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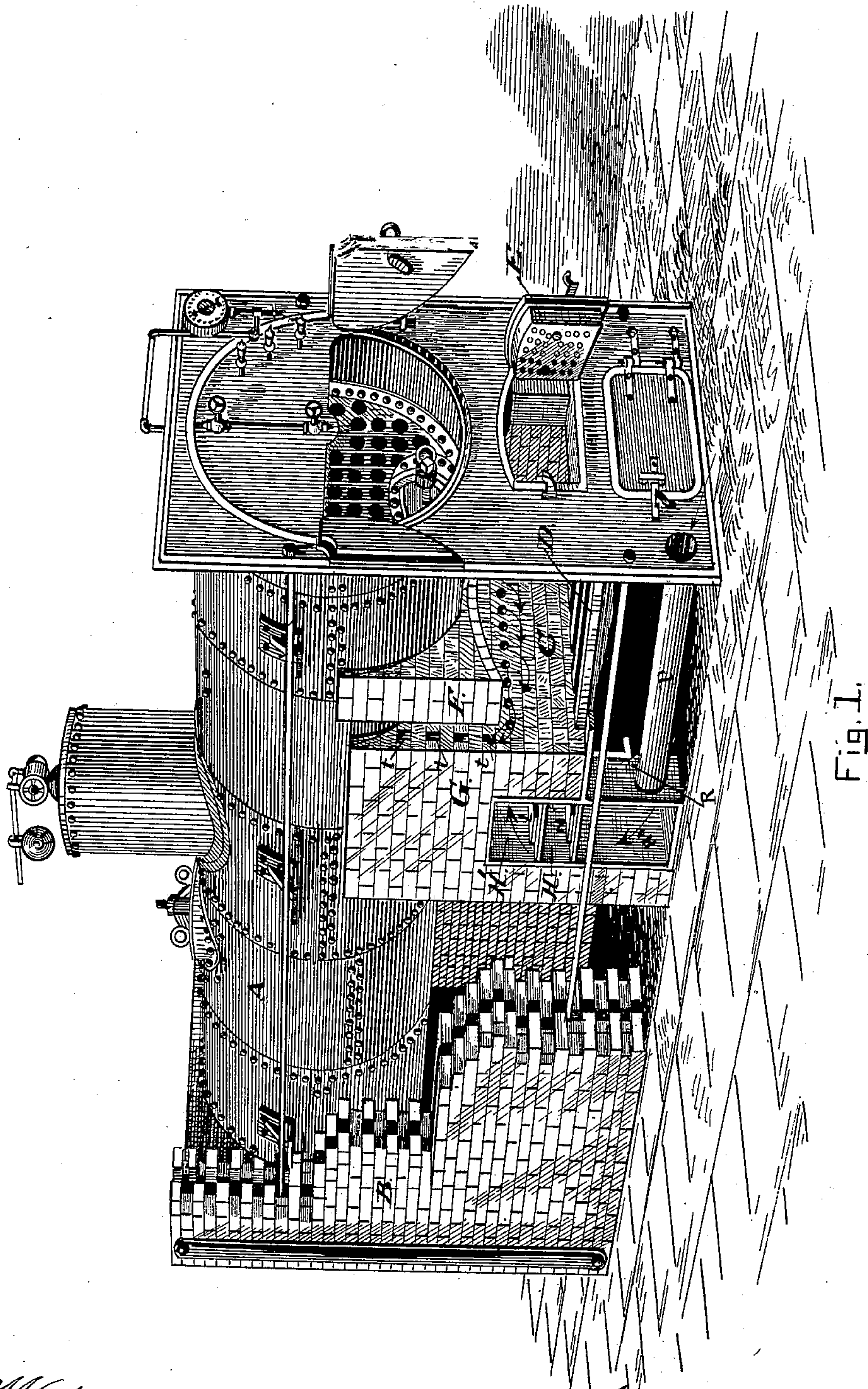
3 Sheets—Sheet 1.

L. STEVENS.

FURNACE FOR BOILERS.

No. 333,429.

Patented Dec. 29, 1885.



Witnesses
John A. Ellis
A. B. Moore.

Inventor
Levi Stevens
By David A. Burr
Attorney

(No Model.)

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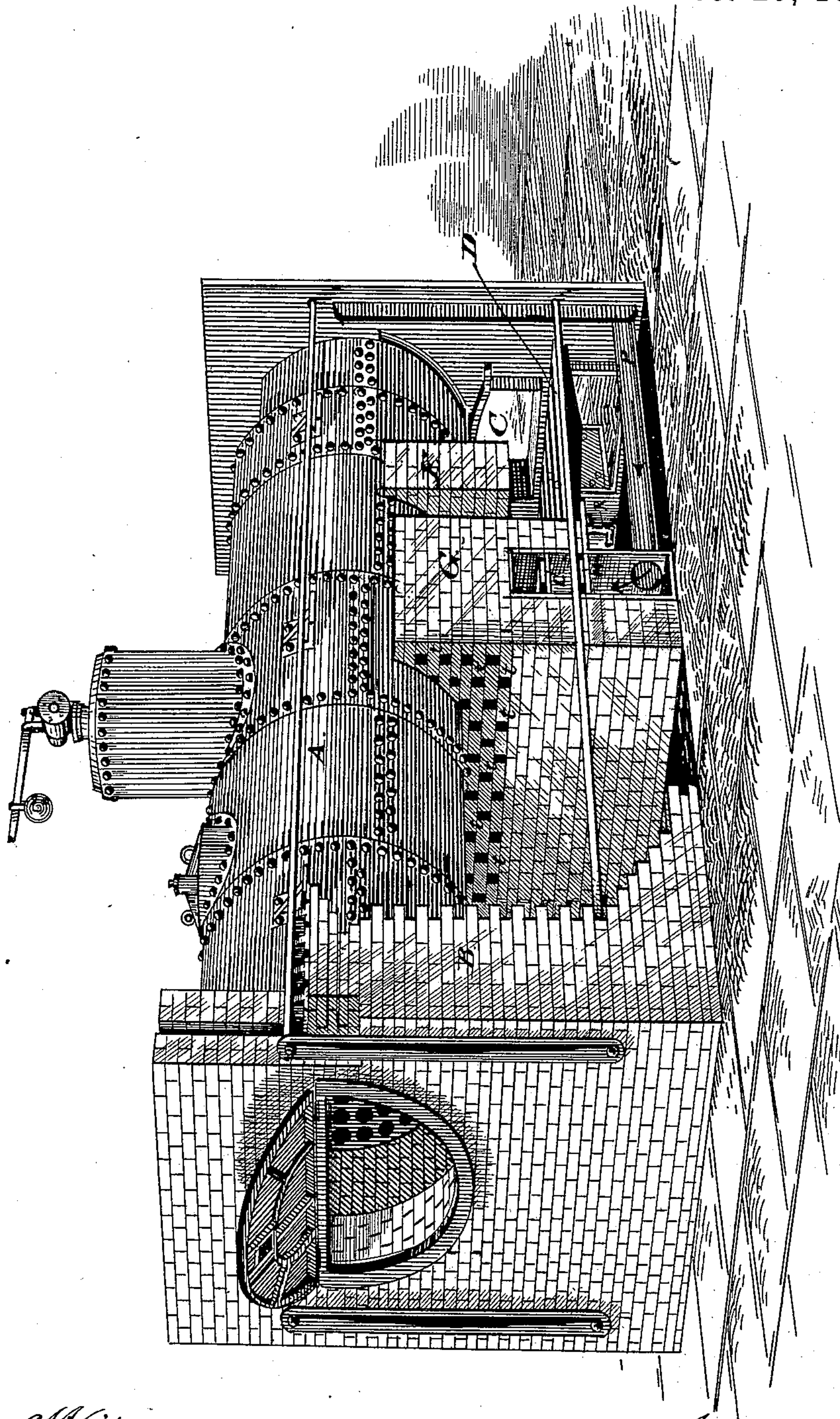


Fig. 2.

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Fig 3.

Fig 4.

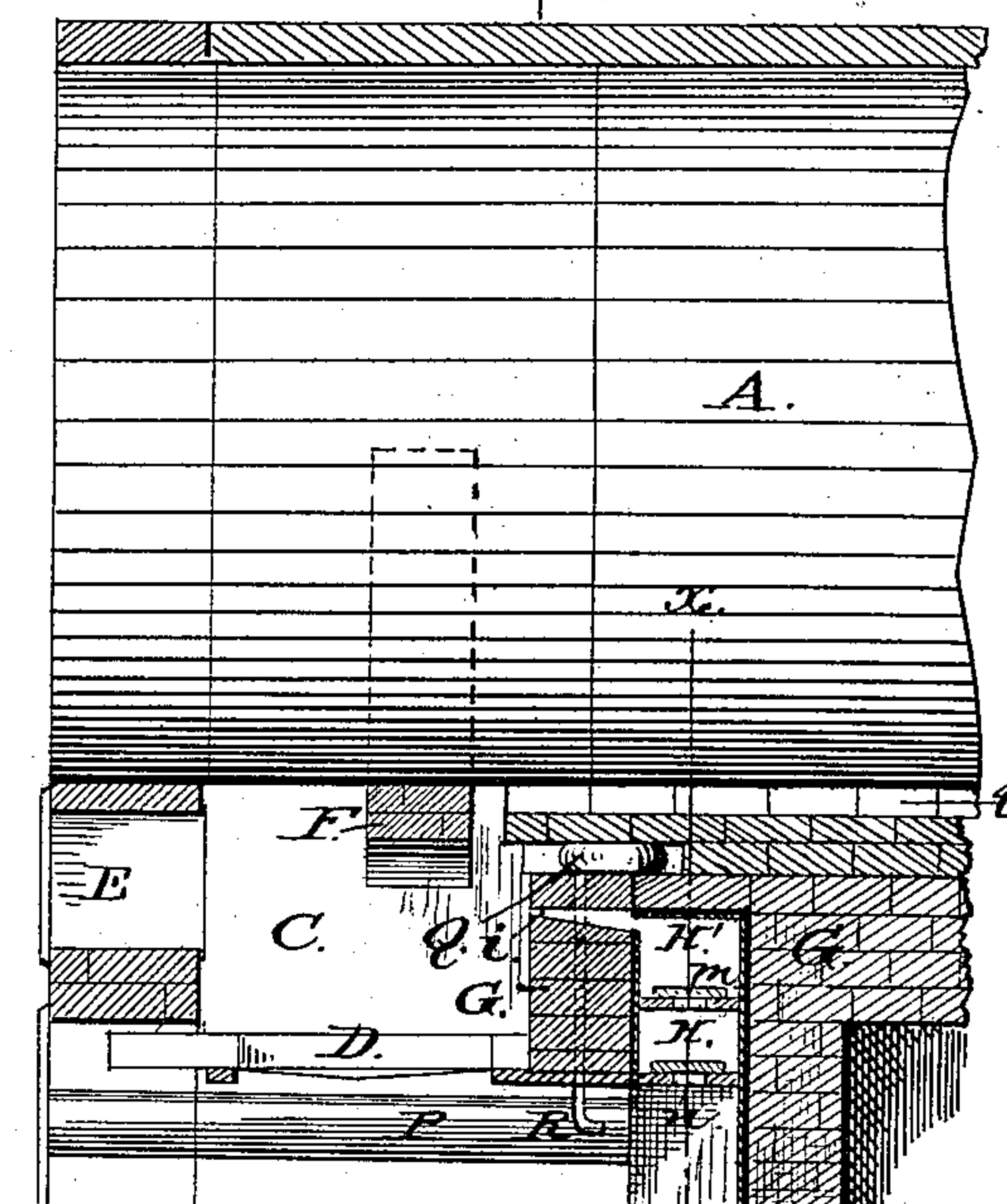
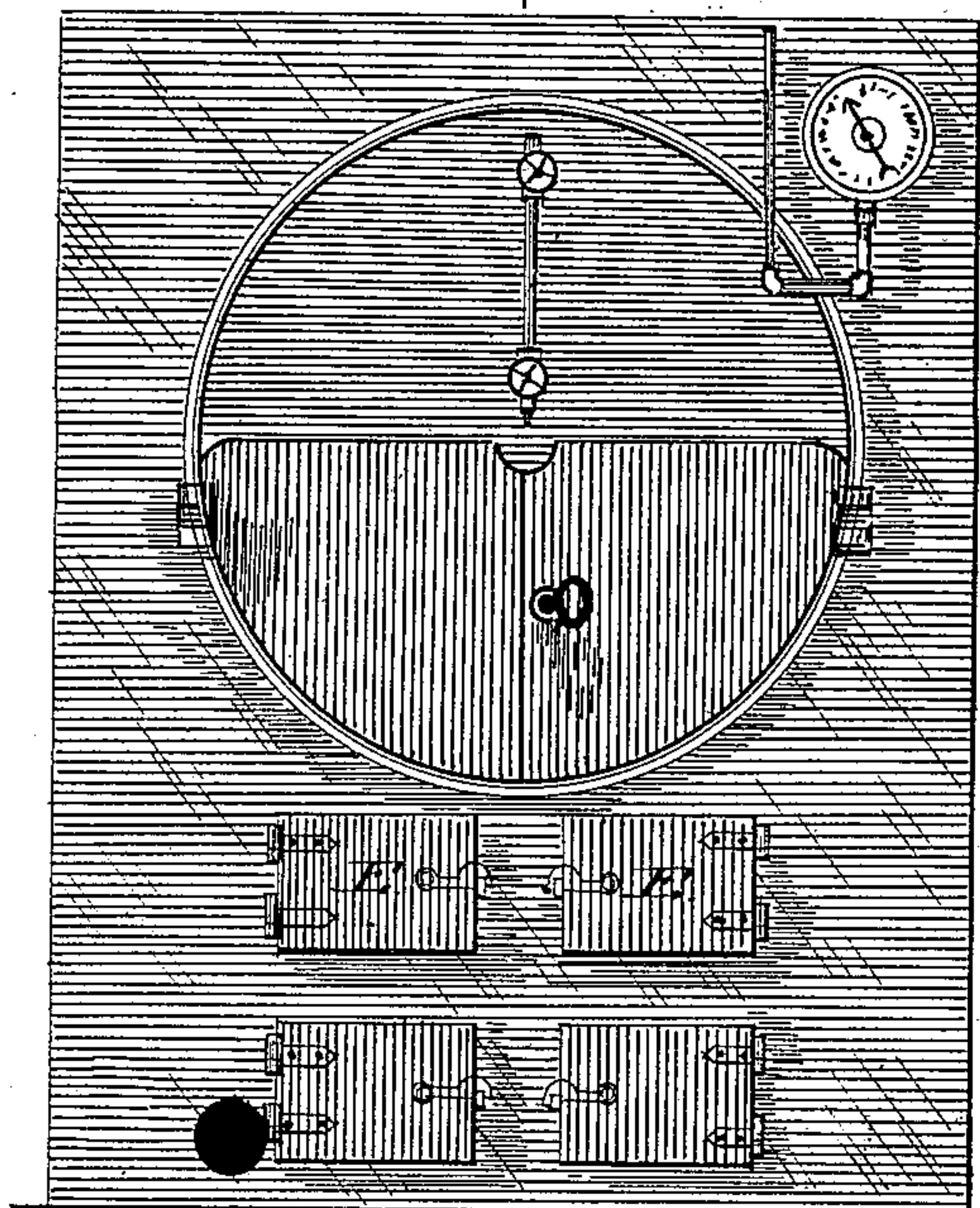
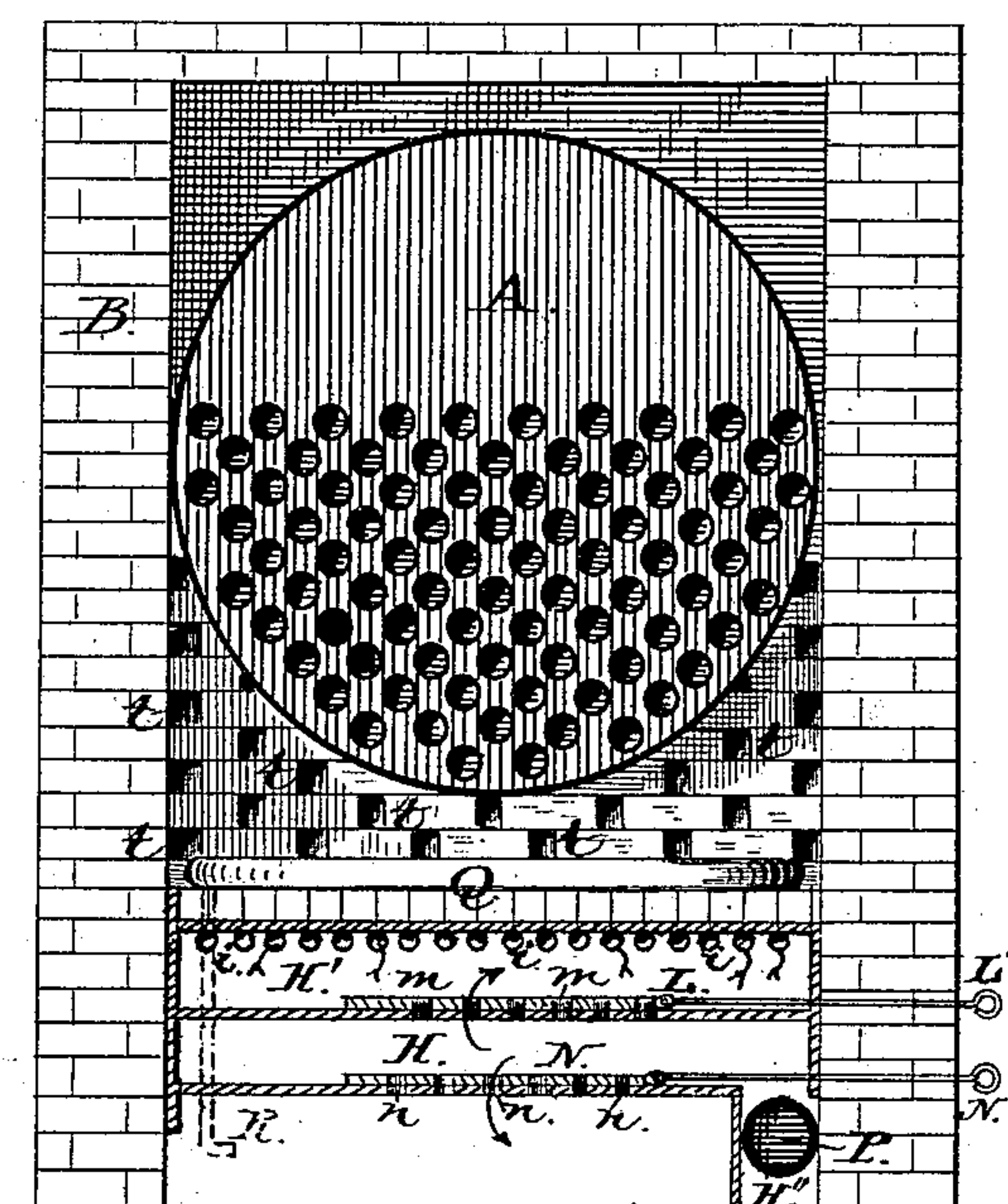
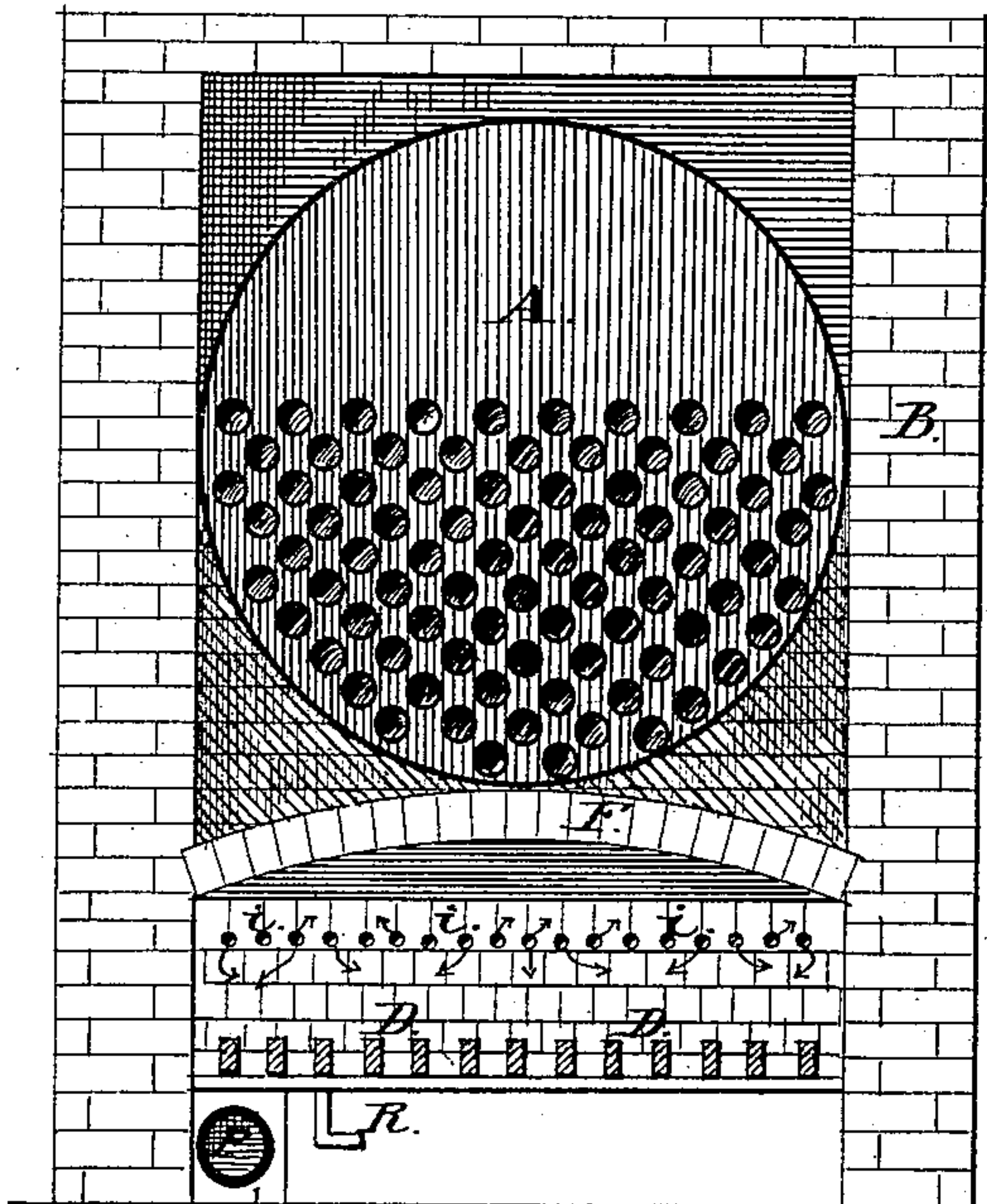


Fig. 5.

Fig. 6.



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UNITED STATES PATENT OFFICE.

LEVI STEVENS, OF WASHINGTON, DISTRICT OF COLUMBIA.

FURNACE FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 333,429, dated December 29, 1885.

Application filed June 12, 1885. Serial No. 162,460. (No mod. l.)

To all whom it may concern:

Be it known that I, LEVI STEVENS, of Washington city, in the District of Columbia, have invented a new and useful Improvement in
5 Furnaces for Steam-Boilers; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of
10 this specification.

My invention relates to improvements in the furnaces of steam-boilers, whereby a more perfect combustion of the fuel is obtained, all smoke is prevented, and an intense heat gen-
15 erated.

In the accompanying drawings, Figure 1 is a view in perspective, from the front, of my improved furnace as applied to a tubular boiler, portions of the walls being broken away
20 to exhibit its internal structure; Fig. 2, a similar view from the rear; Fig. 3, a front elevation of the furnace shown as provided with two fire-doors; Fig. 4, a partial section through the fire-box and air-chamber in the line of the
25 axis of the boiler, the boiler being shown in elevation; Fig. 5, a transverse sectional view at the front end of the boiler, illustrating the hanging bridge at rear of fire-box and the air-openings in its rear wall; Fig. 6, a transverse
30 sectional view through the hot-air chamber and boiler, looking toward the front in line *x x* of Fig. 4, the boiler being shown in elevation.

A in the drawings represents a tubular
35 boiler supported and partially inclosed in the usual manner by a setting of brick-work, B.

C is the fire-box, which differs from the customary fire-boxes in being made shallower, and consequently smaller, and in having its
40 grate-bars D D dropped below the level of the feed door or doors E, as shown in Fig. 4, so as to provide for a good depth of coal thereon.

A hanging bridge-wall, F, is constructed in front of the rear wall, G, of the fire-box, and
45 is made to depend from the under side of the boiler nearly to the customary level of the fuel on the grate. Within this rear wall, G, a hot-air chamber is formed to extend transversely across the width of the furnace and from the
50 ground up to about the level of the lower face of the hanging bridge F. This hot-air chamber is divided horizontally into two compart-

ments, H and H', communicating with each other by a series of openings, *m m m*, closed by a slide-valve, L, (see Fig. 6,) operated from
55 the outside of the furnace by a rod, L', or other suitable device. The upper compartment, H', communicates with the fire-chamber C by means of a series of openings, *i i i i*, in the rear wall immediately under the hanging bridges. 60
The bottom of the lower compartment, H, is upon a level with the bottom of the grate-bars D D. The space beneath it communicates freely with the ash-pit under the grate-bars, and communication is established between the 65
lower compartment, H, and this space by means of a series of openings, *n n n*, closed by a second valve, N, operated in like manner as the first by a rod, N'. Air is admitted to the lower compartment, H, by means of a pipe, 70
P, which is preferably carried through the ash-pit to the front of the furnace. This pipe may open directly into said compartment H, or, as shown in the drawings, into a box, H'', communicating with it. 75

Immediately over the hot-air compartment H' a steam-superheater, Q, is placed, so as to be exposed directly to the heat from the fire-box. The rear wall, G, of the fire-box C is perforated with a series of small longitudinal 80
flues, *t t t*, through which the burning gases and products of combustion are led under the boiler A to a greater or less distance back from the fire-box, so as to protect the boiler from the effects of direct exposure to their in- 85
tense heat as they first escape from the fuel. A discharge-pipe, R, is led from the superheater Q to a point immediately below the openings *n n n* from the hot-air chamber into the ash-pit, so that the steam may commingle 90
with the hot air admitted to the fuel.

In the operation of my improved apparatus the air admitted to the hot-air space H through the pipe P becomes intensely heated by reason of the high temperature which the rear wall 95
of the fire-box attains. This hot air is admitted under the incandescent fuel in the fire-box through the valve-openings *n n*, and is admixed in its passage through the ash-pit before reaching the fuel with a due proportion 100
of superheated steam admitted thereto from the pipe R. The combustion of the fuel is thus supported and maintained by means of superheated steam admixed with hot air, which,

passing through the incandescent coal on the grate, produces therefrom a large volume of gases of highly-heating quality. These gases as they pass from the bed of fuel are collected
5 in the fire-chamber C, and thence forced by means of the hanging bridge-wall F to sweep downward into close proximity to the surface of the fuel before leaving the chamber, and also into direct opposition to a blast of hot air,
10 which enters through the apertures *i i i* from the upper compartment, H', of the hot-air chamber, the volume of the air admitted at this point being controlled by the valve L. The air thus projected upon the intensely-
15 heated gases serves to complete their combustion and to intensify the heat therefrom to be carried under the boiler. The intensity of the heat thus produced at this point would be destructive to the boiler if allowed to play di-
20 rectly thereon; but I have obviated this difficulty and prevented the effects of focalizing the heat on a small portion of the boiler-surface by carrying the gases through the series of flues *t t t*, formed in a brick wall under the
25 boiler. The wall becomes intensely hot and by radiation heats the boiler, and the gases are so far reduced in temperature by the time they reach the rear of the boiler as to allow of their return through its flues without injury thereto.
30 In practice all descriptions of coal are burned freely without smoke in my improved furnace,

and a vaporization of from twelve to twelve and a half pounds of water is obtained for each pound of fuel consumed therein under the ordinary forms of tubular boilers.

My improvements are applicable with slight modification to all descriptions of furnaces; and

I claim as my invention—

The combination, with the fire-chamber of 40 a furnace whose discharge-flues are carried through the upper part of its rear wall, and with an inverted bridge or deflecting wall depending from the top of the chamber in front of said flues, of a hot-air chamber formed with- 45 in said rear wall, divided into two compartments, of which one communicates with the outer air and also by means of separate valve-openings with the second compartment and with the space beneath the grate-bars, and the 50 other communicates by means of openings in the rear wall with the fire-chamber at or below the level of the hanging wall, all substantially in the manner and for the purpose herein set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LEVI STEVENS.

Witnesses:

J. F. ACKER, Jr.,
A. B. MOORE.