

(No Model.)

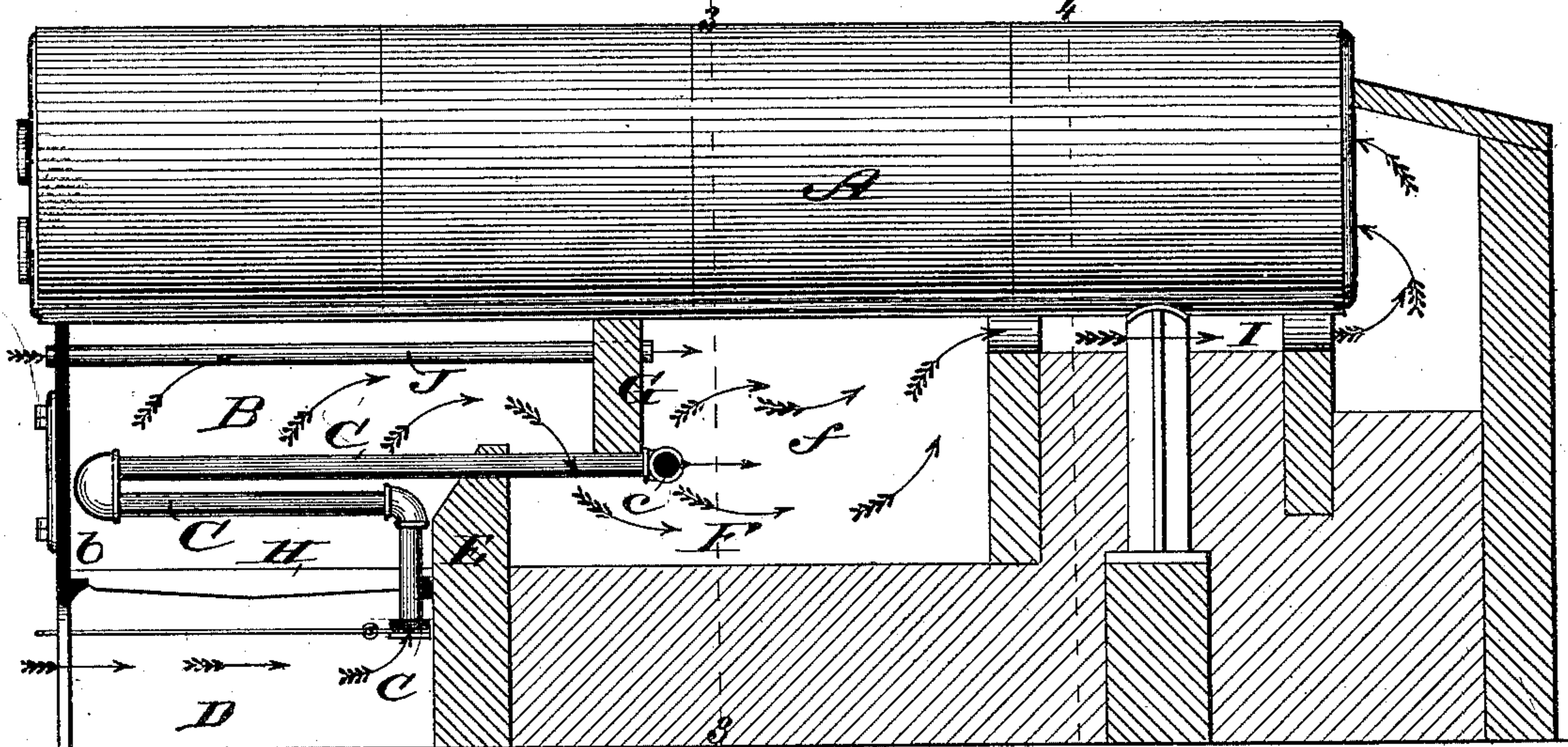
P. W. FRAIN.

SMOKE CONSUMING FURNACE.

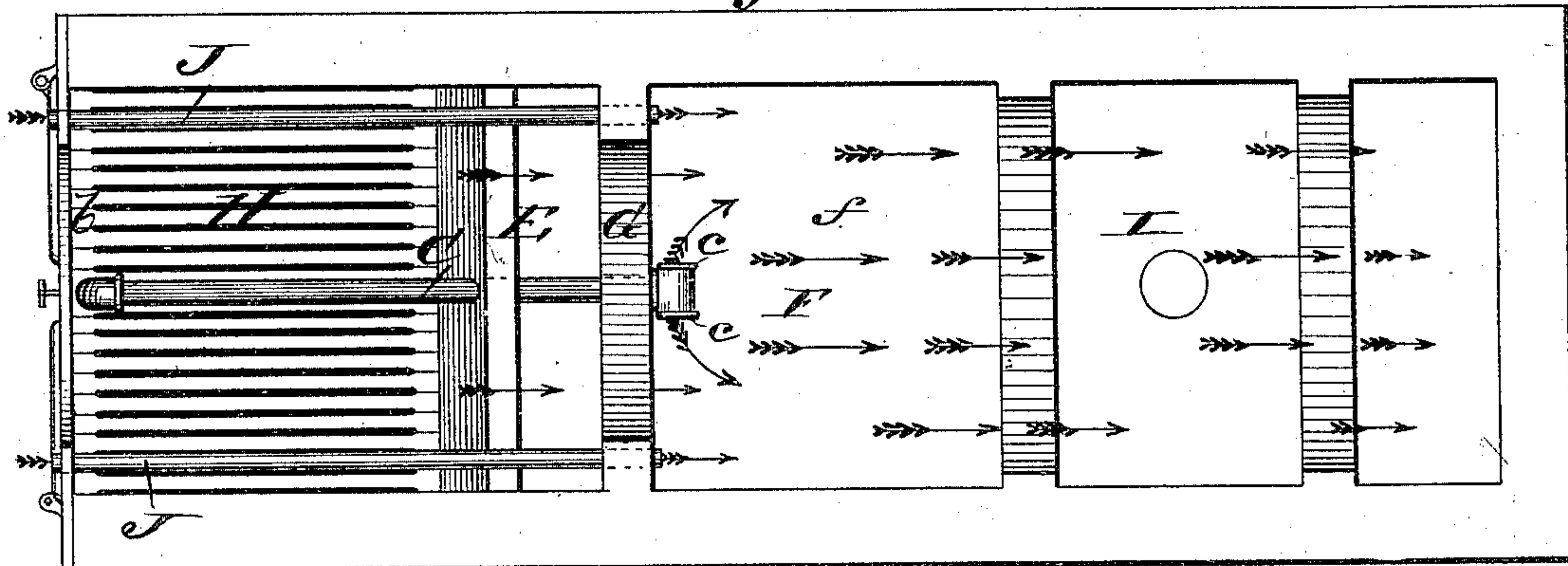
No. 285,887.

Patented Oct. 2, 1883.

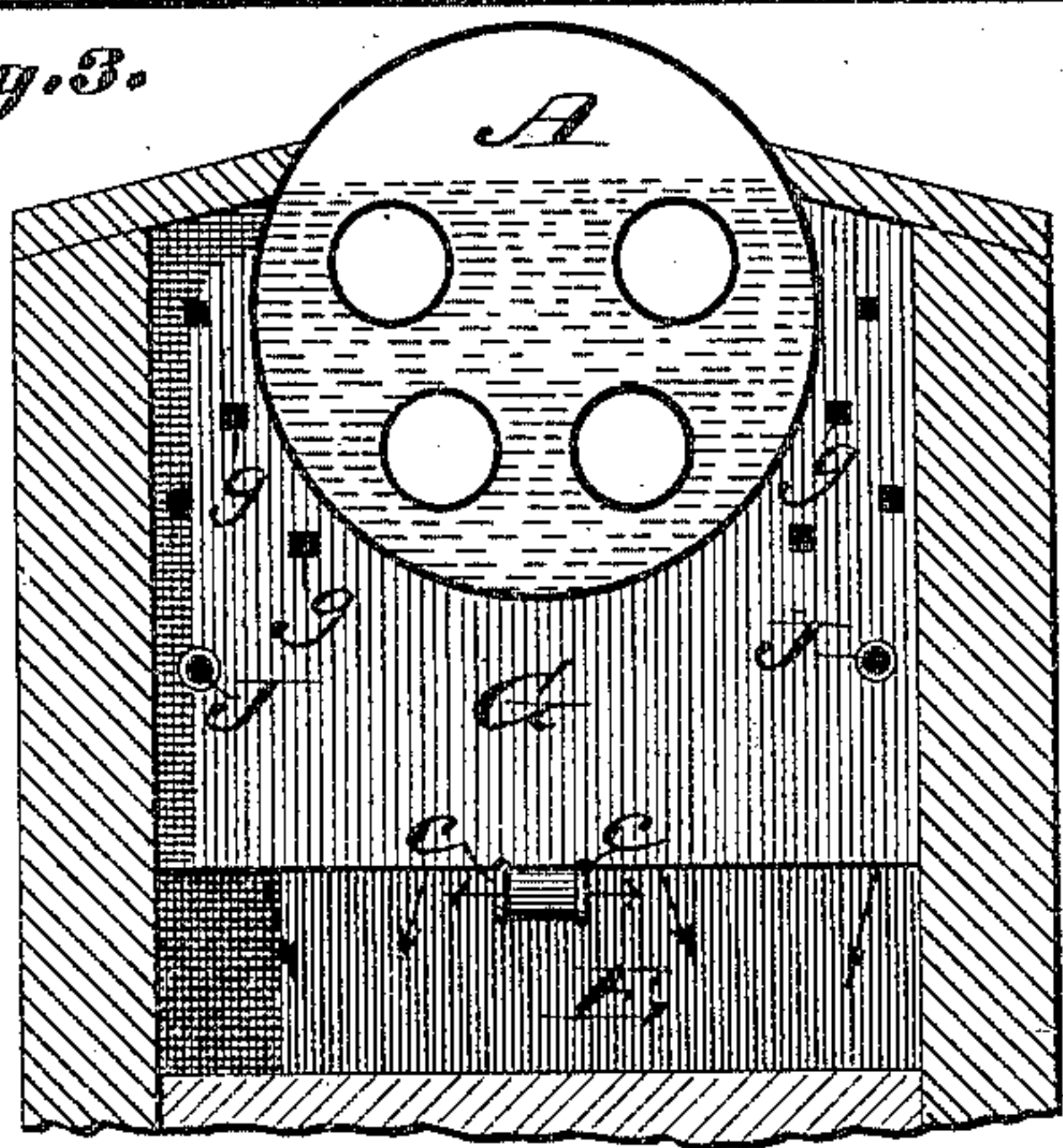
*Fig. 1.*



*Fig. 2.*

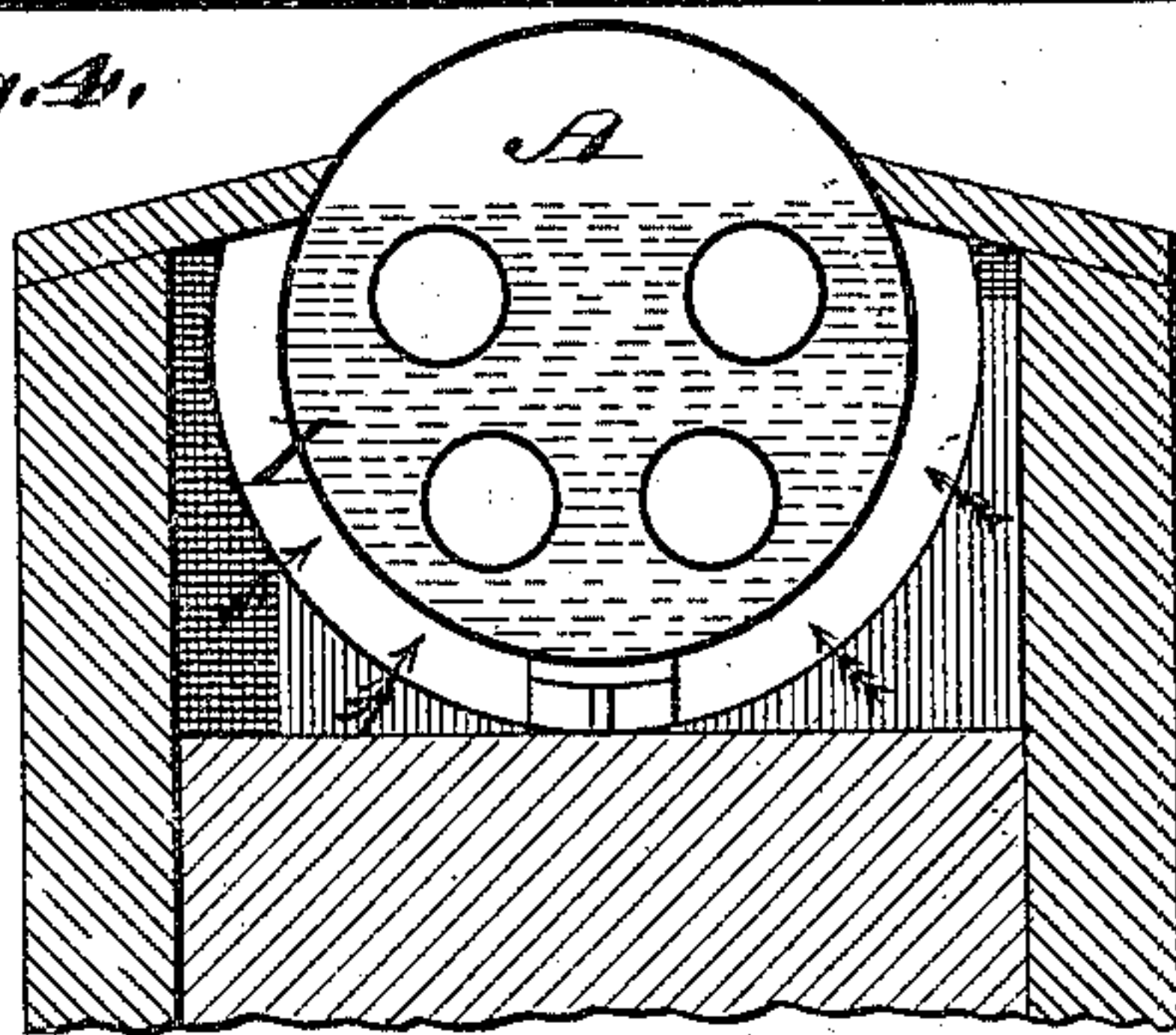


*Fig. 3.*



Attest:  
Charles Pickles  
Albert G. Fish

*Fig. 4.*



*Inventor;*  
*Patrick W. Frain*  
*by C. D. Moody*  
*atty*



# UNITED STATES PATENT OFFICE.

PATRICK W. FRAIN, OF ST. LOUIS, MISSOURI.

## SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 285,887, dated October 2, 1883.

Application filed March 13, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, PATRICK W. FRAIN, of St. Louis, Missouri, have made a new and useful Improvement in Smoke-Consuming Furnaces, of which the following is a full, clear, and exact description, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a vertical longitudinal section taken through a furnace having the improvement; Fig. 2, a horizontal section on the line 2 2 of Fig. 1; Fig. 3, a vertical cross-section on the line 3 3 of Fig. 1, and Fig. 4 a vertical cross-section on the line 4 4 of Fig. 4.

The same letters of reference denote the same parts.

The improvement is shown in the drawings in connection with an ordinary steam-boiler, A, the shape of which is well understood.

B represents the furnace beneath the boiler. An air pipe or flue, C, leads from the ash-pit D upward, near the bridge-wall E, into the furnace-chamber B; thence through the furnace-chamber to or toward the front *b* of the chamber; thence returning to and past the bridge-wall E into the flue F; thence past a diaphragm, G, and finally terminating in the portion *f* of the flue F.

To better distribute the air escaping from the pipe C into the flue F, the pipe is provided with branches *c c*, causing the air to be delivered to the right and to the left in the flue. The object of the pipe C is to deliver heated air into the flue F. To this end the pipe is arranged in the middle of the furnace-chamber, and, preferably, sufficiently above the grate-bars H to bring the pipe into the hottest part of the fire. The air then becomes highly heated by the time it reaches the flue F, at which point it encounters the smoke coming from the furnace-chamber. The flue F is, in effect, a second combustion-chamber, where, in the smoke, with the aid of the heated air introduced through the pipe C, is consumed.

The flue F is the full width of the furnace-chamber, preferably, and extends from the boiler downward to about the level of the grate-bars H. It does not, however, extend to the rear end of the boiler, but is contracted to form the flue I, which, as shown more dis-

tingly in Fig. 4, is quite shallow and made to conform to the curvature of the boiler.

The improvement is operative without the diaphragm G, but better results are obtained when the diaphragm is used. The smoke from the furnace, as indicated by the arrows, descends after passing the bridge-wall, and then, after passing the diaphragm, rises and expands in the flue-space *f*, and at that point mingles with the hot air. The result is further improved by introducing auxiliary hot-air currents through the pipes J J, which lead, at each side of the furnace-chamber, from the front of the furnace through the furnace-chamber and diaphragm, and terminating in the space *f*. The movement of the air through the pipes J J is indicated by the arrows in Figs. 1, 2, and the movement of the air-current through the pipe C is indicated by the arrows in Fig. 1 more especially. The diaphragm G is preferably perforated at *g g*, Fig. 3, to allow a small portion of the smoke to pass through the diaphragm, which, in practice, being made of fire-brick, becomes highly heated, and the smoke, in consequence, passing through the diaphragm is more readily consumed.

I claim—

1. The combination of the chamber B, the space F, the diaphragm G, and the pipe C, having the branches *c c*, arranged substantially as shown and described.

2. The combination of the furnace-chamber B, the flue F, the pipe C, the pipes J J, and the diaphragm G, substantially as described.

3. The combination of the furnace-chamber B, the ash-pit D, the pipe C, the flue F, the diaphragm G, and the flue I, substantially as described.

4. The furnace-chamber B, having the air-pipe C, leading from the ash-pit D upward into the furnace-chamber, thence through said chamber, and thence past the bridge-wall and leading into the flue F, behind the diaphragm G, substantially as shown and described.

Witness my hand this 9th day of March, 1883.

PATRICK W. FRAIN.

Witnesses:

C. D. MOODY,  
CHARLES PICKLES.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

Washington, D. C., November 2, 1883.

Whereas, Charles D. Moody, attorney for the party in interest, has, in writing, refused to receive Letters Patent No. 285,887, granted October 2, 1883, upon the application of Patrick W. Frain, of St. Louis, Missouri, for an improvement in "Smoke-Consuming Furnaces," for the reason that claim 1 of the printed specification was improperly included as a part thereof and that one of the claims of the application was omitted therefrom, and—

Whereas, an examination of the case shows that said Letters Patent were not issued in accordance with the official record of the case;

It is hereby ordered that the seal of said Letters Patent be broken and the grant returned to the file marked *Canceled*, and that Letters Patent in proper form be issued pursuant to the record of the case in the Patent Office.

[SEAL.]

BENJ. BUTTERWORTH,  
*Commissioner of Patents.*

Approved:

H. M. TELLER,  
*Secretary of the Interior.*