

E. H. McNIEL.  
Steam-Boiler and Furnace.

No. 225,625.

Patented Mar. 16, 1880.

FIG. 1.

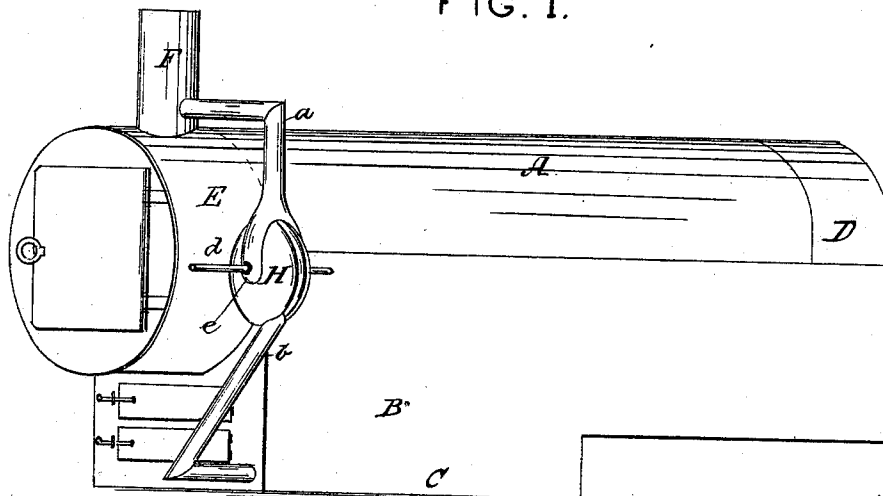


FIG. 2.

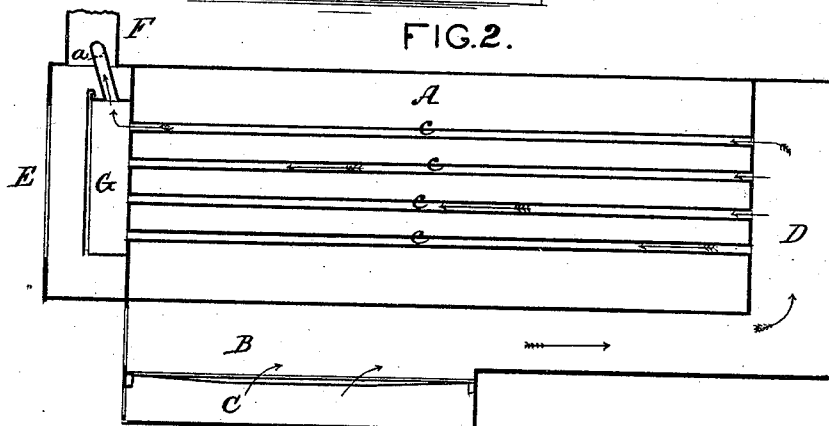
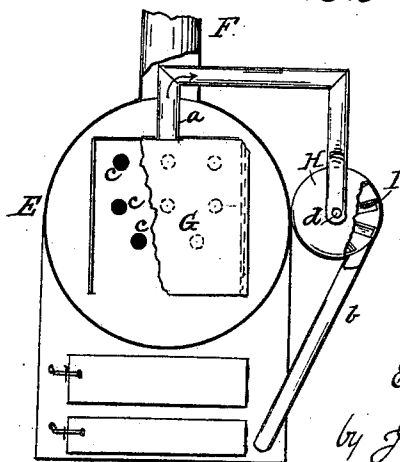


FIG. 3.



Witnesses:

*Sam R. Turner*  
*G. G. Steward.*

Inventor:

*Elias H. McNiel*  
by *J. R. Nottingham*  
Atty

# UNITED STATES PATENT OFFICE.

ELIAS H. McNIEL, OF GROTON, NEW YORK.

## STEAM-BOILER AND FURNACE.

SPECIFICATION forming part of Letters Patent No. 225,625, dated March 16, 1880.

Application filed July 19, 1879.

*To all whom it may concern:*

Be it known that I, ELIAS H. McNIEL, of the town of Groton, in the county of Tompkins and State of New York, have invented certain new and useful Improvements in Steam-Boilers and Furnaces; and I 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.

My invention relates to the class of smoke-consuming boiler-furnaces adapted for saving fuel and intensifying the heat for generating steam in steam-boilers.

It consists in combining the smoke and unconsumed carbon, after it has passed through the boiler-flues, with atmospheric air heated by contact with the escaping gases and returning the same to the fire-box to be consumed; also, in certain details of construction herein-after more particularly described.

In the drawings, Figure 1 is a side elevation of an ordinary boiler and heating apparatus with my improvement attached. Fig. 2 is a longitudinal section. Fig. 3 is a front or end view of a boiler, partly in section, showing my improvement.

A represents the boiler proper. B is the fire-box; C, the ash-box under the same; D, the heating-chamber in rear of boiler; *c c c c*, the boiler-flues; and G is a hood or deflector projecting over the ends or openings of the flues and open at bottom.

E represents a bonnet covering the front end of the boiler and having the smoke-stack F at top. *a* is a pipe extending from the top of hood G upward into and through the side of the smoke-stack, thence downward to a fan-chamber, H. Another similar pipe, *b*, connects with the bottom of the chamber H, and communicates with the interior of the ash-box C beneath the grate.

The operation of my invention is as follows: The smoke or unconsumed carbon resulting from combustion of the fuel passes from the fire-chamber beneath the boiler, in the direction denoted by the arrows, into the heating-chamber D, thence through the flues *c* to the hood

G, the inner face of which is inclined outwardly to deflect it upward toward the opening in the pipe *a*. This hood also serves to suddenly check the current of smoke delivered from the flues as it impinges sharply against its face, thereby causing a separation of its constituents, the heavier gases dropping toward its opening at bottom, while the lighter unconsumed products are directed upward toward pipe *a*. The interior of the fan-box H is occupied by a fan, I, which revolves upon shaft *d* by means of a pulley thereon, which may be driven by the same power for which the boiler supplies steam.

It is obvious that a funnel force-pump or other equivalent device may be substituted for the fan and fan-box, if thought desirable.

In order to prevent this axle from becoming overheated by the heated air passing through the box, I provide an opening or annular space, *e*, in the sides of the fan-box around the shaft of from one-eighth to one-fourth of an inch in width, to admit the required amount of air to keep it cool. The operation of this fan creates a strong draft and partial vacuum within the bonnet E, causing the atmospheric air to rush in at the top of the smoke-stack and unite with the smoke and products of combustion as they are discharged from the flues into hood G. Both then pass through pipe *a* into fan-box H, where they are thoroughly mixed by the fan, and driven thence, through pipe *b*, into the fire-chamber, where they are consumed, and that portion from which every particle of the carbon has been extracted, and which has become thoroughly volatilized, escapes from the bottom of hood G, and passes out of the smoke-stack. The atmospheric air which is admitted at the top of the smoke-stack becomes heated in its passage by contact with these escaping gases before it is drawn into the hood and mixed with the smoke, thus causing it to mix more readily, and preventing it from reducing the temperature of the smoke before its delivery into the fire-box.

My invention is also applicable and may be adapted to railroad-locomotives having the smoke-stack at the opposite end of the boilers, and, in addition to its fuel-saving and heat-promoting qualities, it is a complete spark and cinder arrester, thereby overcoming one of the

principal annoyances incident to locomotive-engines and railroad travel.

I am aware that smoke-consuming boiler-furnaces are not new, and that atmospheric  
5 air has been combined with the smoke in such machines to assist in its combustion, and I do not claim this, broadly; but I am not aware that in any of these the temperature of the air  
10 has first been raised before combining it with the smoke; and

What I claim, and desire to secure by Letters Patent, is—

The boiler A, a bonnet, E, and smoke-stack  
15 F, in combination with hood G, communicating with the furnace by suitable pipes provided

at any suitable point with a fan or its equivalent, whereby a current of air entering at the top of the smoke-stack and heated in its passage is drawn in and combined with the smoke in the hood, and both returned to the furnace, 20 arranged substantially as and for the purpose described.

In testimony that I claim the foregoing as my own I hereto affix my signature in presence of two witnesses.

ELIAS H. McNIEL.

Witnesses:

I. D. BEACH,  
R. H. DUELL.