nozzles projecting through ports or openings, which lead from the hot-air flues in the fire-box and the combustion-chamber of the furnace; and, further, I provide a hollow door-frame having perforations in its outer and inner walls for the passage of air, and having large openings forming communications between its interior channel and the flues in the furnace-walls, and I pass through the channel of the frame a steam-pipe having nozzles projecting through openings in the inner wall of the frame, for drawing air from the outside and from the flues and forcing it into the fire-box, whereby the frame is kept comparatively cool and air is supplied above the fuel for causing partial combustion of the gases in the fire-box. The superheated steam passed through the injecting-nozzles is partially or wholly decomposed in contact with the hot carbonaceous gases in the fire-box, and the resulting carbonic oxide and hydrogen gases yield a high heat upon combustion in the combustion-chamber.

The matter constituting my particular invention herein will be pointed out in the claims.

My invention is illustrated by the accompanying drawings, forming part of this specification, in which—

Figure 1 represents an end elevation of the furnace, partially in section, for showing the hollow door-frame containing the steam-pipe. Fig. 2 represents a longitudinal vertical section of the furnace with the boiler in position. Fig. 3 represents a perspective view of the hollow perforated frame. Fig. 4 represents a horizontal section through the furnace on a plane above the grate-bars, as indicated by lines $x' x'$, Fig. 1. Fig. 5 represents a vertical cross-section through the bridge-wall of the furnace and through the boilers. Fig. 6 is a detail view of the bridge-wall in front elevation, showing the passages through it.

The walls of the furnace A are preferably built of brick, and the boilers are set in the furnace in the usual or any desired manner. Each of the side walls of the furnace is constructed with a flue or channel, B B′, opening at the rear end, and extending to the front end thereof on a line slightly above the grate-bars, where they connect by openings *s* with the channel in the door-frame, and at the front end, adjacent to the fire-box, the ports or tuyeres *b b′* open from the flues into the fire-box, for admitting hot air into the body of the fuel, and these ports, although placed in the opposite walls of the fire-box, are not placed in a transverse line each opposite the other, but so that they will break joints or alternate with each other—that is, so that those in one wall will point to the spaces between those in the opposite wall—whereby the fuel is more uniformly and evenly supplied with air. The bridge-wall D is made thick, and provided with

two channels or spaces, the front one, *d*, opening into the side flue, B′, and containing the coil of steam-pipe C, and the rear one, *f*, opening into the side flue, B, and containing the branch steam pipe *c*, having injecting-nozzles *a a*, projecting into the ports or openings *e*, which open from air-channel *f* into the combustion-chamber H, below the boiler. The branch steam-pipe *c* extends through flue B along the side of the fire-box, and is there provided with jet-nozzles *a a*, projecting into the air-ports *b b*. The branch *g* of the steam-coil C extends through flue B′ along the side of the fire-box, and is there provided with the jet-nozzles *a′ a′*, projecting into the air-ports *b′ b′*, leading into the fire-box. The continuation of steam-pipe *g* extends into and through the upper portion of hollow door-frame F, and it is intended that this steam-pipe shall extend to an adjoining furnace and through its door-frame, and thus on through a number of frames where a battery of boilers is built. The frame F is made of metal, and preferably of wrought or cast iron, with an interior channel, and the outer and inner walls thereof are perforated for the passage of air to the fire-box. Jet-nozzles *i i* project from steam-pipe *g* through openings in the inner wall of the frame, for the injection of steam and air above the bed of fuel in the fire-box. An opening, *n*, leads from the ash-pit into the air-chamber *d* in the bridge-wall, and an opening, *o*, leads from the fire-box into air-chamber *f* of the bridge-wall, the former for admitting air and the latter for permitting the passage of hot gases into combustion-chamber H without impinging upon the bottom of the boiler just above the bridge-wall, where the whole volume of gases, if passed, would injure the boiler. The ports *b* and *b′* and the jet-nozzles *a* and *a′* are arranged, respectively, on different planes or levels on the opposite sides of the fire-box, in order to more uniformly and completely supply air to the fuel.

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

1. A steam-boiler or other furnace for causing complete combustion of the fuel and the gases evolved therefrom, provided with the side air-heating flues, the ports or tuyeres leading from the air-flues into the fire-box and into the non-combustion chamber, and the steam-pipe laid in the flues, said tubes being at different levels, and having jet-nozzles opening into the ports for injecting hot air into the fire-box and mixed air and gases into the non-combustion chamber.

2. A steam-boiler or other furnace having the air-heating flues in its walls, in combination with the hollow door-frame, having a steam-pipe provided with nozzles or openings, and openings forming a communication between its interior channel and the flues, as and for the purpose described.

3. The furnace having the air-heating flues in its walls connecting by ports with the fire-box, the air chambers or spaces in the bridge-wall, one of which connects directly by ports with the combustion-chamber, in combination with a coil of steam-superheating pipe located in one of the chambers in the bridge-wall, and the branch pipes having jet-nozzles projecting into the air-ports, as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

GEORGE FARR.

Witnesses:

EDWARD E. ELLIS,

O. E. DUFFY.