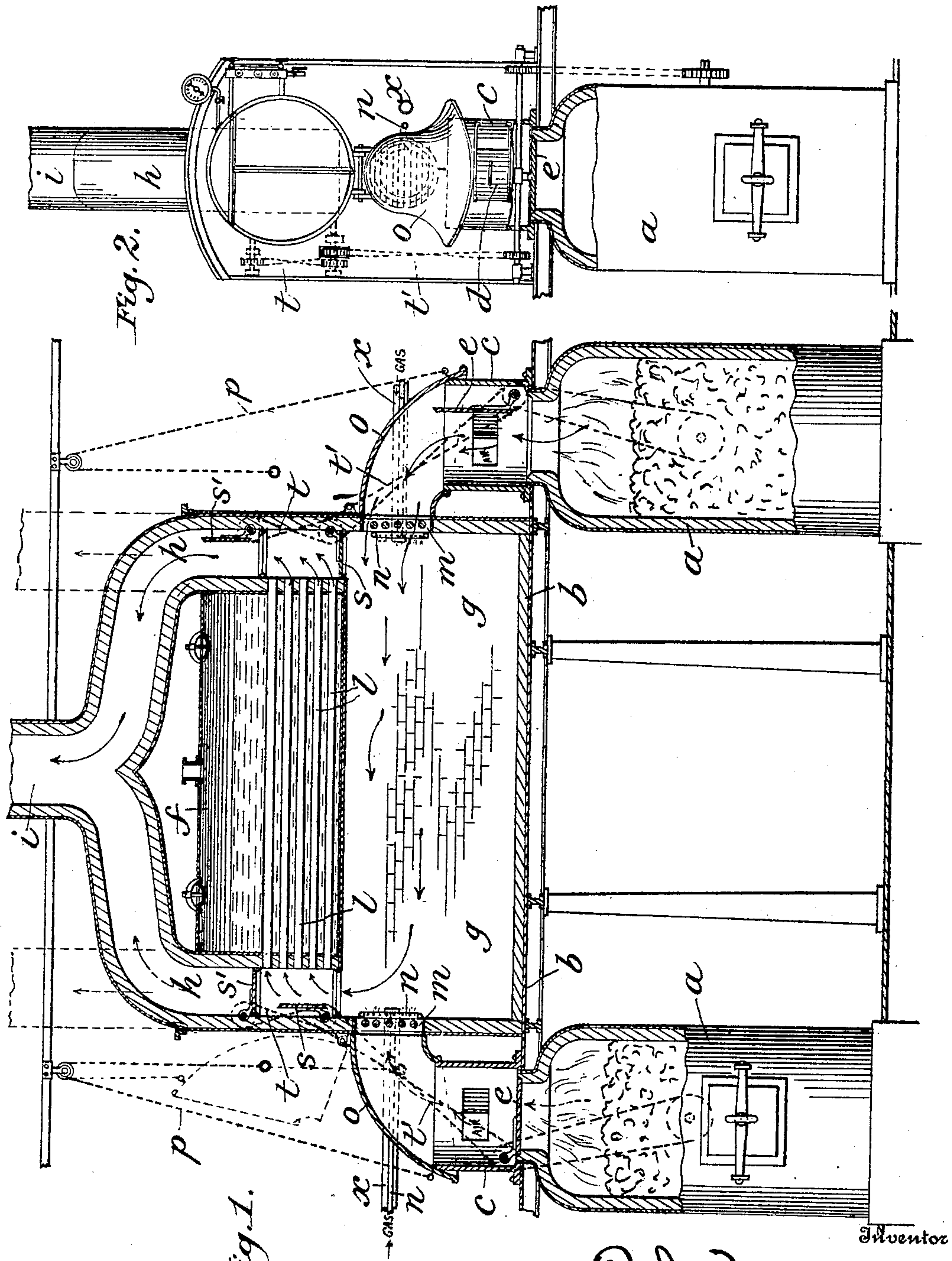


P. J. NEVINS.  
GAS FURNACE.

APPLICATION FILED DEC. 17, 1904.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

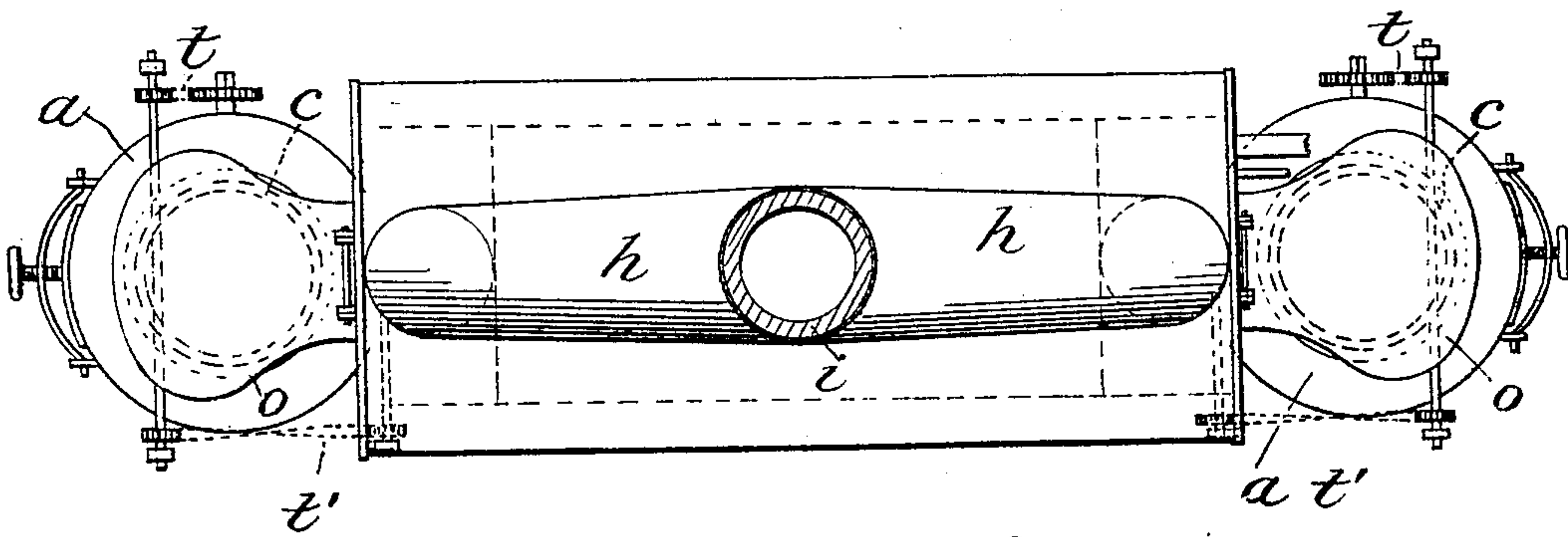


Fig. 3.

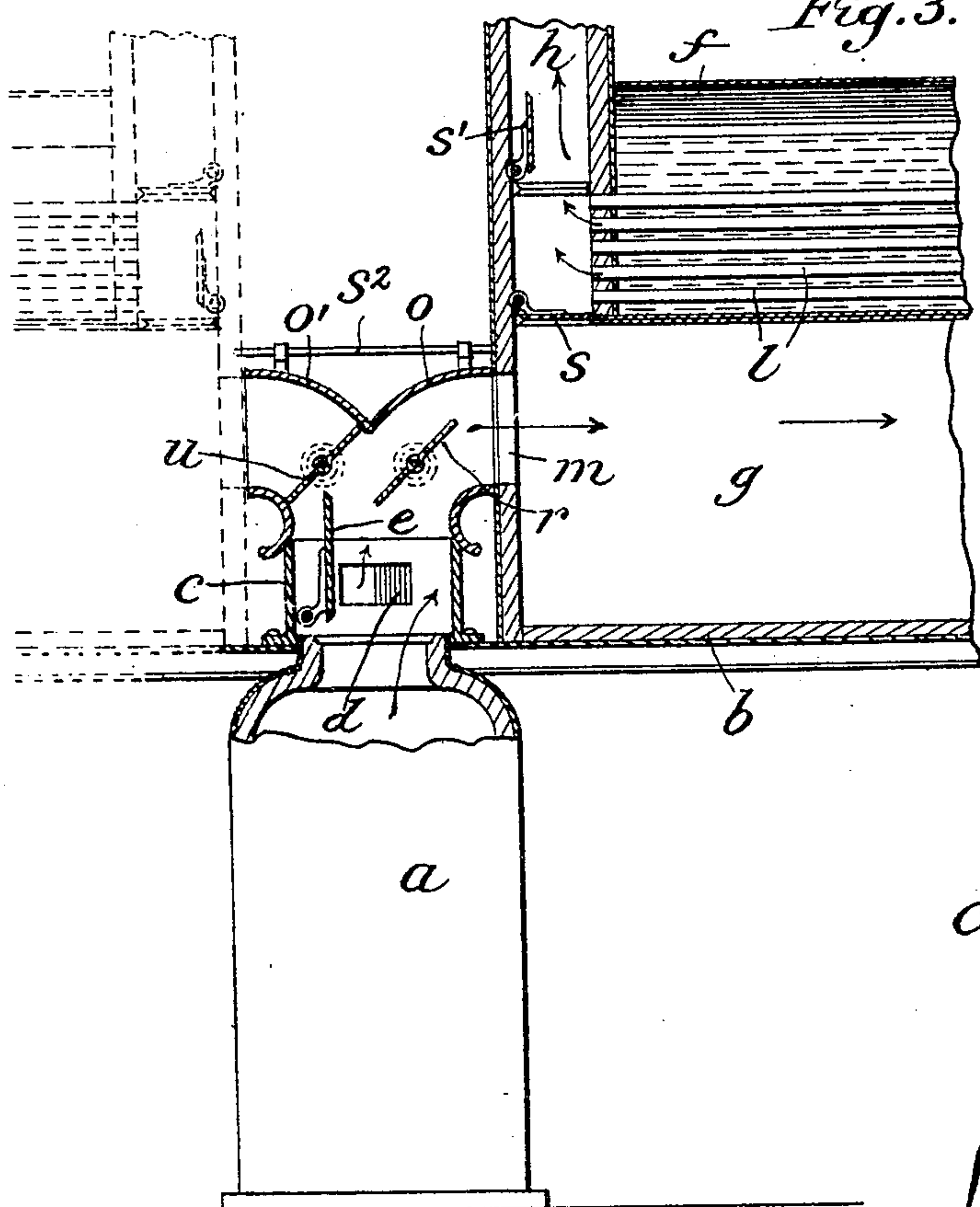
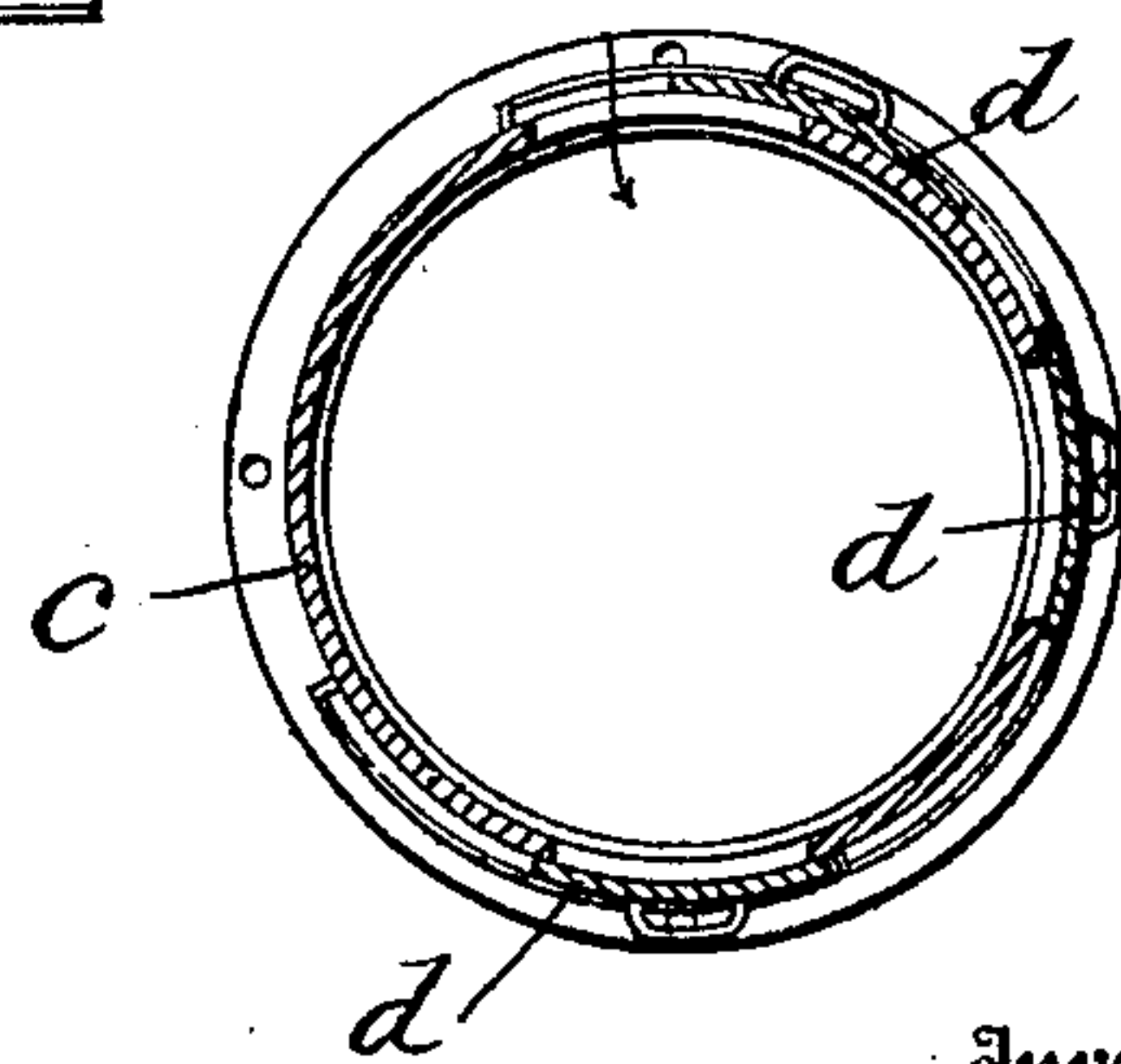


Fig. 5.



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# UNITED STATES PATENT OFFICE.

PATRICK J. NEVINS, OF HAVERHILL, MASSACHUSETTS.

## GAS-FURNACE.

No. 795,299.

Specification of Letters Patent.

Patented July 25, 1905.

Application filed December 17, 1904. Serial No. 237,247.

*To all whom it may concern:*

Be it known that I, PATRICK J. NEVINS, a citizen of the United States, residing at Haverhill, county of Essex, Massachusetts, have invented certain new and useful Improvements in Utilizing Waste Heat from Gas and other 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.

The invention has for its object the provision of means to utilize the heat that usually goes to waste in the blowing-up or discharging periods of gas-making furnaces or generators.

To this end I have combined with a gas furnace, furnaces, or generators of well-known type a steam-boiler furnace whose general construction is also well understood, but whose specific features are novel and have been designed with a view to take the products of combustion issuing from the gas furnace, furnaces, or generators and utilize them to the best advantage in making steam.

Specifically, the invention consists in the combination of a fire-tube boiler and furnace with one or more gas-making furnaces or generators in such a way that the combustion products from either of the latter may be passed through the former in a particular manner to be hereinafter fully described and claimed. The boiler-furnace may be located above and between or any reasonable distance from the gas furnaces or generators and is provided with a flame-space extending from one end to the other under the boiler. At each end this space of the boiler-furnace is provided with an opening which is connected by a hood with one of the gas furnaces or generators, so that during the blowing-up or discharging period when the cover to the furnace or generator mouth is open the products of combustion or flame issuing therefrom is conducted into the flame-space under the boiler. At each end of this flame-space there is a smoke-flue leading to the chimney, and the fire-tubes of the boiler extend from flue to flue, and in connection with this arrangement there is a pair of dampers in each flue, one damper of each pair being located below the fire-tubes and one of each pair being above the tubes, the particular object of this arrangement being to cause the flame issuing from either gas-furnace to pass clear across the flame-space of the boiler-furnace before en-

tering the fire-tubes. At the openings for the flame into the boiler-furnace there is a pilot-light to insure the prompt lighting of the gaseous products issuing from the gas-furnace, and preferably, also, there is an auxiliary gas-main leading into each end of the boiler-furnace. There are also certain details of the construction that need not be mentioned here, but which will be described later on.

The invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a vertical section lengthwise through the boiler and its furnace. Fig. 2 is an end view of the same, the gas-making furnaces being also shown in each view. Fig. 3 is an enlarged sectional view showing a bypass arrangement by which a gas-furnace may be connected to two boiler-furnaces or adapted to discharge part of the flame into the air. Fig. 4 is a plan view of Fig. 1, and Fig. 5 is a cross-section of the casing inclosing the mouth of each gas-furnace.

In the views, *a a* denote gas-making furnaces of well-known construction, and *b* indicates the usual floor at about the level of their mouths. Inclosing the mouth of each furnace there is a casing *c*, that is open at the top and has sliding doors *d d* in its walls, and the mouth of each furnace has a hinged lid or cover *e* working inside the casing, as shown in Figs. 1 and 3.

The boiler-furnace is erected on the floor *b* between the two furnaces *a a*. It has a boiler *f* with a flame-space *g* beneath, and this space communicates with smoke-flues *h h* at either end. These flues may be turned inward over the top of the boiler and united to one chimney *i* or there may be a separate chimney for each flue, as indicated in dotted lines in Fig. 1.

The flame-space under the boiler extends from one end of the furnace to the other, and through the water-space of the boiler extend a plurality of fire-tubes *l l*, that connect freely with the flues at each end of the furnace.

The gaseous products from the gas-furnace enter the flame-space through openings *m*, that may, if preferred, be provided with flame spreading or breaking bars or grids, as shown in Fig. 1, and around each of these openings there is arranged a circular gas-pipe *n*, forming a pilot to cause the products to burst into flame instantly on entering the space *g* if not already ignited.

Each opening *m* is covered by a hood *o*, which is hinged to the outside of the furnace-wall just above the opening and is curved



downward in an expanded bell-like form and covers the open top of the casing that surrounds the mouth of the gas-furnace. These hoods conduct the products from the gas-furnaces to the boiler-furnace and are raised and lowered when required by chains  $p p$ , passing over pulleys in the ceiling, or in any other convenient way.

When the flame enters the space  $g$ , it tends to take the shortest route to the chimney; but as it is so hot just inside the openings  $m$  that it would burn the bottom plate and tubes of the boiler if allowed to enter them at once I provide two dampers  $s$  and  $s'$  in each flue, one damper  $s$  being below the fire-tubes and practically forming an extension of the bottom plate of the boiler across the lower end of the flue and the other being located just above the fire-tubes, as clearly shown in Figs. 1 and 3.

The two dampers of each pair are pivoted, as shown, and are connected together by chains  $t$ , so that as one is opened the other closes, and the shafts of the lower dampers are connected by similar chains  $t'$  to the shaft of the lid or cover  $e$  over the mouth of each gas-furnace. This chain arrangement causes the dampers to work simultaneously in opposite directions. I do not desire or intend to be limited to this manner of working them; but it is greatly preferred that they should be operated in this way, for the reason that it is desirable that the flame entering the space  $g$  should not be allowed to enter the nearest flue  $h$ , but should be compelled to cross over and enter the flue at the other end of the furnace, and the chain connection of the lower dampers to the furnace-lids  $e$  causes the damper at the nearest end of the space  $g$  to close whenever either lid is opened.

According to the arrangement shown in Fig. 1 the entire products from one of the gas-furnaces must enter the flame-space. It is sometimes desirable, however, not to admit so large a flame, and for this purpose I have provided the by-pass arrangement, (shown in Fig. 3,) where the hood  $o$  is hinged on a rod  $s^2$  at right angles to the axis of the hoods in the other figure, and a branch hood or by-pass  $o'$  is provided to take part of the flame to another furnace (indicated in dotted lines) or to the outer air. In this construction both the by-pass and the hood proper will have dampers  $u$  and  $v$ , respectively, to better regulate the amount of products passing through each.

It is sometimes the case also that the combustion products from a single furnace do not furnish sufficient heat for exigencies, and I therefore connect an auxiliary gas-main  $x$  to each end of the boiler-furnace in proximity to the pilot  $n$ . This main may be used as an auxiliary to the main flame or as a substitute therefor when a small amount of heat is desired.

The construction and arrangement being as

thus described, the operation of the plant will be understood from the above description and by following the drawings. It is to be noted, however, that as the flame enters the space under the boiler it is compelled to travel to the opposite end of the furnace before it can enter the flue leading to the chimney and that when it enters one of the flues  $h$  it passes through the fire-tubes in the reverse direction, the closed damper  $s'$  preventing it from going on up the flue and turning it into the tubes  $l$ .

Preferably the bottom plate of the boiler and the lower dampers are located somewhat above the level of the openings where the flame enters, the object being to provide against burning out these parts.

The doors  $d$  in the casings inclosing the mouths of the gas-furnace in addition to permitting fuel to be charged into the furnaces without lifting the hoods perform the further important office of permitting the admixture of any desired amount of air into the stream of combustion products going through the hood into the boiler-furnace.

What I claim is—

1. The combination with one or more gas-making furnaces, generators, furnaces, of a steam-boiler furnace having smoke-flues at each end, connections between the boiler-furnace and each gas or other furnace, and dampers or valves by means of which the products of combustion from either furnace may be turned into the boiler-furnace, ignited and passed directly along fire-box and back through tubes and out the flue at the same end.

2. The combination with gas-making furnaces of a steam-boiler furnace having smoke-flues at each end, connections between the boiler-furnace and each gas-furnace, fire-tubes connecting the flues in the boiler-furnace, and a pair of dampers in each flue, one above and one below the fire-tubes.

3. The combination with gas-making furnaces of a steam-boiler furnace, a connection, comprising a movable hood, between the furnaces whereby the products of combustion from the gas-furnace may be turned into the boiler-furnace, a by-pass leading from the connection between the two furnaces, and dampers in said connection and by-pass, whereby part of the products may be directed to the boiler-furnace and part through the by-pass.

4. The combination of a gas-furnace, an open-topped casing inclosing the mouth of the furnace, an elevated boiler-furnace, a hood hinged to the boiler-furnace and overhanging the casing to conduct the combustion from the latter to the former, a cover for the mouth of the gas-furnace, and a door in the casing to admit air into the boiler-furnace and permit fuel to be charged into the gas-furnace.

5. The combination of a gas-furnace, a steam-boiler furnace, a connection between the furnaces whereby the combustion products of the gas-furnace may be turned into



the boiler-furnace, and a pilot-burner consisting of a perforated pipe within the boiler-furnace surrounding the opening of the delivery end of the connection between the furnaces.

6. The combination with a gas-furnace, of a steam-boiler furnace, a connection between the furnaces whereby the products of combustion from the gas-furnace may be turned into the boiler-furnace, a valve or cover for the mouth of the gas-furnace, a damper for admitting air into the connection above the furnace-mouth, a by-pass leading from the connection between the furnaces, and dampers above the air-inlet in said connection and by-pass.

7. The combination with a pair of gas-furnaces, of a steam-boiler furnace having smoke-flues at each end and fire-tubes extending through the boiler and connecting said flues, a pair of dampers in each flue, one above and one below the fire-tubes, and connections between the dampers of each pair to cause them to move in opposite directions.

8. The combination with a pair of gas-furnaces, of an elevated steam-boiler furnace located between said gas-furnaces, and having smoke-flues at each end and fire-tubes extending through the boiler and connecting said flues, a cover for the mouth of each gas-furnace, hoods hinged to the boiler-furnace and overhanging the mouths of the gas-furnace to conduct the combustion products therefrom to the boiler-furnace, a pair of dampers in each flue of the boiler-furnace, one above and one below the fire-tubes, and connections between each gas-furnace cover and the two dampers of one pair, whereby when either gas-furnace cover is opened, the lower one of the pair of nearest dampers is closed and the upper one of the same pair is opened.

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

PATRICK J. NEVINS.

Witnesses:

PATRICK J. ANDERSON,  
EDWARD M. DALEY.