Sheet 1
2 Sheets.

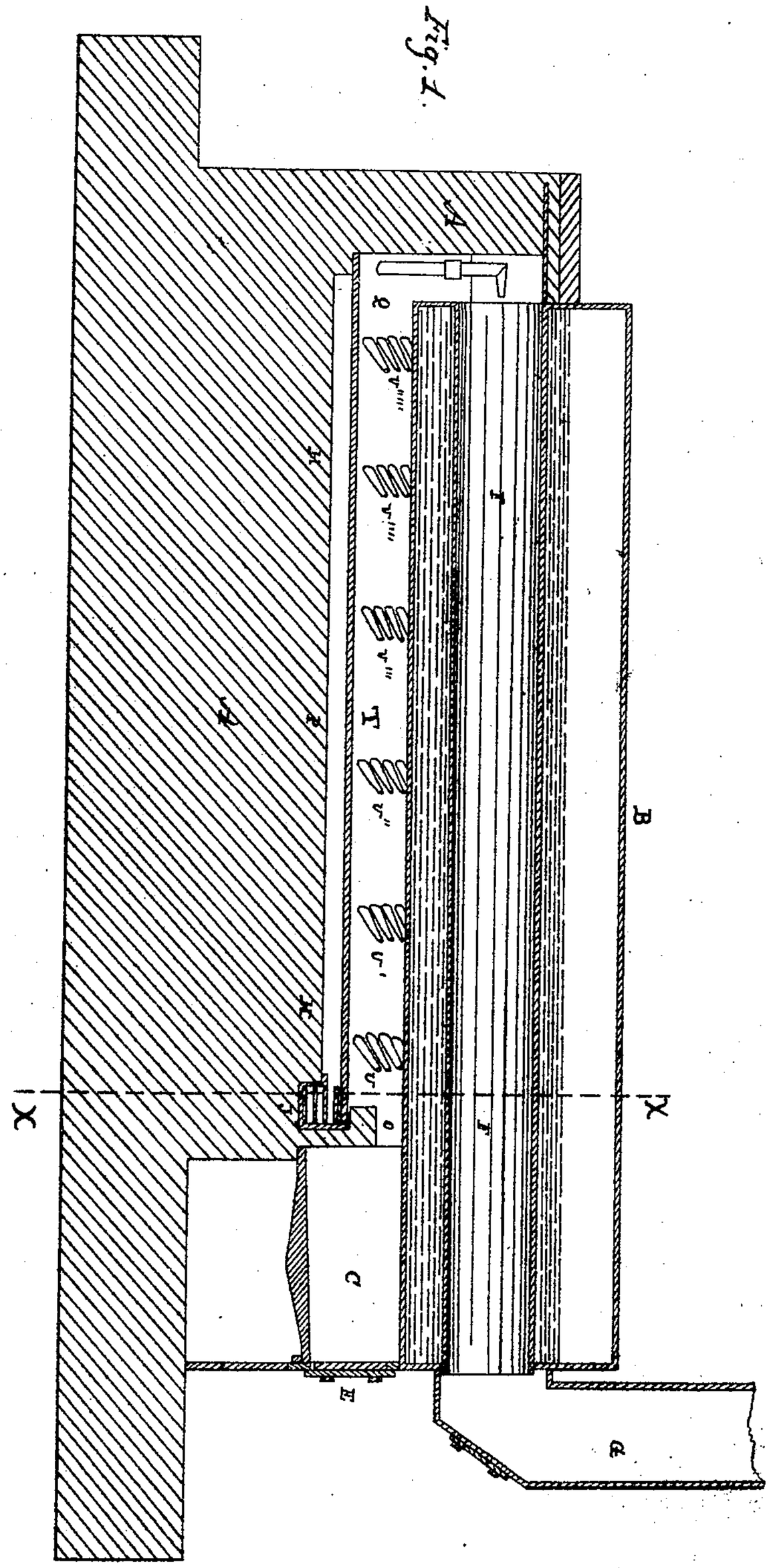
C. Fownes.

Furnace for Steam-Boiler.

No. 72278 Patented Dec. 17, 1867.

2 Sheets.

Fig. 1.



Witnesses
P. A. Stout
W. P. Gengenbach

Inventor
Chas. Fownes

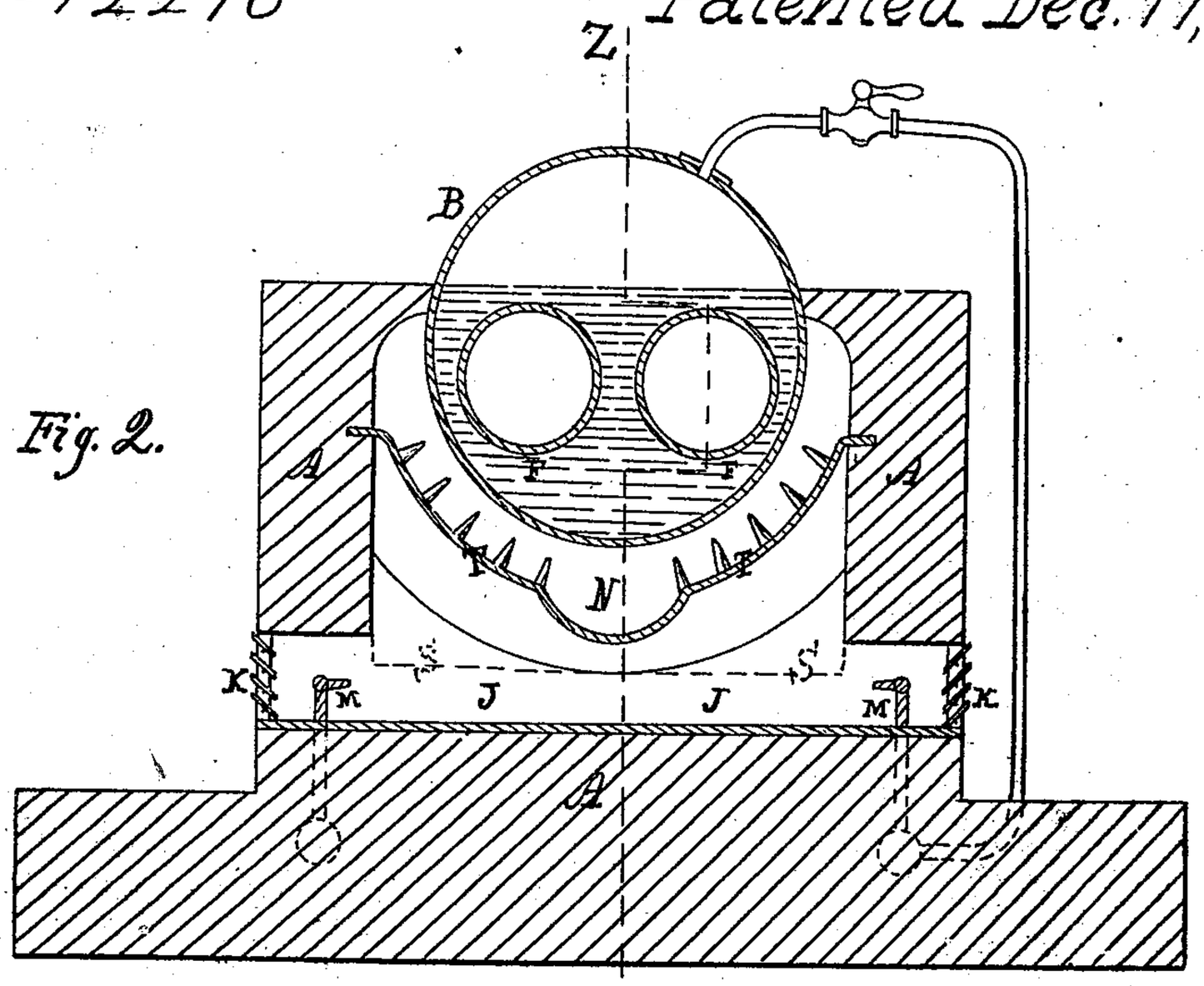
Sheet 2.
2 Sheets.

C. Fownes.

Furnace for Steam Boiler.

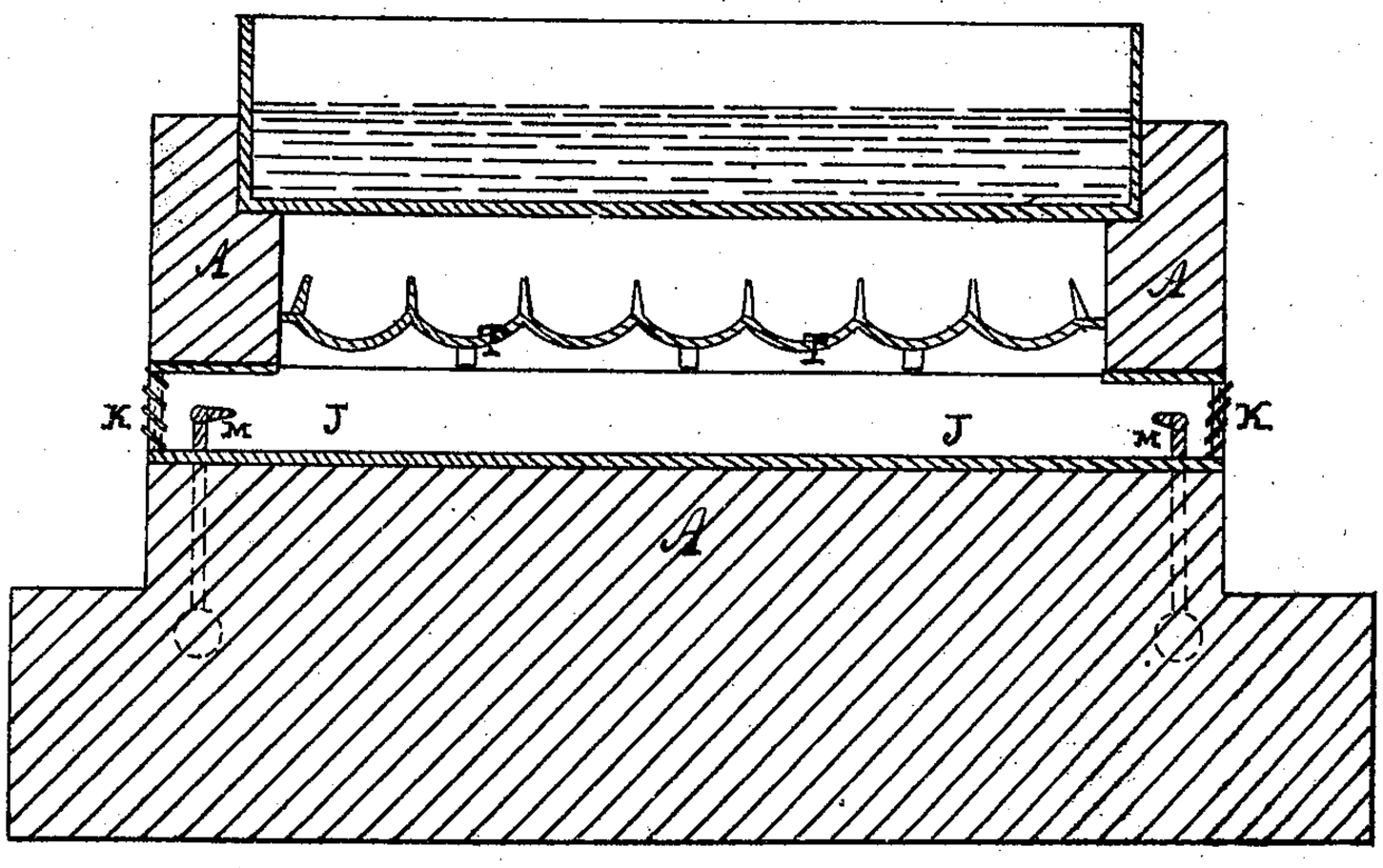
No. 72278 Patented Dec. 17, 1867.

Fig. 2.



Z

Fig. 3.



Witnesses

P. A. Stout

W. P. Gengenbuy

Inventor.

Chas. Fownes.

United States Patent Office.

CHARLES FOWNES, OF PITTSBURG, PENNSYLVANIA.

Letters Patent No. 72,278, *dated December* 17, 1867.

FURNACE FOR STEAM-BOILERS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, CHARLES FOWNES, of the city of Pittsburg, in the county of Allegheny, and State of Pennsylvania, have invented a new and improved Smoke-Consumer; and I do hereby declare that the following is a full and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section of my smoke-consumer, applied to a steam-boiler, through the line *z z*.

Figure 2 is also a sectional view of the same, but through the line *x x;* and

Figure 3 is a sectional view of my smoke-consumer applied to flat-bottom evaporating-pans, stills, or boilers.

The nature of my invention consists in a smoke-consumer, more fully described below, applicable to the furnaces of steam-boilers, stills, or evaporating-pans, provided with a number of burners so arranged as to furnish a supply of fresh atmospheric air, at different degrees of heat, in different parts of the furnace, in the manner and for the purpose below described.

In order to understand clearly my invention, it is necessary not only to examine its construction, but also to have a correct idea of its mode of operation.

I will describe the application of my smoke-consumer to a cylindrical steam-boiler, as it is almost the same as for a cylindrical still, and that for any other shape of boilers, stills, &c., the only difference being in the shape of the diaphragm T T, which will be varied to suit the shape of the apparatus, and carry out the same principle.

A is the masonry of the furnaces; B is the cylindrical boiler; C is the fire-room, with its grate-bars D and door E; F F are the flues of the boiler, and G is the smoke-stack, so far, all arranged in the ordinary way. Now, instead of allowing the smoke and unburnt products of combustion to expand in a large space, under and on the side of the boiler, as is usually done in furnaces built as the dotted line S, fig. 2, I build the bottom of my furnace of a circular shape, H H, leaving an equal distance from the shell of the boiler all the way, and I place a diaphragm or plate, T T, so as to divide that space in two compartments, one above the diaphragm and one smaller below the diaphragm. The diaphragm T T is composed of as many separate plates jointed together as may be thought best to make it, and it is provided with a number of burners or small pipes, located in rows, running across the furnace, and placed at certain intervals from each other, as represented by the letters U U′ U″, &c. These burners or small pipes U U′ U″, &c., are not set in the plates T at right angles with the surface of said plates, but are inclined towards the front of the boiler, or in opposite direction to the natural direction of the draught of the furnace. At the extreme end of the diaphragm T there are two pipes, V V, which extend upward, and have an elbow and one or more burners directly opposite to the flues F F. At the point *x x*, where the sectional view is taken, there is below the diaphragm T T a channel, J, which extends the whole breadth of the furnace, under the bridge-wall. To that channel there are one or more openings K K, to admit of the external air entering the channel J, and that, or these openings K K, are provided with registers to regulate the amount of air thus admitted. M M are jets of compressed air or steam, which are introduced near the openings K K, so as to impel the air forward, and, as it were, to compress it in the channel J.

The operation of my smoke-consumer is based on the following facts, and is as follows: When fuel is burnt in a furnace of considerable length, the unburnt products of combustion, smoke, gas, and particles of combustible, as they pass the bridge-wall O, are at a high degree of temperature; but as they travel on, they lose a great part of their heat, by giving it off to the boiler and to the sides of the furnace, so that when they arrive at the point Q they are so far reduced in temperature that any admixture of atmospheric air at that point, if not highly heated, would not only fail to ignite them, but actually help to lower still more their temperature, and they would be no better than dull, heavy, damp smoke; but if fresh air is admitted at the point O, in a limited proportion, it will ignite a part of the unburnt gases and smoke, and produce a blaze which will heat the part from O to P; and if at the different points U U′ U″ U‴ U⁗, &c., air is also admitted, but air more and more heated as we proceed on, then new centres of combustions will be created at each row of burners, which, by heating further the diaphragm T, will heat the air below to such degree that, at the point Q and through the pipes V V, the air is so hot that it will ignite the balance of the unburnt particles of carbon, the gases, and fill the flues F F with a volume of flame.

The object of my arrangement of plates and of burners being to supply air increasing in temperature as the temperature of the smoke decreases in the furnace and flues, so as to establish a balance, and obtain at all points a perfect combustion of the gases and particles of solid carbon, products of imperfect combustion contained in the smoke, the diaphragm T T is so shaped at bottom as to present a channel or gutter, N, where all the dust will collect, which can be removed at pleasure. In the case of flat-bottom evaporating-pans or stills, fig. 3, the plates are corrugated so as to answer the same purpose.

I have placed my burners inclined in the opposite direction to the draught of the furnace, so as to create a thorough mixture of the fresh air and the unburnt gases, but this is not indispensable to the working of my