

E. P. PENNIMAN, Sr.  
Heater or Furnace.

No. 223,450.

Patented Jan. 13, 1880.

Fig. 2.

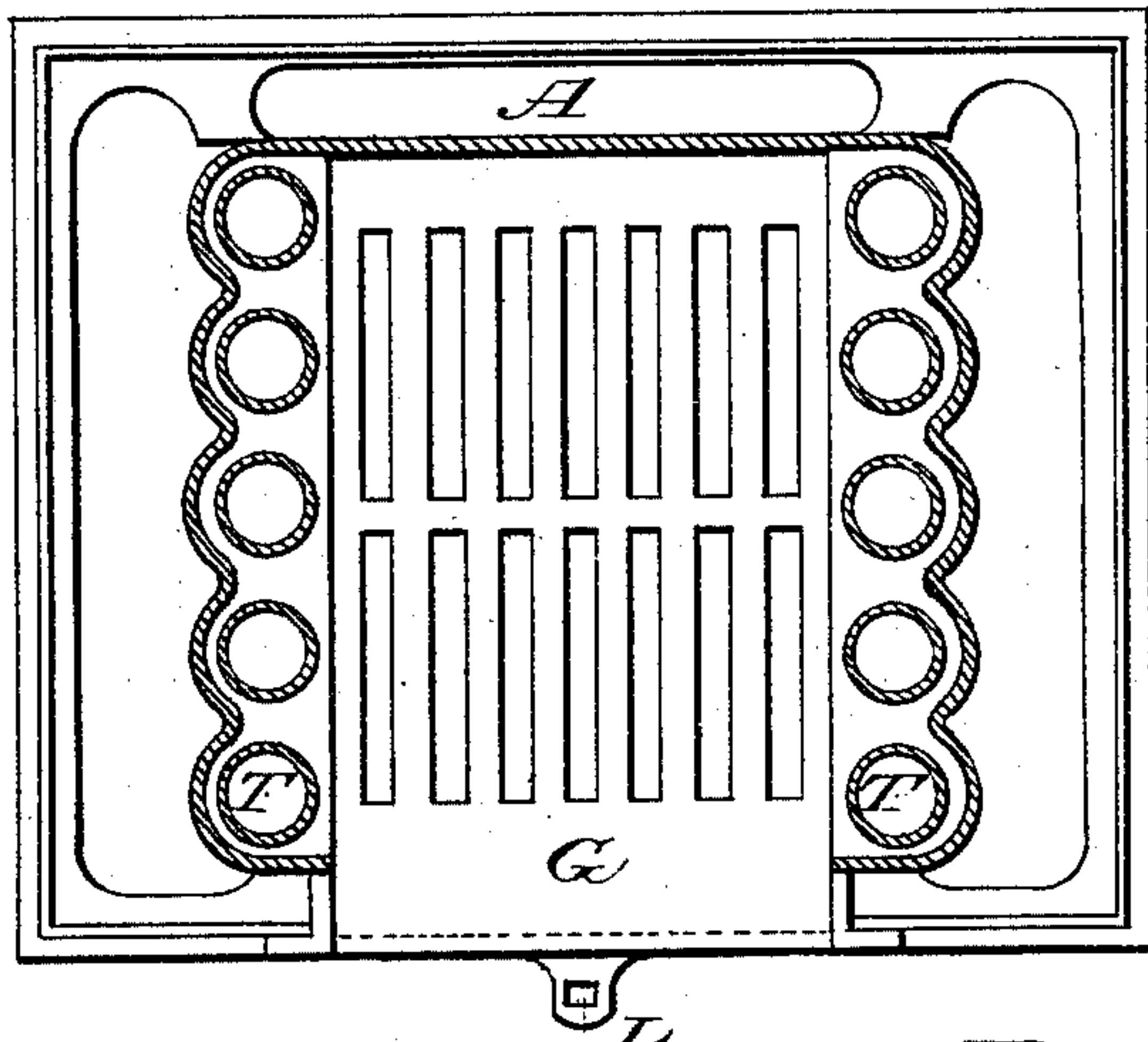


Fig. 1.

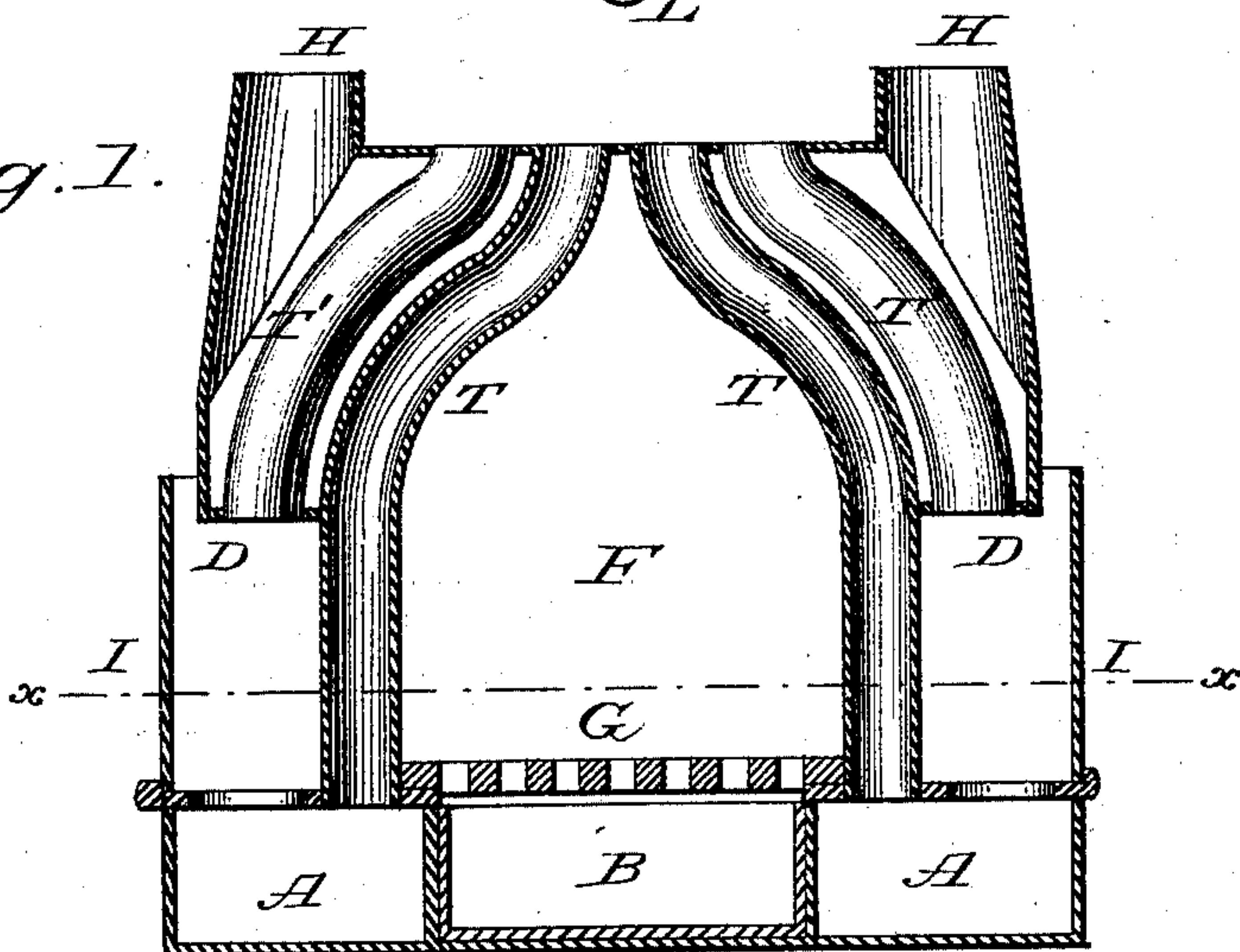
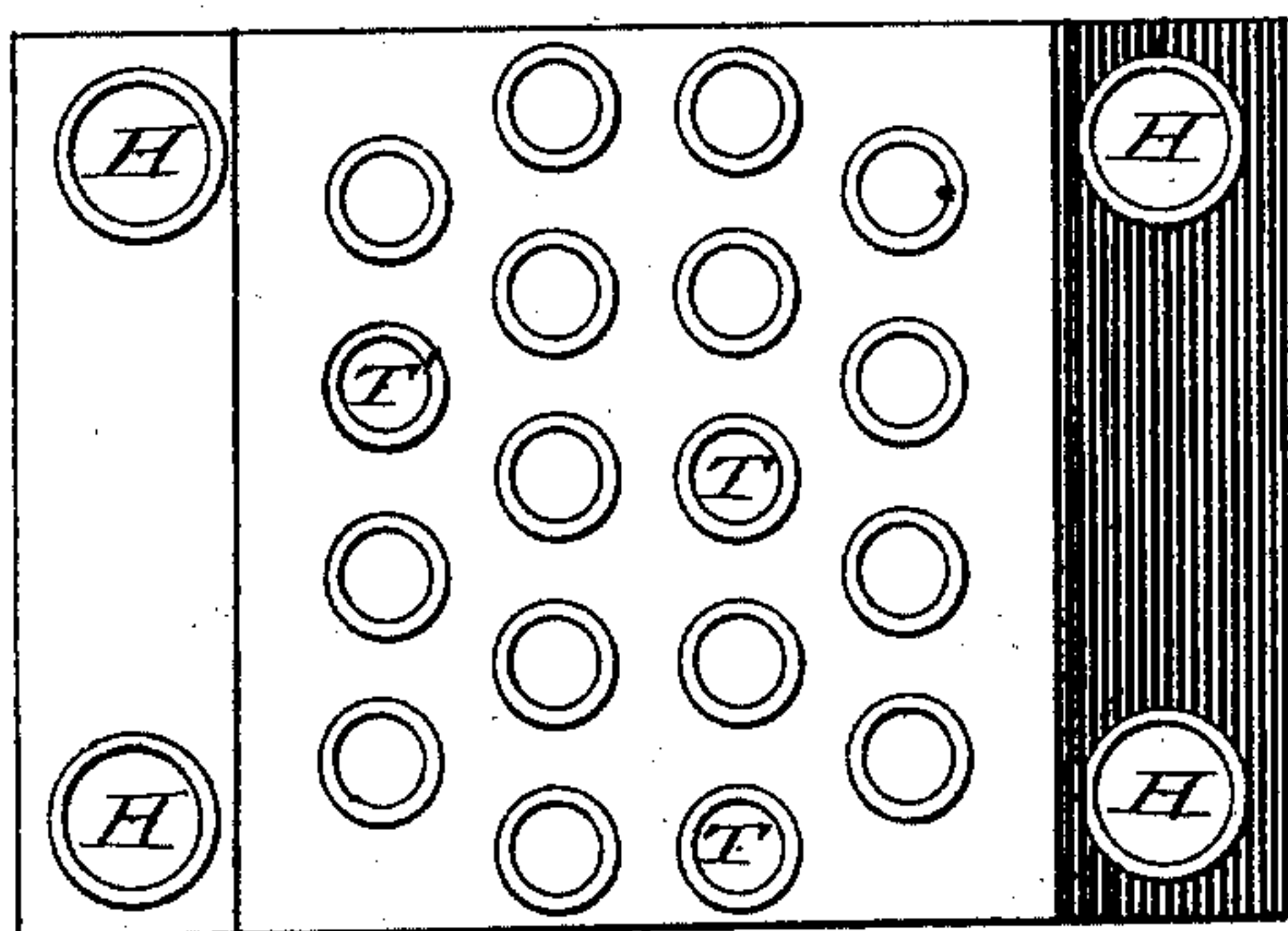


Fig. 3.



Witnesses:  
*J. H. Miller*  
*Le. B. Wright*

Inventor:  
*Elyak P. Penniman Sr.*  
By Attorney.  
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# UNITED STATES PATENT OFFICE.

ELIJAH P. PENNIMAN, SR., OF BLOOMINGTON, ILLINOIS, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO NICHOLAS DIEDRICH.

## HEATER OR FURNACE.

SPECIFICATION forming part of Letters Patent No. 223,450, dated January 13, 1880.

Application filed September 24, 1879.

*To all whom it may concern:*

Be it known that I, ELIJAH P. PENNIMAN, Sr., of Bloomington, in the county of McLean and State of Illinois, have invented certain new and useful Improvements in Hot-Air Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being made to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a vertical section of my improved furnace; Fig. 2, a horizontal section through the line *x x* of Fig. 1; Fig. 3, a top or plan view of the same.

My invention relates to certain new and useful improvements in the class of hot-air furnaces employing cold-air tubes on both sides of the furnace, having for its object the production of a furnace in which the cold-air tubes are subjected to the heat their entire length, and also entirely around them; and to this end the invention consists in the general construction, arrangement, and combination of parts, all as will be hereinafter fully described, and specifically pointed out in the claims.

To enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation.

In the drawings, A represents the cold-air chamber or chambers; B, the ash-pit, and G the fire-grate.

T T' represent two sets of cold-air tubes on both sides of the furnace. The interior set of tubes, T, extend to the bottom of the furnace and communicate with the cold-air chamber or chambers A. They also constitute the side walls of the fire-box. The short tubes T' are arranged a short distance outside of the tubes T, and alternating therewith, a sufficient space being left between them to permit the heat and smoke to circulate around them, and from thence out through the combustion-flues H. These short tubes T' are about half the length of the long tubes T, and they are held in place by the plate or plates D.

All of the cold-air tubes are curved over the top of the fire-box and their upper ends con-

nected with the top of the furnace, by which they are held in place, and communicate with the usual hot-air chamber arranged over the same.

I represents an outer casing, through which air is admitted to the pipes T', the air in its passage to said tubes being partially heated by coming in contact with the walls of the fire-box formed by the lower portions of the tubes T.

The smoke or combustion flues H communicate with the interior of the furnace through the plates which constitute the outer casing of the upper portion of the furnace.

The cold air is received by the tubes at their lower ends, and becomes heated as it passes through said tubes by the heat and smoke, which pass entirely around them, and, owing to the tubes curving directly over the fire-box, the air passing through them becomes more intensely heated as it reaches the upper ends of the tubes.

Having thus fully described my invention, I do not wish to be understood as claiming, broadly, cold-air tubes arranged on opposite sides of the fire-box of a hot-air furnace; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. In a hot-air furnace, the combination, with the fire-box, of the two series of cold-air tubes T T', arranged on opposite sides of and curving over the top of said fire-box, whereby the heat and smoke pass entirely around said tubes, substantially in the manner herein shown and described.

2. In a hot-air furnace, the combination, with the cold-air chamber or chambers A, outer casing, I, and flues H, of the long and short cold-air tubes T T', curved over the fire-box, the lower portions of the tubes T forming the side walls of the fire-box, substantially in the manner as and for the purpose herein shown and described.

ELIJAH P. PENNIMAN, SR.

Witnesses:

J. H. ANDERSON,  
ALLEN T. LAURENCE.