

(No Model.)

T. R. RENWICK.
HEATING FURNACE.

No. 305,477.

Patented, Sept. 23, 1884.

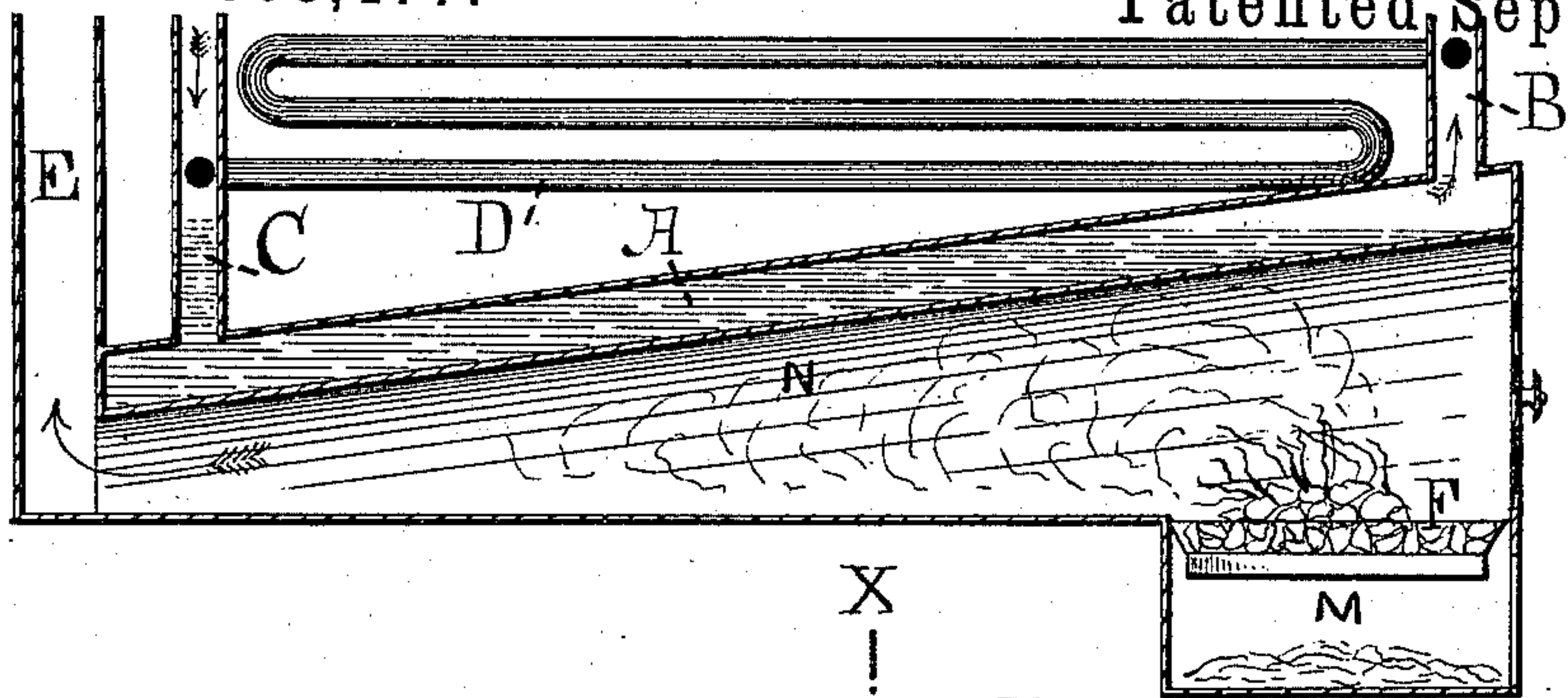


FIG. 1.

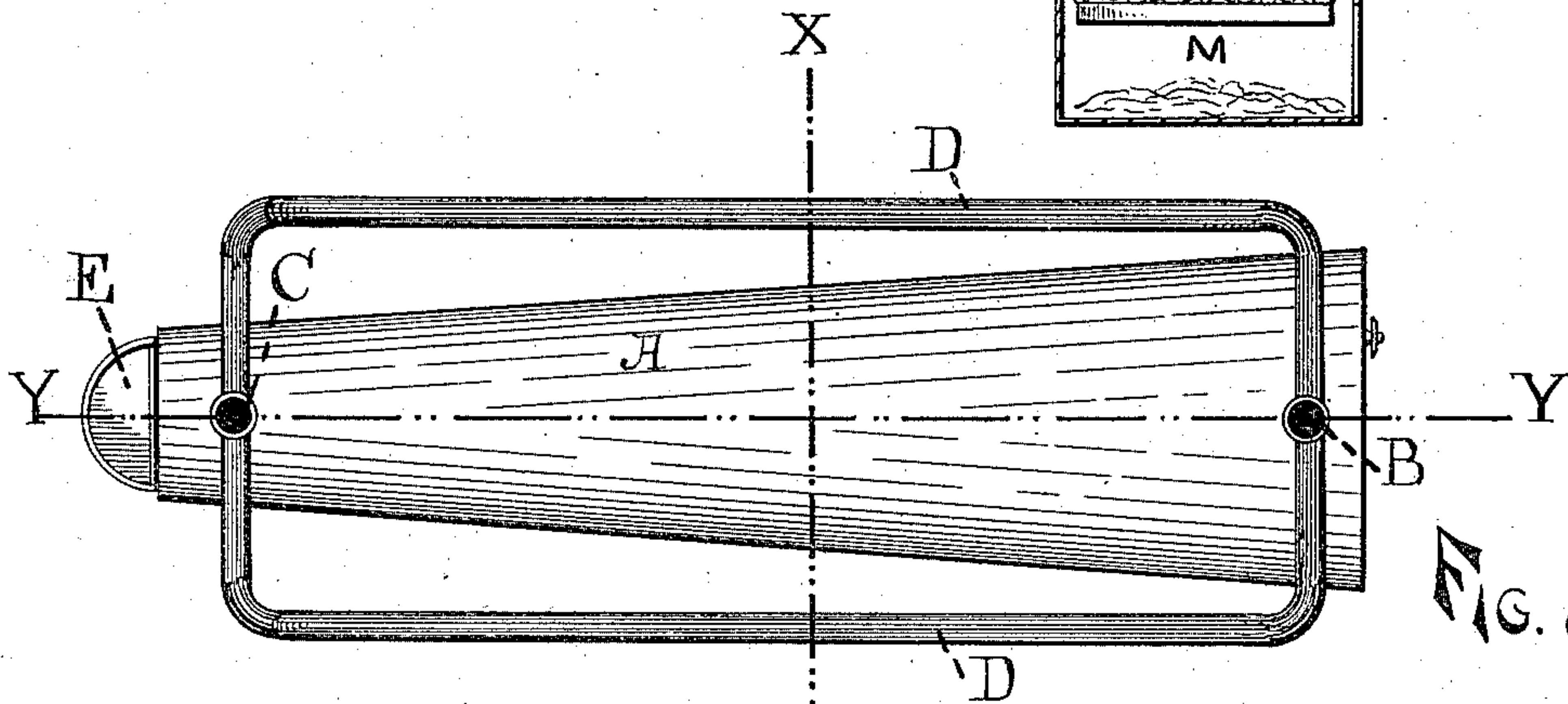


Fig. 2.

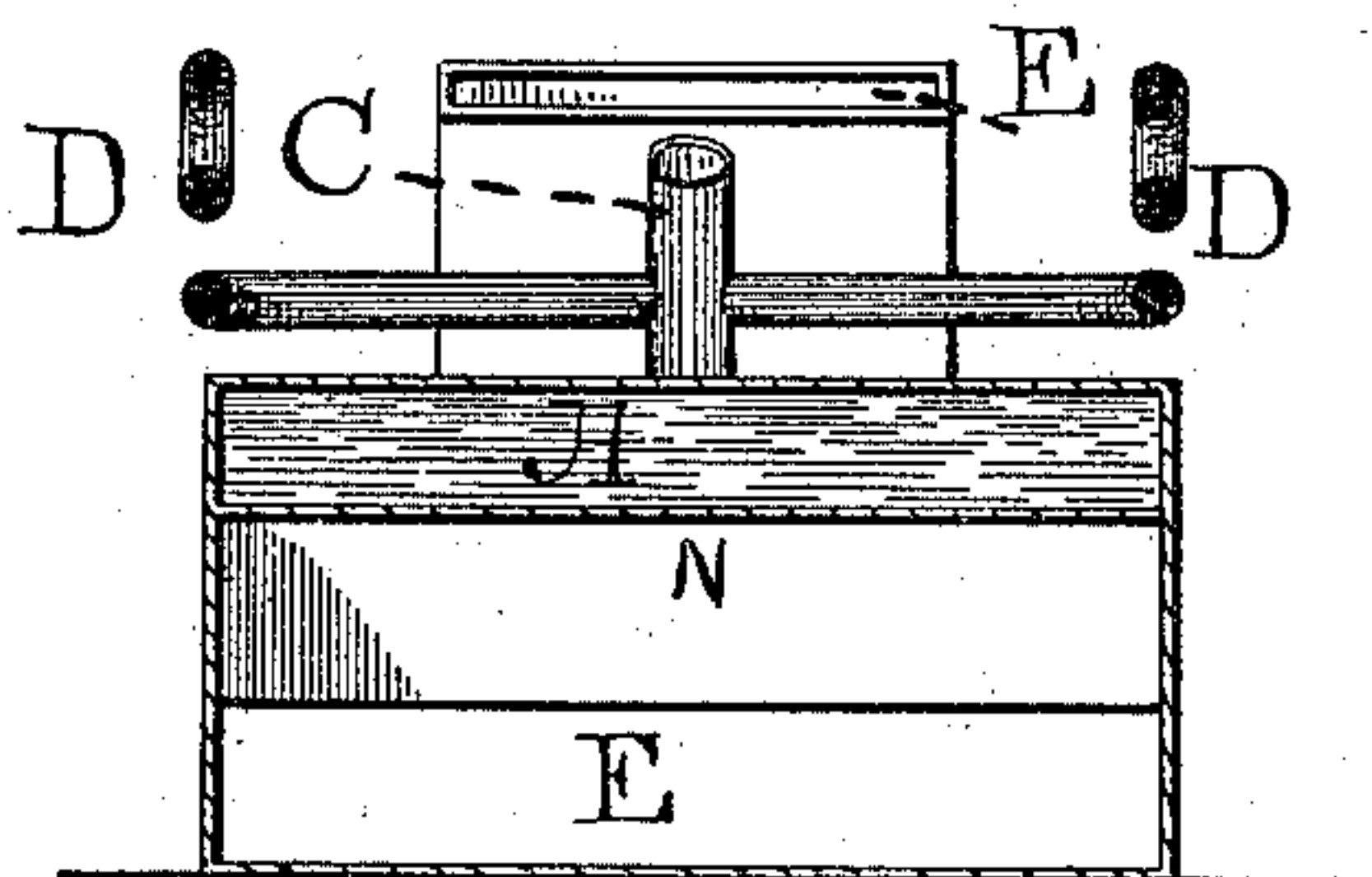


Fig. 4.

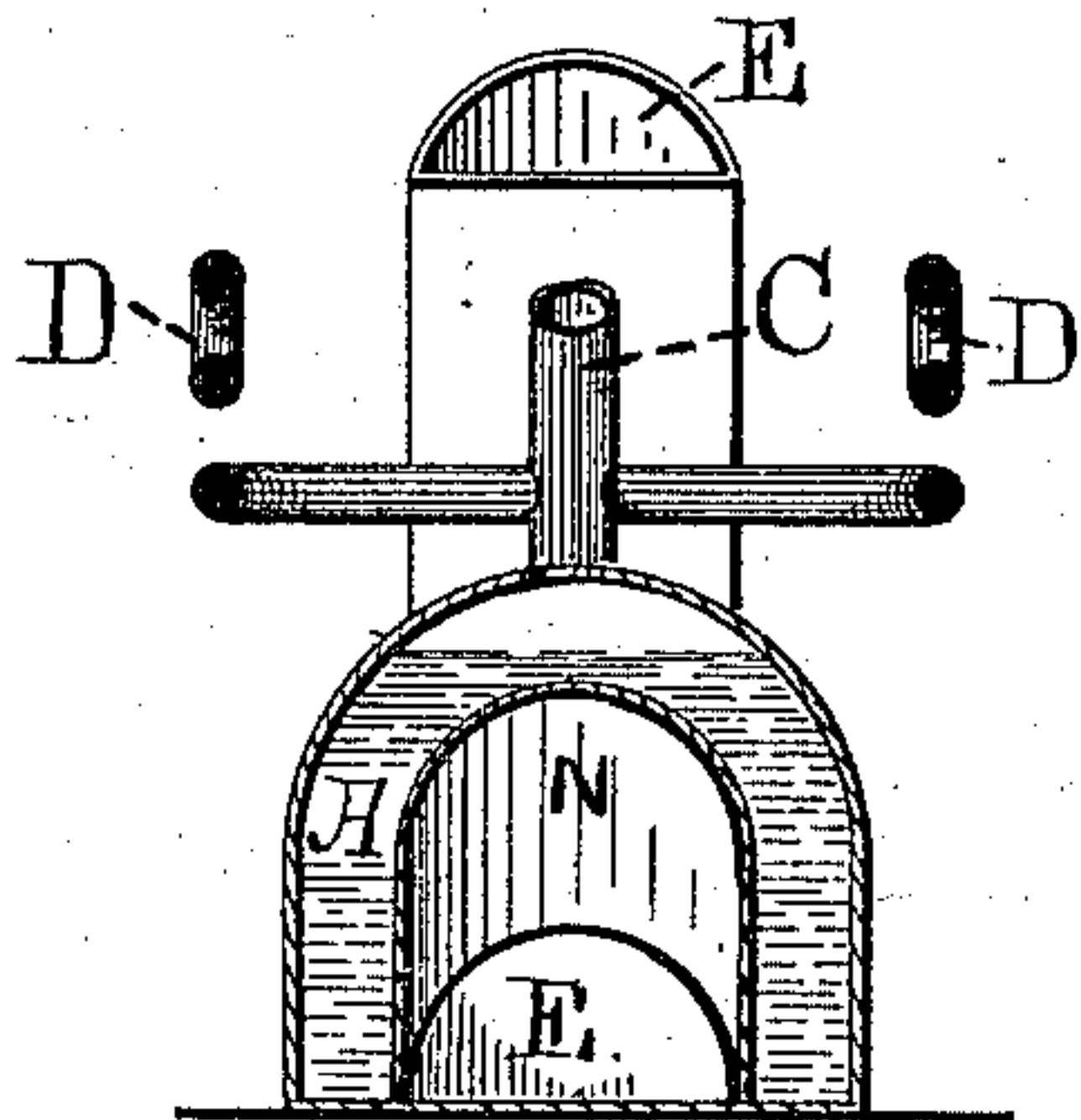


Fig. 3.

WITNESSES:

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HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 305,477, dated September 23, 1884.

Application filed May 1, 1883. (No model.)

To all whom it may concern:

Be it known that I, THOMAS R. RENWICK, of the city of Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Heating-Furnaces, of which the following is a specification.

My invention relates to that class of heating-furnaces in which the heat is conveyed from a boiler to the radiating pipes or coils by means of heated water; and the object of my invention is to economically use as much as possible of the heat generated by the combustion of the fuel in the furnace, and prevent the great waste of heat which usually escapes through the smoke-pipe or chimney. This object I accomplish by means of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view on the line *y*, Fig. 2, of a furnace and boiler constructed in accordance with my invention. Fig. 2 is a plan view of the boiler when constructed saddle-shaped. Fig. 3 is a cross-section of the boiler and smoke-flue on the line *x*, when the boiler is saddle-shaped. This figure also shows the perspective inside of the flue. Fig. 4 is a cross-section of the boiler and flue on the same line, *xx*, when the boiler is a thin, flat, inclosed pan, which form from my experiments I think preferable.

Similar letters refer to similar parts throughout the several views.

A represents the boiler, which in Figs. 2 and 3 is shown saddle-shaped, and in Fig. 4 rectangular. The boiler is placed immediately above the fire-box F and flue N. The under side of the boiler A is higher at the end over the fire-box than at the other end, it inclining downward to the chimney. In case of the saddle-shaped boiler, the lower side of the boiler forms the top and sides of the flue, which decreases in size as it proceeds from the fire-box to the smoke-pipe or chimney E. When the flat boiler is used, the under side of the boiler inclines downward from the fire-box to the chimney, and the side walls of the flue may or may not be contracted so as to decrease the flue. The flame and hot air from the burning fuel rises from the fire-box and impinges directly against the bottom of the boiler, and the bottom of the boiler being on an incline it does not cease to act upon it until it finally

leaves the flue. Beneath the fire-box F is the ash-pan M. At or near the lower end of the boiler is the inlet-pipe C, and at or near the upper end of the boiler is the outlet-pipe B.

D is the radiating-coil, connected with the outlet and inlet pipes. Attached in any suitable manner to the coil or the boiler is an expansion-tank, the same not being shown in the drawings.

The operation of my invention is as follows: The coils and boiler are filled with water, and a fire is kindled in the fire-box F. The water in the boiler becomes quickly heated and begins to pass out the pipe B into the radiating-coils D, and after passing the entire length of the radiating-coils it again enters the boiler, more or less cooled, at C. Thus a continuous current of water is kept up from the lower end of the boiler to the upper end, as shown by the arrows. While the water is passing in an upward current from the lower to the upper end of the boiler, immediately beneath and in contact with the boiler in the flue, a current of flame and heated air is passing in the opposite direction, as shown by the arrows, in the flue. The fire being placed under the upper end of the boiler A, the highest temperature or greatest heat is at this point, and the heat gradually decreases as it proceeds toward the lower end; hence the coolest water enters the boiler at the point where there is the least heat under the boiler and immediately begins to take heat from the warmth beneath. As the water passes up toward the upper end of the boiler the heat increases and the water increases in temperature, until it reaches the highest initial point of heat, when it passes out pipe B into the coils. There is no point in the boiler, from the time that the water enters at C until it leaves at B that it is not taking up heat from the fire beneath.

I am aware that in hot-water furnaces the water has been heated in inclined pipes among which the products of combustion and the heated air from the fire-box pass, the arrangement being such in relation to the fire-box that the greatest heat is applied to the upper parts of the pipes where the water is the hottest; and such a construction of furnace will in a degree accomplish the objects of my invention; but in such boilers the thorough utilization of

the heat is imperfectly accomplished, because
a large proportion of the products of com-
bustion and heated air circulating among the
pipes at their upper parts is necessarily car-
ried off without producing any heating effect
at the lower ends of the pipes, whereas with
my construction of boiler and its arrangement
all of the products of combustion and of the
heated air must necessarily pass along the en-
tire length of the boiler, thus utilizing the
heat of the furnace to the maximum extent
and insuring a constant and gradual increase
in the temperature of the water in the boiler
from the lower to the upper end of the same.
I therefore do not broadly claim, in combina-
tion with the other parts of the apparatus, an
inclined boiler; but

What I do claim is—

1. The combination, with a fire-box, a chim-
ney, a flue inclining downward from said fire-
box to said chimney, and a boiler of substan-
tially the character shown and described, in-
clining downward from the fire-box to the

chimney and forming one side of said flue, of
an inlet pipe or pipes leading to said boiler at
its lower end, an outlet pipe or pipes leading
from said boiler at its upper end, and a radi-
ating coil or coils connecting said pipes, where-
by the water entering the boiler at the lower
end passes upward toward the upper end of
the boiler, while the flame and heated air pass
downward in the opposite direction in contact
with the boiler, the current of water being in
one direction and the current of heated air
in the opposite direction, substantially as de-
scribed.

2. The flat thin boiler located above and
forming one side of the flue N, and inclining
downward from the fire-box F to the chimney
E, in combination with the fire-box F, pipes
B and C, and coil D, all constructed as de-
scribed.

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Witnesses:

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