

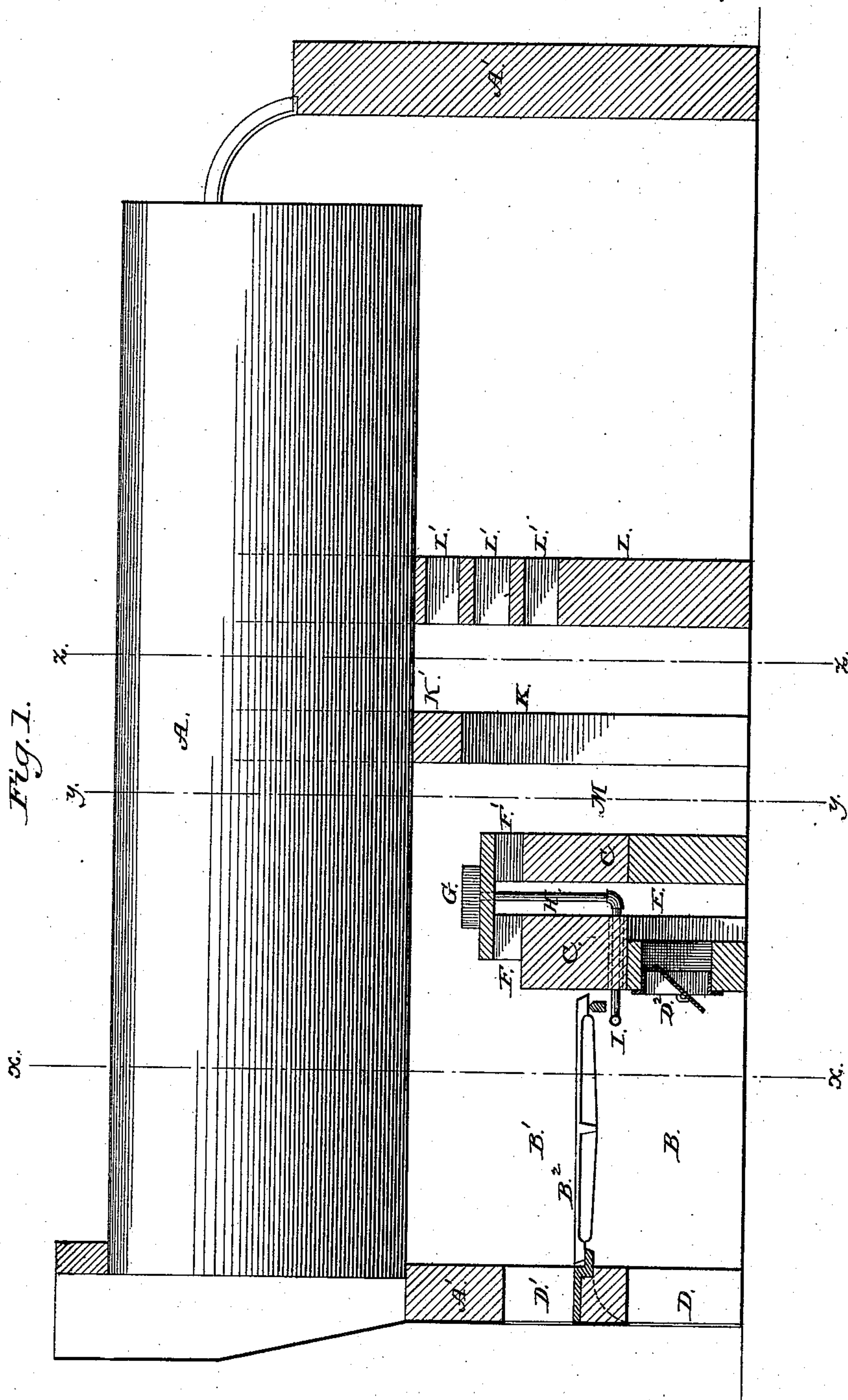
(No Model.)

2 Sheets—Sheet 1.

L. STEVENS.
STEAM BOILER FURNACE.

No. 351,475.

Patented Oct. 26, 1886.



Attest:
John A. Ellis.
A. B. Moore.

Inventor:
Levi Stevens
By David A. Burr
Atty.

(No Model.)

2 Sheets—Sheet 2.

L. STEVENS.
STEAM BOILER FURNACE.

No. 351,475.

Patented Oct. 26, 1886.

Fig. 4.

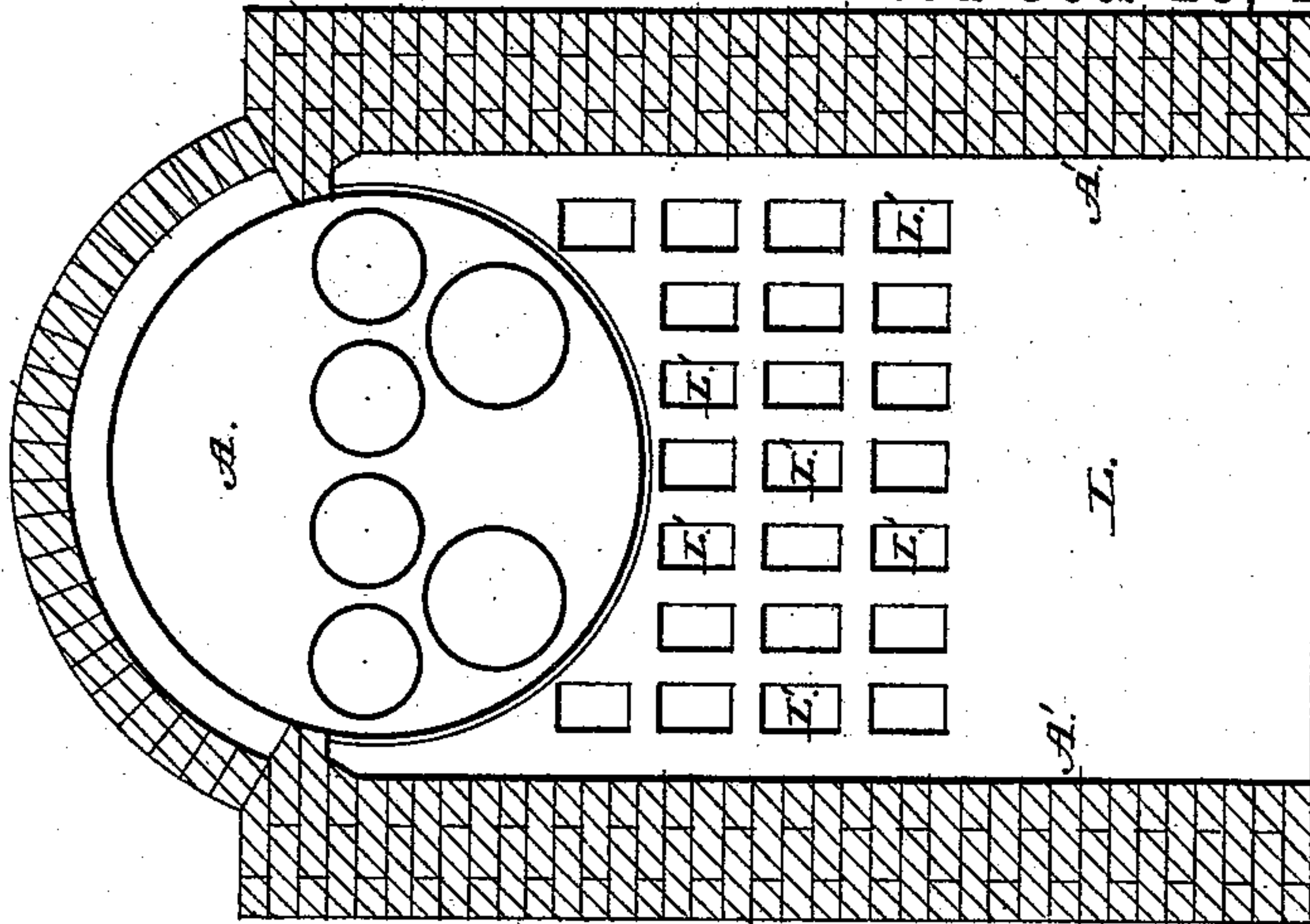


Fig. 3.

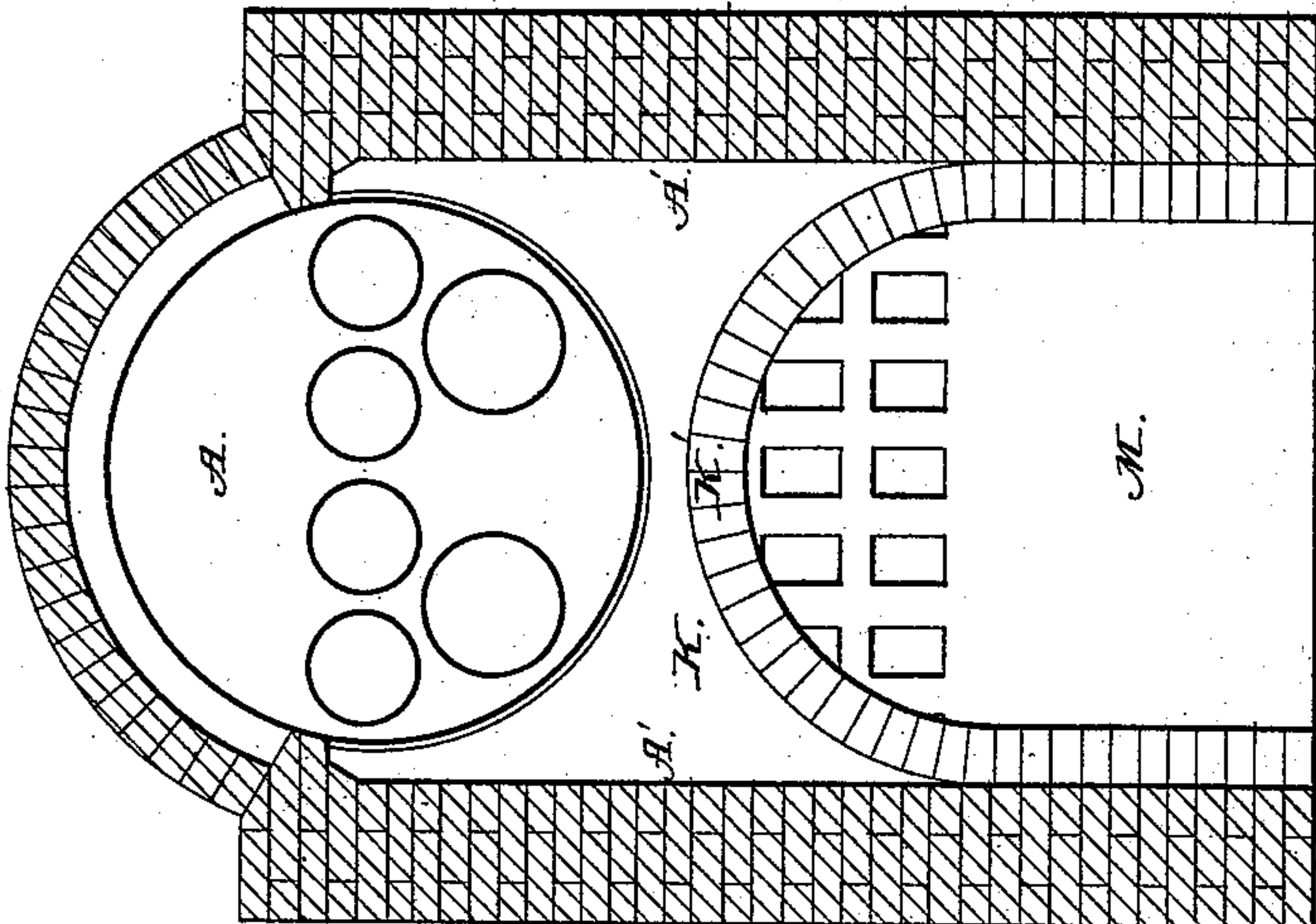
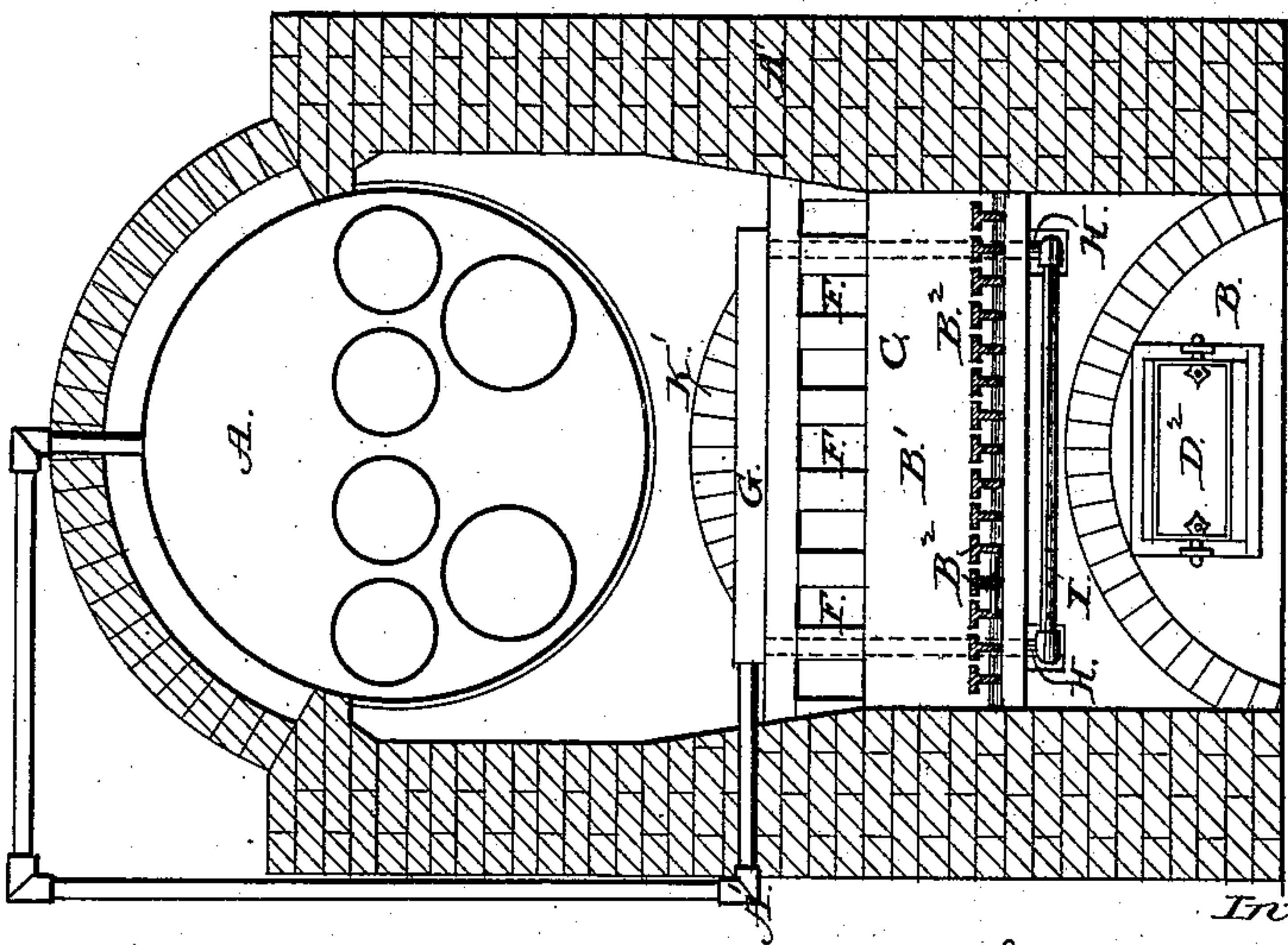


Fig. 2.



Attest:

John A. Ellis
A. B. Moore

Inventor:

Leri Stevens
By David A. Burr
Atty.

UNITED STATES PATENT OFFICE.

LEVI STEVENS, OF WASHINGTON, DISTRICT OF COLUMBIA.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 351,475, dated October 26, 1886.

Application filed December 12, 1885. Serial No. 185,439. (No model.)

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 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 this specification.

My invention relates to improvements in the construction of furnaces for steam-boilers, and has for its object to produce a perfect combustion and consumption of the gases evolved from the burning fuel, and a consequent prevention of smoke and an economy in the generation of steam therewith.

In the accompanying drawings, Figure 1 is a longitudinal section taken centrally through my improved furnace, constructed under a tubular boiler, the boiler being shown in elevation; Fig. 2 is a transverse section in line x x ; and Figs. 3 and 4 are similar sections in the lines y y and z z , respectively, of Fig. 1.

A represents the tubular boiler of any approved form, supported in the customary manner by the walls A' A' , of the furnace for heating the same. B is the ash-pit, and B' the fire-chamber of the furnace. B² are its grate-bars; D, the ash-pit door, and D' the fire-door. The bridge-wall C, at the rear of the ash-pit and fire-box, is made hollow, and is carried up far enough above the grate-bars to give proper depth to the fire-chamber B', and upon its top a superheater, G, of any approved construction, is fitted and connected with the boiler. This superheater is also connected by one or more pipes, H H, with a transverse perforated pipe, I, fitted under the grate-bars, so that a supply of superheated steam is emitted therefrom in fine jets into the ash-pit B, to be carried up between the grate-bars B², and through the bed of incandescent fuel thereon. Within this hollow bridge-wall C a hot-air chamber, E, is formed, and it is made to communicate by a series of apertures, F F', pierced in opposite directions through the inclosing-walls C, near the top thereof, both with the fire-chamber B' on one side, and with a combustion-chamber, M, on the opposite side thereof. The hot-air chamber E is supplied with air by

means of an opening communicating therewith from the ash-pit and controlled by a damper, D².

The combustion-chamber M is inclosed between the bridge-wall C, back of the fire-chamber and a second wall, L, built transversely under the boiler, and whose upper portion alone is pierced with a series of small apertures, L' L'. (See Fig. 4.) A hanging wall or deflecting-arch, K K', (see Fig. 3,) is interposed between the rear wall, L, of the combustion-chamber and the hollow bridge-wall C of the fire-chamber, the top of the open arch K' being about on a level with the top of the wall C. The effect of this arch is to check the hot currents of combustible gases sweeping over the top of the wall C and divert and deflect them downward toward the lower solid portion of the rear wall, L, and thereby form countless eddies and counter-currents within the combustion-chamber before reaching the series of small upper discharge-apertures, L' L'.

In the operation of my improved furnace the combustible properties of the gases escaping unconsumed from the bed of incandescent fuel upon the grate-bars in the fire-chamber B are increased, and they are rendered more ready for oxidation by the discharge of a small supply of highly superheated steam beneath the grate-bars at the point where the fuel is always in its most perfect state of combustion. This small amount of steam is readily decomposed in passing up through the incandescent fuel, and the hydrogen and carbonic-oxide gas formed by its decomposition commingle with the unconsumed gases escaping from the fuel before they pass up over the bridge-wall, and by combining therewith increase the percentage of their combustible properties. In this condition, and at the moment they pass in an intensely-heated and highly-inflammable condition over the bridge-wall C, they are supplied with oxygen by means of the minute currents of hot air admitted thereto from the hot-air chamber E first through the apertures F and then through the apertures F' in the top of the wall, which said currents serve to induce and intensify their combustion. The jets of pure hot air which issue from the apertures F F' are brought more or less into opposition to said currents of

hot unconsumed gases as they are deflected by the arch or hanging wall K, and, becoming thoroughly admixed therewith in the whirls and eddies which are created within the combustion-chamber M, by reason of the peculiar combination and arrangement of said hanging wall K K, with reference to the top of the bridge-wall C, and to the series of cellular discharge-openings L L in the upper portion of the rear wall, L, of said combustion-chamber, induce a complete combustion of said gases. By this ignition and complete combustion of the inflammable gases within the combustion-chamber they are made to develop and impart an increased percentage of heat to the boiler above said chamber, as well as in passing forward thence through the boiler-flues, while no unconsumed particles whatever will remain to be discharged in the form of smoke.

My invention differs from that described in Letters Patent to H. M. Brady, No. 294,007, of February 28, 1884, in that in Brady's furnace no superheater is employed. The steam and air are delivered at a comparatively low temperature to the gases after they have parted with much of their caloric and are measurably cooled, and the second or rear bridge-wall of the combustion-chamber is provided with a large full discharge-opening, whereas in my invention the steam is highly superheated and then delivered under the incandescent bed of coals in the fire-chamber, so that the heat-units absorbed in its decomposition are quickly returned to the furnace.

Highly-heated air is supplied through the bridge-wall immediately at the rear of the fire-chamber to the admixed gases from the fuel and steam when they are at the hottest, and in such manner, by reason of the arrangement of the hanging wall in combination with the series of small apertures in the upper part of the rear wall of the combustion-chamber, as not to reduce their temperature, but by a quick complete admixture therewith promote an immediate ignition and combustion thereof. It differs from the invention described in the patent to P. W. Frain, No. 285,887, October 2, 1883, in that in Frain's furnace no provision is made for increasing the combustible properties of the gases escaping from the fuel

by means of superheated steam, while the supply of air is admitted at a comparatively low temperature to the second or combustion chamber beyond a deflecting-arch therein at a point where the escaping gases have already become measurably cooled. In its construction also the second or combustion chamber is so shallow as that it does not perform the function of creating eddies and counter-currents, which in my device are of great importance in connection with the admission of hot air, as specified. Moreover the outlet from said chamber is not broken up into a series of small apertures.

I do not herein claim the construction of the bridge-wall C with its inclosed hot-air chamber E, nor the combination therewith of the superheater G, nor, broadly, the arrangement of a combustion-chamber at the rear of the fire-chamber, nor the combination of a deflecting arch or hanging wall with said chamber and the bridge-wall.

What I claim as my invention is—

The combination, in a furnace, of the fire-chamber and ash-pit, the hollow bridge-wall back of the same, the combustion-chamber formed in the rear of the bridge-wall by a transverse rear wall pierced with a series of eduction-flues in its upper portion, the hanging wall or deflecting arch interposed between the bridge-wall and rear wall, the air-chamber formed within the hollow bridge-wall and provided with an induction-opening communicating with the ash-pit, and eduction-ports communicating with the fire-chamber and combustion-chamber near the top of the bridge-wall, means for controlling the supply of air to the hot-air chamber, and a superheater within the furnace, communicating by discharge-pipes with the ash-pit, 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:

B. L. ARBECAM,
H. G. MORSE.