

G. F. TINKHAM.
SMOKE CONSUMING FURNACE.

No. 460,189.

Patented Sept. 29, 1891.

Fig. 1.

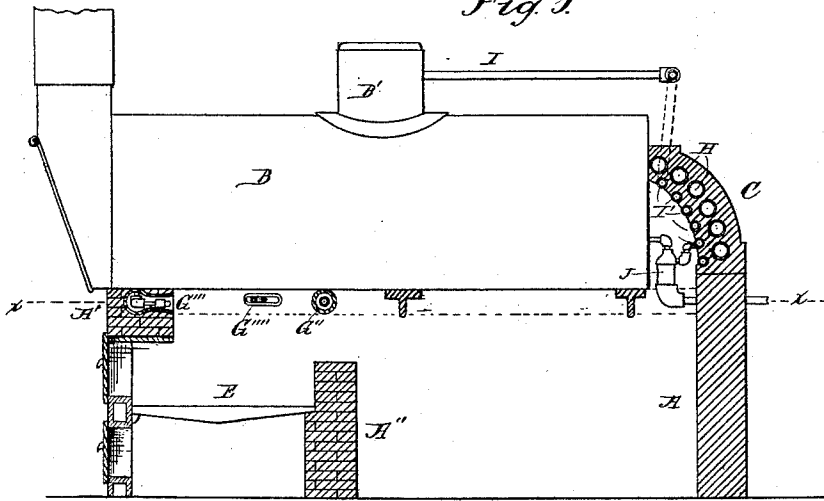


Fig. 2.

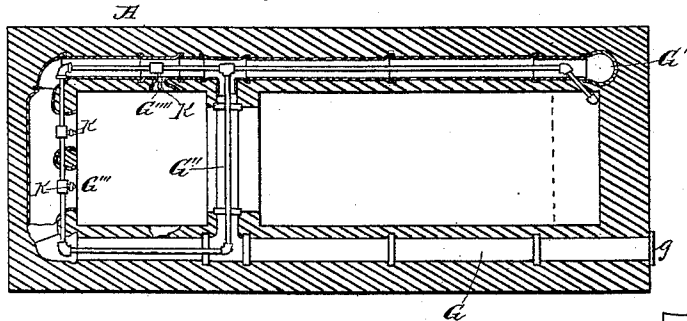


Fig. 6.

Fig. 3.

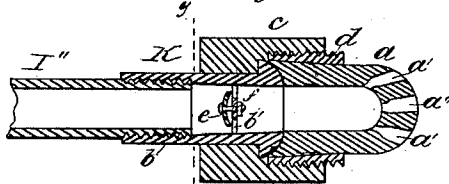


Fig. 5.

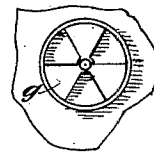
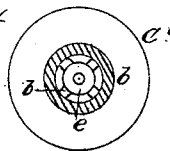


Fig. 4.



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(No Model.)

2 Sheets—Sheet 2.

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Fig. 7.

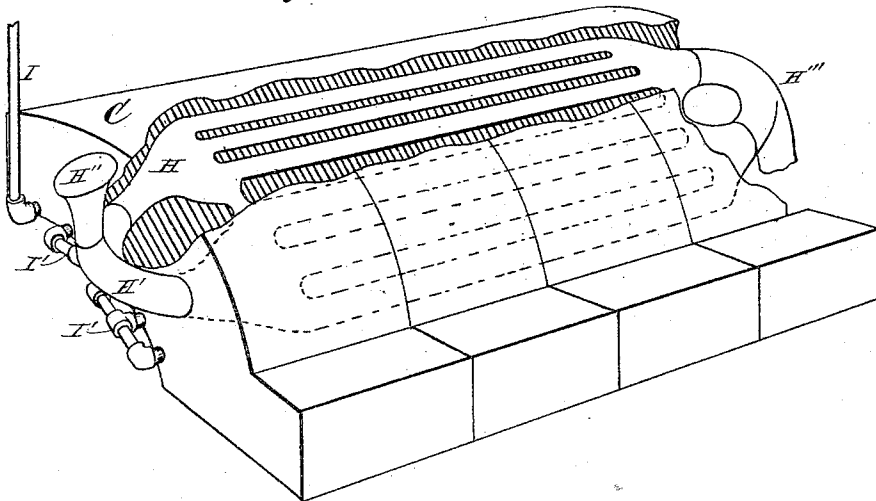


Fig. 8.



Fig. 9.

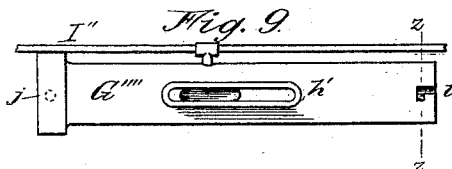


Fig. 10.

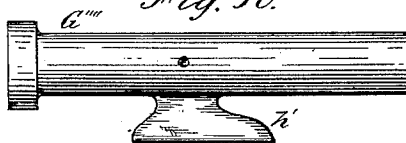
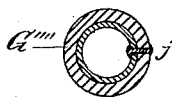


Fig. 11.



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UNITED STATES PATENT OFFICE.

GEORGE F. TINKHAM, OF BURLINGTON, IOWA.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 460,189, dated September 29, 1891.

Application filed September 30, 1890. Serial No. 366,614. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. TINKHAM, a citizen of the United States, residing at Burlington, in the county of Des Moines and State of Iowa, have invented certain new and useful Improvements in Smoke-Consuming Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to that class of smoke-consumers in which the complete combustion of the fuel is effected through the operation of the constituent gases of air and steam in the combustion-chamber; and the object of my invention is to so construct a furnace and its connections as to most perfectly accomplish the end above stated.

The invention consists in the construction, combination, and arrangement of parts, as will be hereinafter fully set forth and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a central longitudinal section of a furnace embodying my invention. Fig. 2 is a horizontal section of the same in the line xz . Fig. 3 is a central longitudinal section of the steam-nozzle. Fig. 4 is a transverse section of the same in the line yy . Fig. 5 is an end view of the nozzle-outlet. Fig. 6 is a view of the damper at the end of the air-pipe. Fig. 7, Sheet 2, is a view in perspective of the back arch of the furnace, with air and steam pipes attached. Fig. 8 is an elevation of the portion of the air-pipe under the front end of the boiler as seen from the inside of the combustion-chamber. Fig. 9 is a similar view of the section of air-pipe at the side of the combustion-chamber. Fig. 10 is a plan view of the part shown in Fig. 9. Fig. 11 is a transverse section of the air-pipe at the line zz , showing the coupling.

Similar letters of reference indicate corresponding parts.

Referring now to the drawings, A represents the furnace, or, more specifically, the inclosing brick-work of the boiler B. These are of practically the same form as those in common use; but in the construction of the furnace and the rear arch of the brick-work certain novel features are introduced and will now be described. At the rear end of the

boiler, with its crest above the upper line of flues in the boiler, is the segment of an arch C, standing transverse to the boiler and of the usual general form. It is understood, of course, that the flame from the combustion-chamber E passes over the bridge A'', up under the arch, and out through the flues. Consequently this arch is exposed to a large amount of heat, and this heat, which ordinarily is wasted so far as the arch is concerned, I utilize for the purpose of heating air and steam preliminary to its discharge into the combustion-chamber.

My improvement consists, essentially, in supplying this arch with a series of air-ducts and steam-pipes in the nature of coils, the particular construction of which is most fully illustrated in Fig. 7. In practice the arch C is preferably made of fire-clay in the form desired, which is practically that shown. It may, however, be built of brick in the usual way. Within the body of this arch and extending across it transverse to the end of the boiler is a multiple air-duct H, the termini of which converge into Y's H', and these into inlet H'' and outlet H'''. In practice these are made of cast-iron molded into the desired form. The multiplication of the ducts in the middle part and the spreading of the same tend to secure a more rapid and perfect heating of the air in its passage through them. The downwardly-extended portion of the duct H''' communicates through a vertical section G' with that portion of the air-duct G which passes through the brick-work of the furnace around the boiler and terminates at the rear end, where it is provided with a suitable damper g to regulate the supply of air. In that portion of the air-duct which immediately surrounds the combustion-chamber are sections of pipe G''' and G''', having contracted and elongated openings h and h' , respectively, through which the air and vapor pass into the combustion-chamber. The purpose of this vertical contraction of the openings in the air-ducts is to cause the current of air to pass into the combustion-chamber in a comparatively thin sheet close under the bottom of the boiler, experience having shown this to be the best method of securing the most perfect ignition of the contents of the combustion-chamber.

In practice I make the section G''' concave on top, so as to conform to the shape of the boiler, which rests upon it. A simple form of coupling for the sections is shown in Figs. 8, 9, and 11, consisting of the notch *i* in the male end, into which a pin *J* in the female end slips and is fastened by turning the section slightly.

In practice the longitudinal portions of the air-duct, as well as the inclosed steam-pipe, are connected by a transverse portion G'' over the bridge-wall, thereby increasing the temperature of the air and vapor within.

From the steam-dome B' a pipe *I* conveys steam to a coil I', lying along the inner face of the arch C. The construction of this coil is a simple and well-known one, and is clearly shown in Fig. 7. By reference to Fig. 1 it will be seen that the greater portion of the pipes composing the coil is embedded in the arch, leaving a small portion of the surface of the pipes exposed to the heat arising from the furnace. The steam in the pipes is thus superheated, while at the same time the pipes are sufficiently protected from burning out by the contiguous fire-clay, with which they are nearly surrounded. The lower terminus of the coil connects with a reservoir or well J, wherein a considerable body of steam is still further superheated, as exposed to the direct flame from the furnace, and from this well the steam passes through a pipe I'', placed on top of the air-duct to the nozzles K K, from which it escapes in fine jets commingled with air into the combustion-chamber.

The construction of the nozzle is shown in Figs. 3, 4, and 5. Connecting with the pipe I'' is a tubular seat *b*, with a head thereon fitting a shoulder in a coupling *c*. One end of this coupling is counterbored and threaded, and in this is fitted a plug *d*, having a tapered hole therein fitting the corresponding taper of the outside of the nozzle end *a*. The inner end of this nozzle *a* abuts upon the end of the part *b* and forms a connection therewith in practically the same manner as do the parts of a common gas-fitting known as a "union." By this means the nozzle end or outlet may be readily removed or attached. The nozzle is provided with a central outlet-orifice *a''* and diverging orifices *a' a'*, whereby the vapor is ejected in a fine spray in all

directions. The part *b* is provided with a small central disk *e*, attached by bolt and nut *f* to a bridge *b'*. The purpose of this disk is to catch such small sediment as collects at first in the apparatus by deflecting the current of steam. After the apparatus has been in use for a little time this disk may be removed.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a smoke-consuming furnace, the combination of the rear arch C, the steam-coil I', mounted on the inner side of said arch, the greater portion of the surface of the pipes composing said coil being embedded in the arch, the pipe *I*, connecting one extremity of the coil with a steam-supply, and the pipe I'', serving as an outlet for the superheated steam in the coil to the combustion-chamber, and a small portion of the surface being exposed to the direct action of the heat from the furnace, whereby the steam in said pipe is superheated and the pipe is sufficiently protected against burning out.

2. In a smoke-consuming furnace, the combination, with the rear arch and steam-boiler, substantially as described, of multiple air-ducts embedded in said arch and having a suitable inlet and an outlet communicating with the combustion-chamber, of a steam-coil mounted near the inner surface of said arch, a supply-pipe connected with said coil, and an outlet-pipe adapted to convey superheated steam through suitable nozzles to the combustion-chamber, substantially as and for the purpose set forth.

3. The herein-described nozzle for the steam-pipe of a smoke-consuming furnace, consisting of the outlet *a*, having holes *a' a''*, and a tapered inner portion abutting upon a suitable seat, a seat *b*, connecting with the steam-pipe, a central disk *e* within said part *b*, a collar *c*, and a connecting-plug *d*, all constructed substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE F. TINKHAM.

Witnesses:

W. W. DODGE,
NELLIE KLINE.