(No Model.) 2 Sheets—Sheet 1.

W. H. HARRIS & G. FARR.

FURNACE FOR STATIONARY BOILERS.

No. 252,214. Patented Jan. 10, 1882.

Fig. 1.

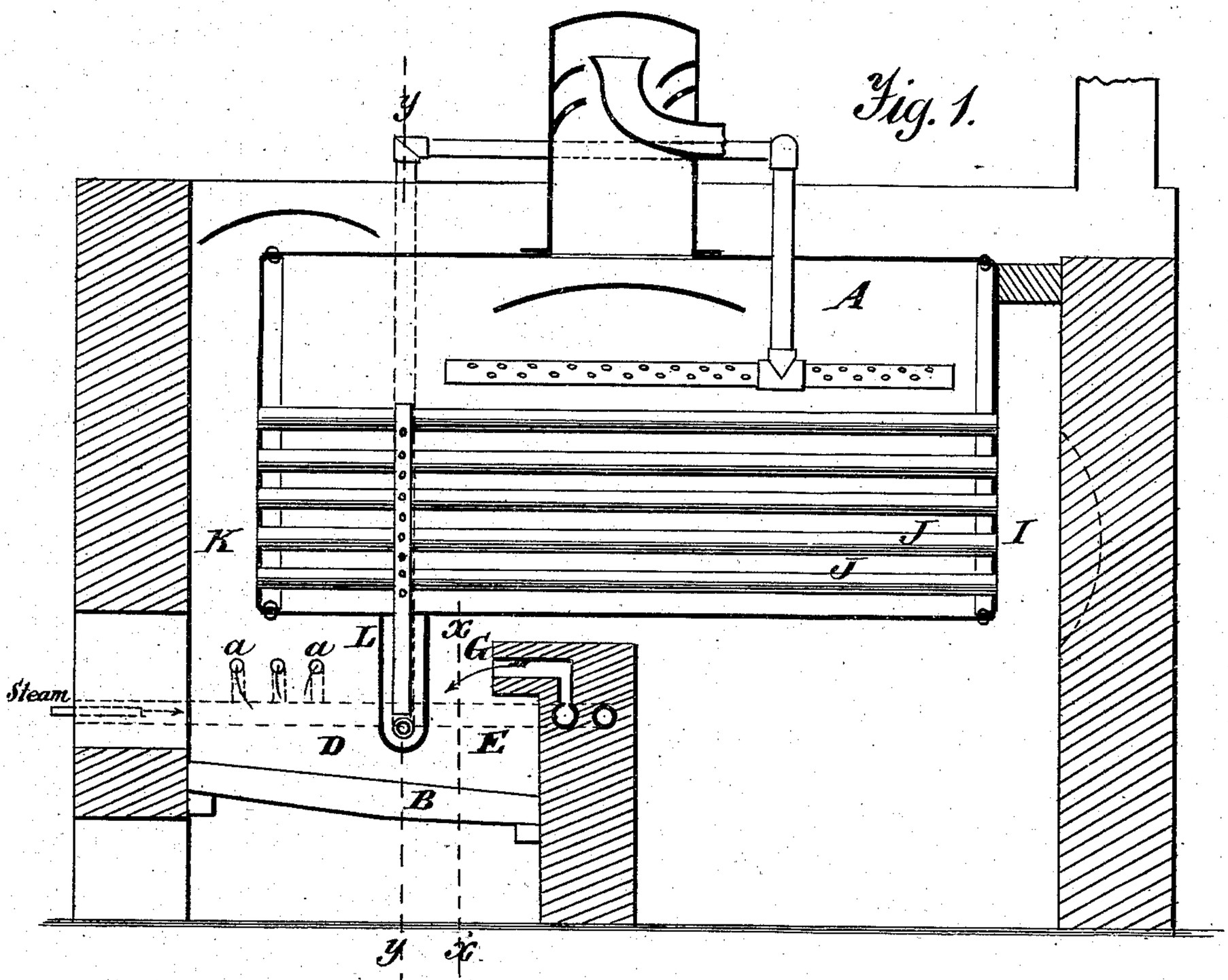
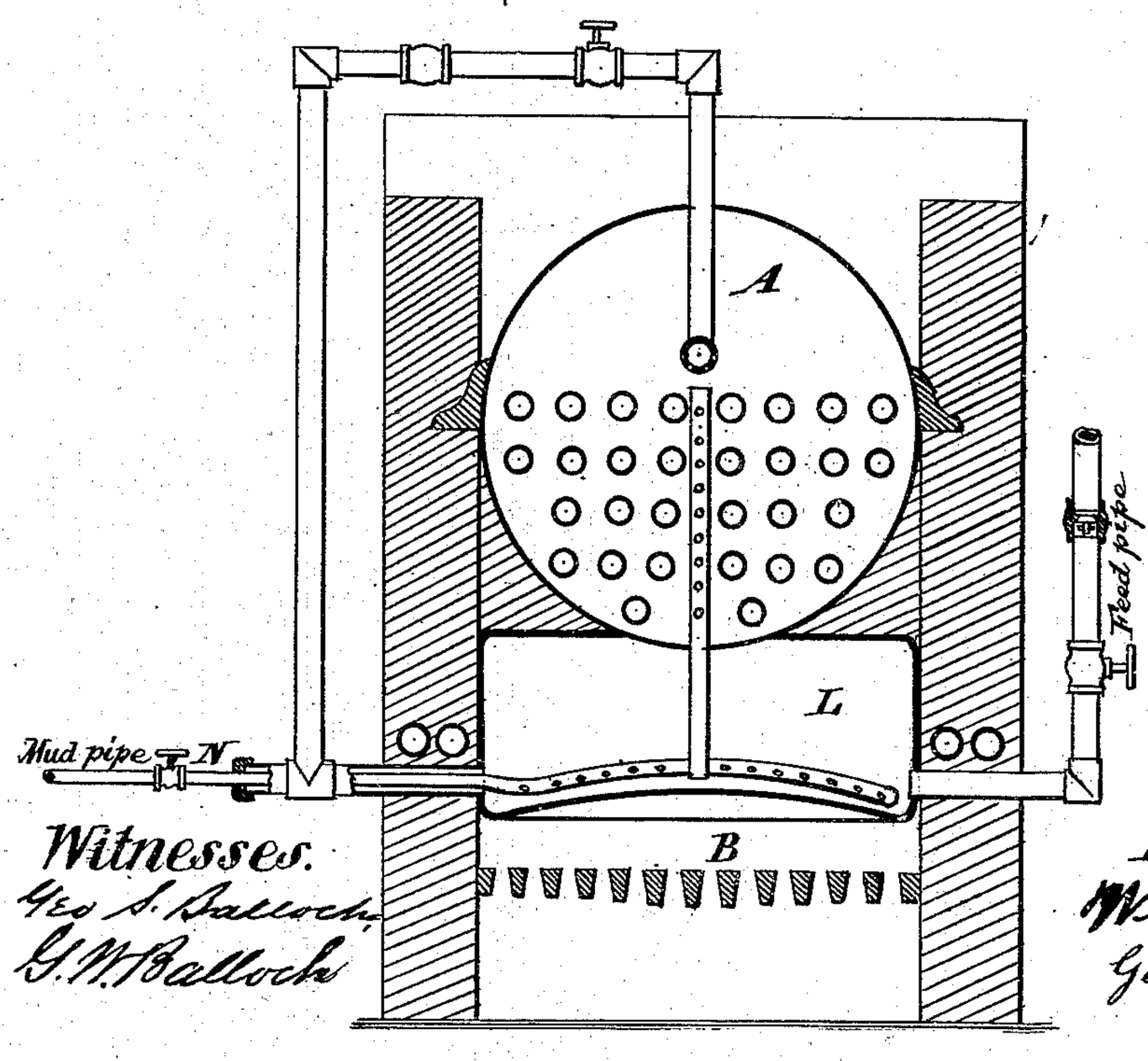


Fig. 2.



Witnesses.
Geo. S. Ballock.
G. W. Ballock

Inventors.
William H. Harris
George Farr,

(No Model.) 2 Sheets—Sheet 2.

W. H. HARRIS & G. FARR.

FURNACE FOR STATIONARY BOILERS.

No. 252,214. Patented Jan. 10, 1882.

Fig. 3.

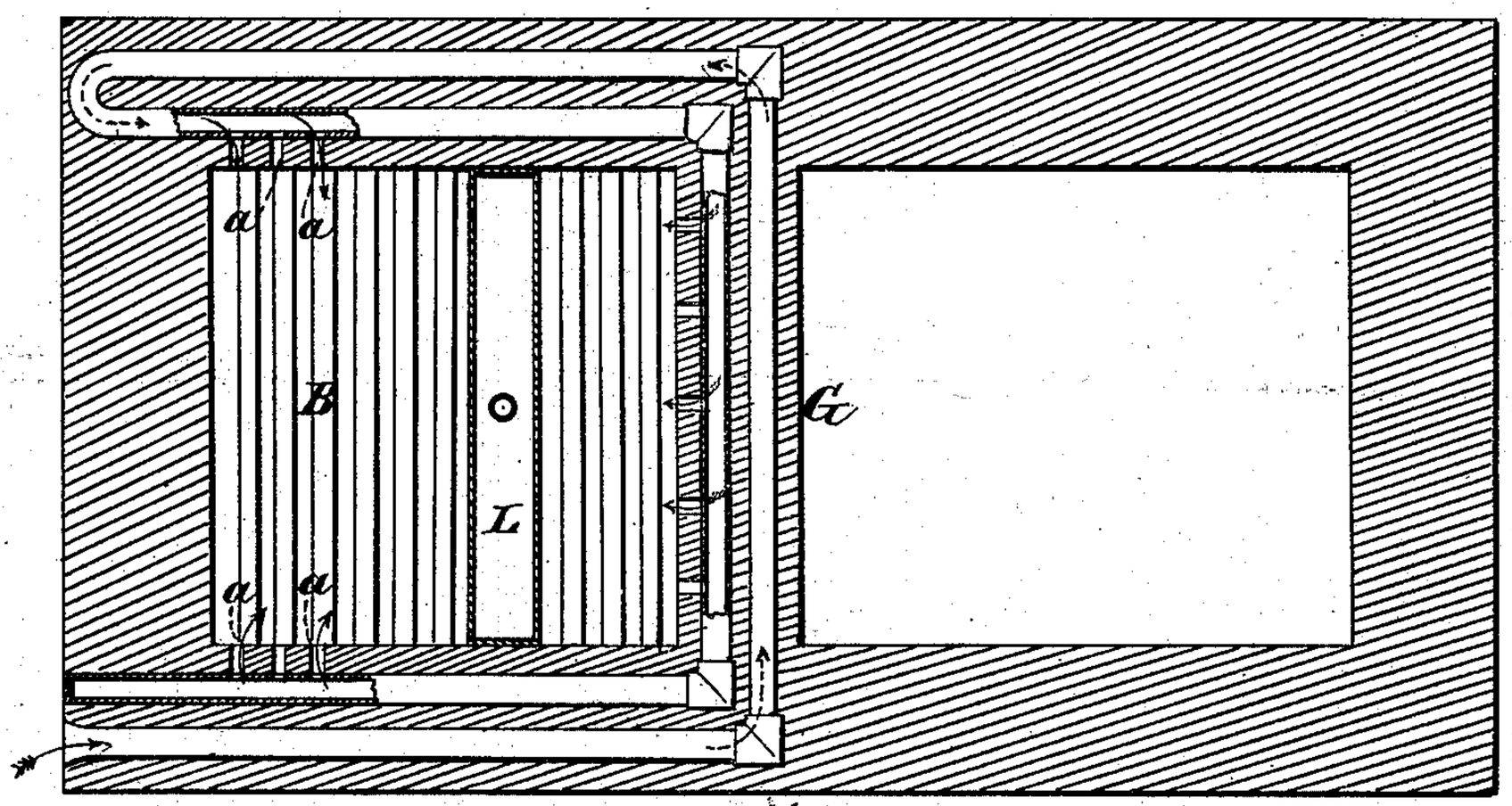
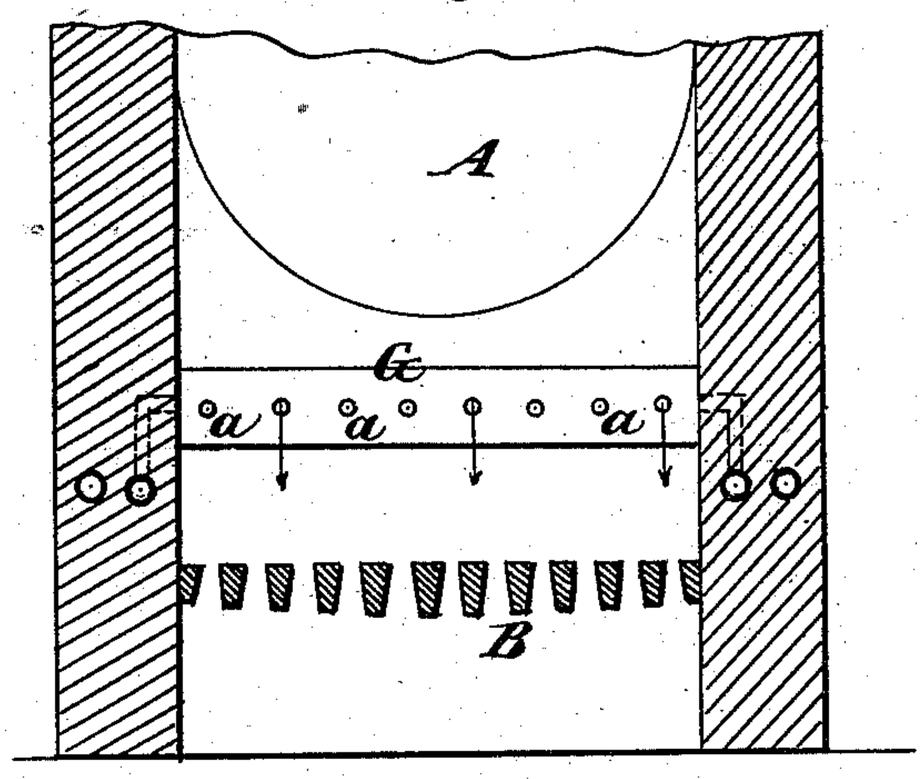


Fig. 4.



Witnesses.
Geo. S. Bulloch,
C. W. Bulloch

Inventors.
William Henry Harris
George Farr,

UNITED STATES PATENT OFFICE.

WILLIAM H. HARRIS, OF BROOKLYN, AND GEORGE FARR, OF NEW YORK, N. Y.

FURNACE FOR STATIONARY BOILERS.

SPECIFICATION forming part of Letters Patent No. 252,214, dated January 10, 1882.

Application filed December 7, 1881. (No model.)

To all whom it may concern:

Be it known that we, WM. H. HARRIS, of Brooklyn, Kings county, and GEORGE FARR, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Furnaces for Stationary Boilers; and we 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 a part of this specification.

This invention relates to improvements in furnaces and boilers of the stationary type.

Our invention is applicable to a variety of boilers, but we will illustrate it by means of the ordinary flue or tubular boiler; and its objects are, first, to prevent incrustation on the boiler-shell of the boiler by furnishing it with pure water; second, the nearly perfect combustion of fuel by means of a proper supply of heated air and at the proper place or places; third, disposing of the fuel in such manner that all the combustible gases will be consumed, and thereby the avoidance of smoke and economy of fuel.

In the drawings hereto annexed, Figure 1 illustrates a vertical longitudinal section through the center of the boiler; Fig. 2, a vertical transverse section of the same; Fig. 3, a horizontal section, and Fig. 4 a face view of the bridge-wall.

A is the boiler, B the grate-bars, and C the ash-pit; D E, front and rear combustion-chambers; F, throat formed between the pendent partition and the forward projection, G, of the top of the bridge-wall. H is the rear flue, and I the rear connection. J are fire-tubes.

When it is intended to carry the outgoing products of combustion over the boiler for the purpose of superheating the steam or for heating air the chimney is placed at the rear end of the boiler. Then they pass through return smoke-connection K and over the boiler to the uptake; but in ordinary cases the smoke-stack may be placed just over the smoke box or connection K in the usual way. The location of the smoke-box, however, is immaterial to our invention.

We will now describe the functions and operation of that portion of our invention just above pointed out.

Fuel being fed to the furnace in the usual way, and the fire being started some time, the air in the air-flues becomes heated. As soon as the fire becomes incandescent and steam is raised the blast is put on, either by means of a fan-blower or a steam-injection pipe. The air-flues extend twice around the furnace, so that it becomes thoroughly heated, and in this condition it is forced out through the apertures *a* in the side of the front combustion-chamber, and also through the air-outlets in the projection of the bridge wall. The fire now being in good condition the gases evolved from the fuel in the front chamber are forced beneath the pendent water-partition and come in contact with the gases and intense flame in the rear combustion-chamber, and evolving from this the combustible gases are again met with another blast of heated air at the throat of the bridge-wall, with which they are intimately mixed, and in this condition they form a complete chemical union, become ignited and entirely consumed, so that no smoke or combustible gases escape. This pure flame and intense heat is made to impinge on the heating-surface of the boiler. Said surface being free from soot and oxidation, the heat is rapidly taken up and transmitted to the water in the boiler. Thus economy of fuel is the result, and a clear avoidance of the smoke nuisance.

The second feature of our invention is locating across the combustion-chamber a hollow pendent water-partition, L, dividing the furnace chamber into two—viz., front and rear—as before described. The top of this partition is flat and slightly arched on the bottom, and extends well down toward the grate-bars. Into this partition we introduce our feed-water, and from its location the water is soon heated, when it is transmitted to the boiler through the central perforated pipe, or through the outside circulating-pipe, M, which also terminates in a perforated pipe arranged at right angles therewith.

On the arched bottom of the water heater, generator, and purifier we locate a perforated blow-off pipe, N, curved to conform to the curve of the heater. We curve the heater in this way, for the reason that any sediment or mud

precipitated and deposited on the bottom of the heater naturally seeks the lowest level. The lowest part of the heater is in the coolest part of the furnace, so should any accumulation of sediment remain the heater will not be injured. In this way the water is entirely cleansed of any foreign substances that may enter with the feed-water before its introduction into the boiler, and hence no incrustation is formed on the boiler-plate and tubes, and, as before stated, the heat is more rapidly transmitted through it than when it is in a dirty or muddy condition. The boiler and tubes also last longer, for the reason they will not burn or blister while plenty of water is in immediate contact with boiler-plate and tubes. The introduction of the water to the boiler is gradual, and well distributed through all parts of the boiler by means of the perforated pipes. By the purity of the water in the boiler foaming and priming is almost entirely avoided. But should it happen, from agitation or other causes, water should rise and saturate the steam too much, the separators in the dome will liberate all the steam from the water, and thus dry steam is carried to the engine.

The feed-pipes and blow-off pipes may be located as may be required by the boiler-setting.

The various steam-boiler appliances are not shown, as they will suggest themselves.

The location and arrangement of air heating and distributing flues will be readily seen at Fig. 3.

Referring, again, to the rear combustion-chamber, E, it will be seen it extends under the bridge-wall projection, forming a hooded chamber. This hooded chamber plays a very important part in the perfect combustion that takes place there, and in this way, that a large mass of incandescent feed is placed just at the point where it meets the gases from the front combustion-chamber, and if the layer were thin they would readily rush through it without being consumed; but by the mass of incandescent coals there the gases are retarded until they have time to unite with the air and become thoroughly mixed, when the mixture readily ignites and is instantly consumed, and thus the formation of smoke is avoided.

We are fully aware that pendent partitions are old, being both solid and hollow; and we are also aware that it is not new to introduce heated air, either at the side or at the bridge wall, for many attempts have been made in this direction; but we are not aware that pendent independent hollow water-partitions arched, connected, and adapted to be cleaned like ours have ever before been used. Neither are we aware that any such an arrangement of heating-flues with their capped projecting perforated bridge-wall and apertures leading into the fire on the other side of the pendent partition have been used.

We do not therefore claim any former arrangements; but

What we do claim is—

1. A furnace divided by an independent water-partition into front and rear combustion-chambers, said combustion-chambers being surrounded by air-heating flues arranged to twice encircle said furnace, said flues terminating in side apertures in the front chamber and in a series of perforations in the bridge-wall in an upper forward projection, whereby the gases are made to mix with the heated air and become ignited and thereby consumed in the manner described.

2. The combination, in a heating-furnace consisting in a divided furnace-chamber, of a hollow arched pendent partition, a hollow bridge-wall having a forward-projecting hood or cap forming a hooded chamber beneath it, as described, and a series of air-heating flues encircling the furnace and within the walls, adapted to supply heated air to the side apertures in the front combustion-chambers and to the perforations in the hood or projection in the bridge-wall in the manner set forth and described.

3. The combination, in a steam-boiler furnace, of the arched pendent partition arranged and located as described, the feed-water pipe, the central perforated pipe, the outside circulating-pipe, terminating in a perforated pipe at right angles thereto, and the blow-off pipe, all arranged for joint operation in the manner set forth and shown.

In testimony that we claim the foregoing as our own we affix our signatures in presence of two witnesses.

WILLIAM HENRY HARRIS.
GEORGE FARR.

Witnesses:
G. W. BALLOCH,
GEO. S. BALLOCH.