

F. M. CAMPBELL.
HOT AIR FURNACE.

No. 458,969.

Patented Sept. 1, 1891.

Fig. 1.

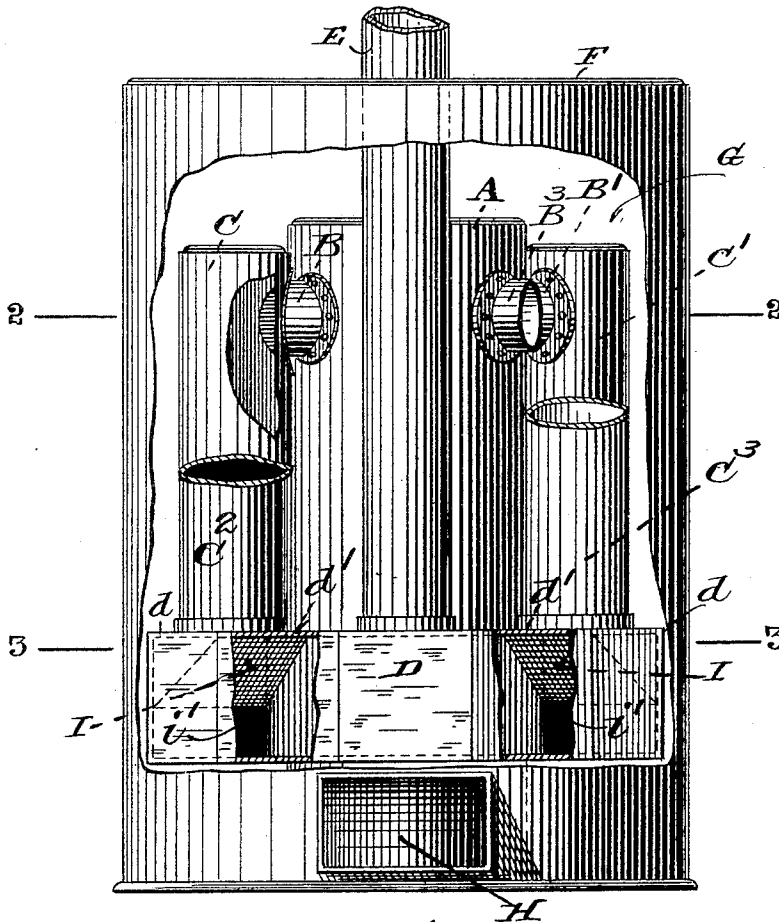
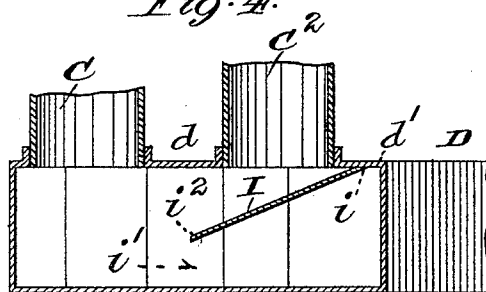


Fig. 4.



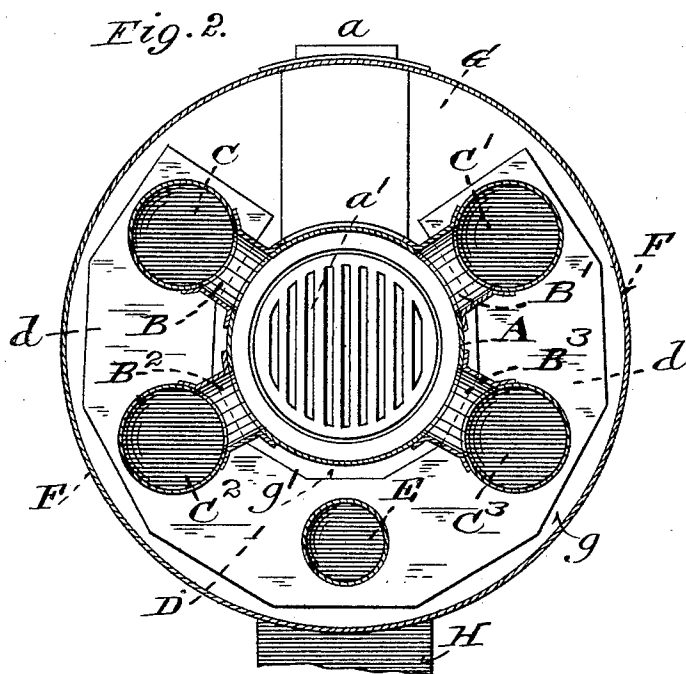
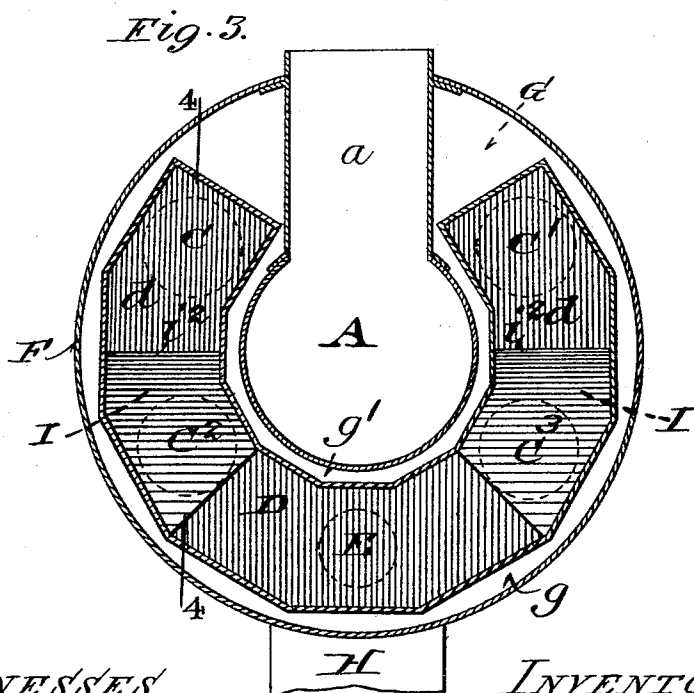
WITNESSES
A. Bonville.
Edward L. Furrell

INVENTOR
Francis M. Campbell
by C. D. Moody, atty

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UNITED STATES PATENT OFFICE.

FRANCIS M. CAMPBELL, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE
FRONT RANK STEEL FURNACE COMPANY, OF SAME PLACE.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 458,969, dated September 1, 1891.

Application filed April 13, 1891. Serial No. 388,693. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS M. CAMPBELL, of St. Louis, Missouri, have made a new and useful Improvement in Hot-Air Furnaces, of which the following is a full, clear, and exact description.

The improvement relates to the system of flues traversed by the products of combustion in their escape from the combustion-chamber, substantially as is hereinafter described and claimed, aided by the annexed drawings, making part of this specification, in which—

Figure 1 is a rear elevation of the improved furnace, portions of the furnace-wall and flues being broken away to exhibit the interior construction; Fig. 2, a horizontal section on the line 2 2 of Fig. 1; Fig. 3, a horizontal section on the line 3 3 of Fig. 1, and Fig. 4 a vertical section on the line 4 4 of Fig. 3.

The same letters of reference denote the same parts.

A represents the combustion-chamber of the furnace. It is of the customary form, saying as it may be modified or supplemented by the improvement under consideration. Its door appears at *a*, Fig. 2, and its grate at *a'*. The chamber A is substantially an upright one, and leading from its upper portion are four escape-flues B B' B² B³, Fig. 2, and shown in part in Fig. 1. These flues respectively lead into four upright flues C C' C² C³ at or toward the upper portion thereof. The flues C C', &c., at the lower end thereof connect with a horizontal chamber D, substantially as shown. The exit from the chamber D is by means of an upright flue E, Figs. 1, 2, and 3, which leads upward from the chamber D, substantially midway between the flues C, C' C² C³, and at its upper end connects with any suitable escape-flue. (Not shown.)

F represents the customary furnace wall or case for inclosing the hot-air chamber G. A cold-air inlet to the chamber G is at H, Figs. 1, 2, and 3. The chamber D is at the back and sides of the combustion-chamber, and it is arranged above the level of the cold-air inlet. The chamber D is also arranged to provide an air-space *g* between said chamber and the wall F, through which the air can pass upward from the lower part of the chamber G to above the chamber D, and also to provide another

air-space *g'*, through which the air can pass from the lower part of the chamber G upward between the chamber D and the combustion-chamber. With the exception of the spaces *g g'*, the chamber D occupies the most of the room between the combustion-chamber and the surrounding furnace-wall at or about the level of the lower portion of the combustion-chamber. There is sufficient room beneath the chamber D for the air entering the hot-air chamber to circulate beneath it. The descending flues C C' C² C³ are larger in diameter than the ascending flue E. As thus far described the construction is analogous to that shown in Letters Patent No. 414,018, granted to me October 29, 1889, for an improvement in hot-air furnaces. This difference, however, exists: In the former construction there are but two descending flues, and the chamber D is confined more to the rear of the combustion-chamber which is arranged eccentrically within the furnace-wall, whereas in the present construction the chamber D extends well around the combustion-chamber, and there are four descending flues, as stated. In addition to this a partition I, Figs. 1 and 4, is introduced into the chamber D at each side *d d* thereof, whose function it is to equalize the downward currents through the descending flues C C', &c. To this end the partition at its rearward edge *i* is joined to the roof *d'* of the chamber D in rear of the rearward one of the pair of descending flues at that side of the chamber, and it extends thence downward and forward, substantially as shown in Fig. 4, and also laterally across the side *d* of the chamber D, and leaving a space *i'* beneath its lower forward edge *i²* for the products of combustion to pass.

The operation is as follows: The heated products of combustion pass from the chamber A into the two pairs C C' and C² C³ of descending flues. The course is then downward through all of said descending flues into the chamber D. Owing to the partition I, any tendency that the escaping current may have to pass mainly through the rearward descending flue of each pair of said flues is prevented, and the current is not only divided to pass down at each side of the combustion-chamber, but each said division of the current is also

5 further divided into substantially equal currents which pass down through the two flues respectively of the pair of flues, for while the rearward ones of said descending flues
 10 are more directly in line with the ascending flue E, the partitions I I require those currents which descend through said rearward flues to be carried forward again past the front edge of said partitions, and in consequence of
 15 this it is substantially as short a course from the combustion-chamber to the escape-flue E *via* the forward ones of said descending flues as it is *via* said rearward descending flues.

I claim—

15 1. The combination of the wall F, the combustion-chamber, the chamber D, extending at the rear and also at the sides of said combustion chamber, as described, the two pairs of descending flues at the sides, respectively,
 20 of said combustion-chamber and connected

at the upper end thereof with said combustion-chamber and the lower end thereof with said chamber D, the ascending flue, and the partitions I I, substantially as described.

2. The combination of the combustion-
 25 chamber, the two pairs of descending flues at the sides, respectively, of said combustion-chamber, and the chamber D, said descending flues at the upper end thereof being connected
 30 with said combustion-chamber and at the lower end thereof with said chamber D, and said chamber D having the partitions I I, as and for the purpose described.

Witness my hand this 10th day of March, 1891.

FRANCIS M. CAMPBELL.

Witnesses:

C. D. MOODY,
 A. BONVILLE.