

(No Model.)

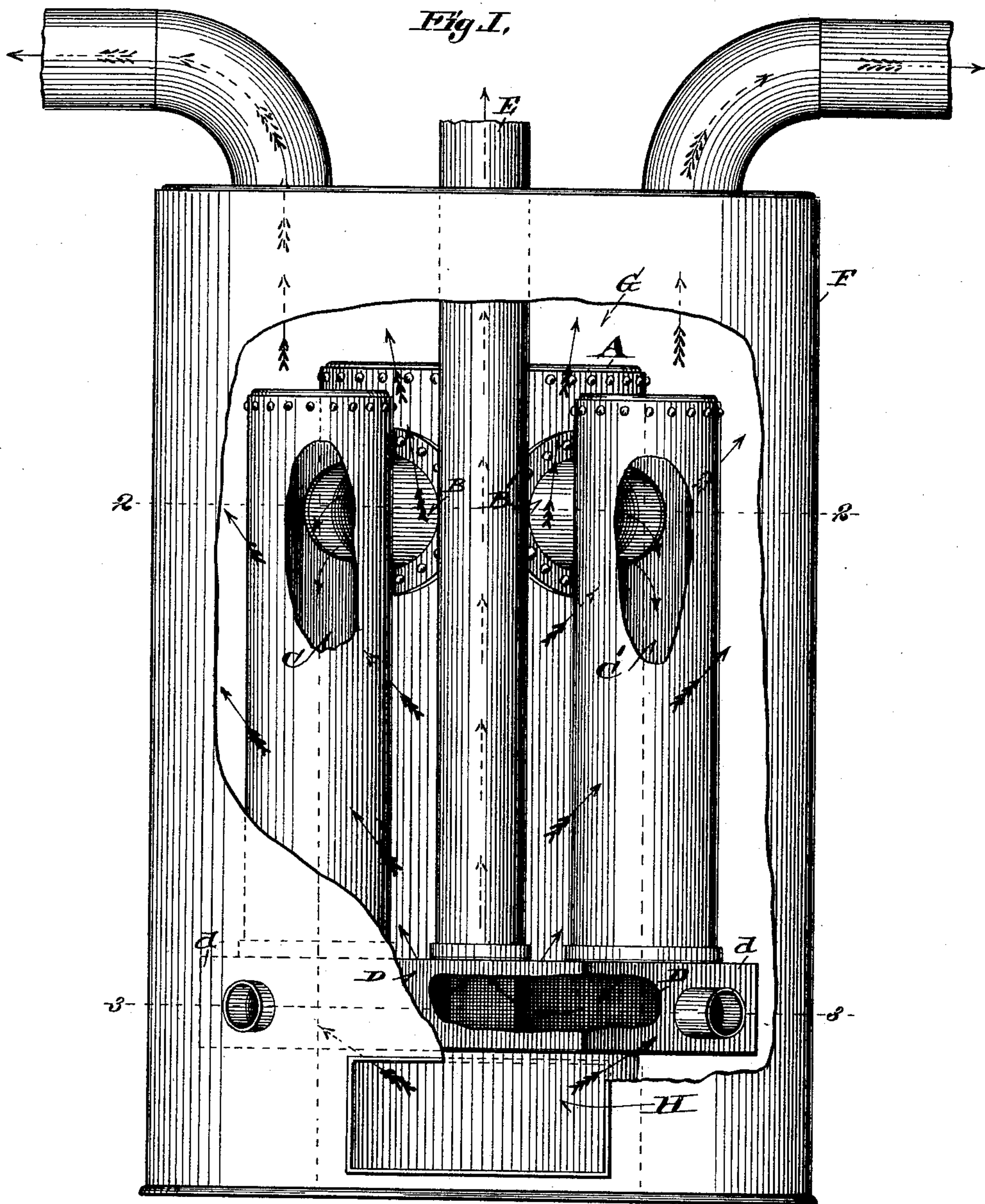
2 Sheets—Sheet 1.

F. M. CAMPBELL.

HOT AIR FURNACE.

No. 414,018.

Patented Oct. 29, 1889.



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*by C. D. Moody atty*

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Fig. 2.

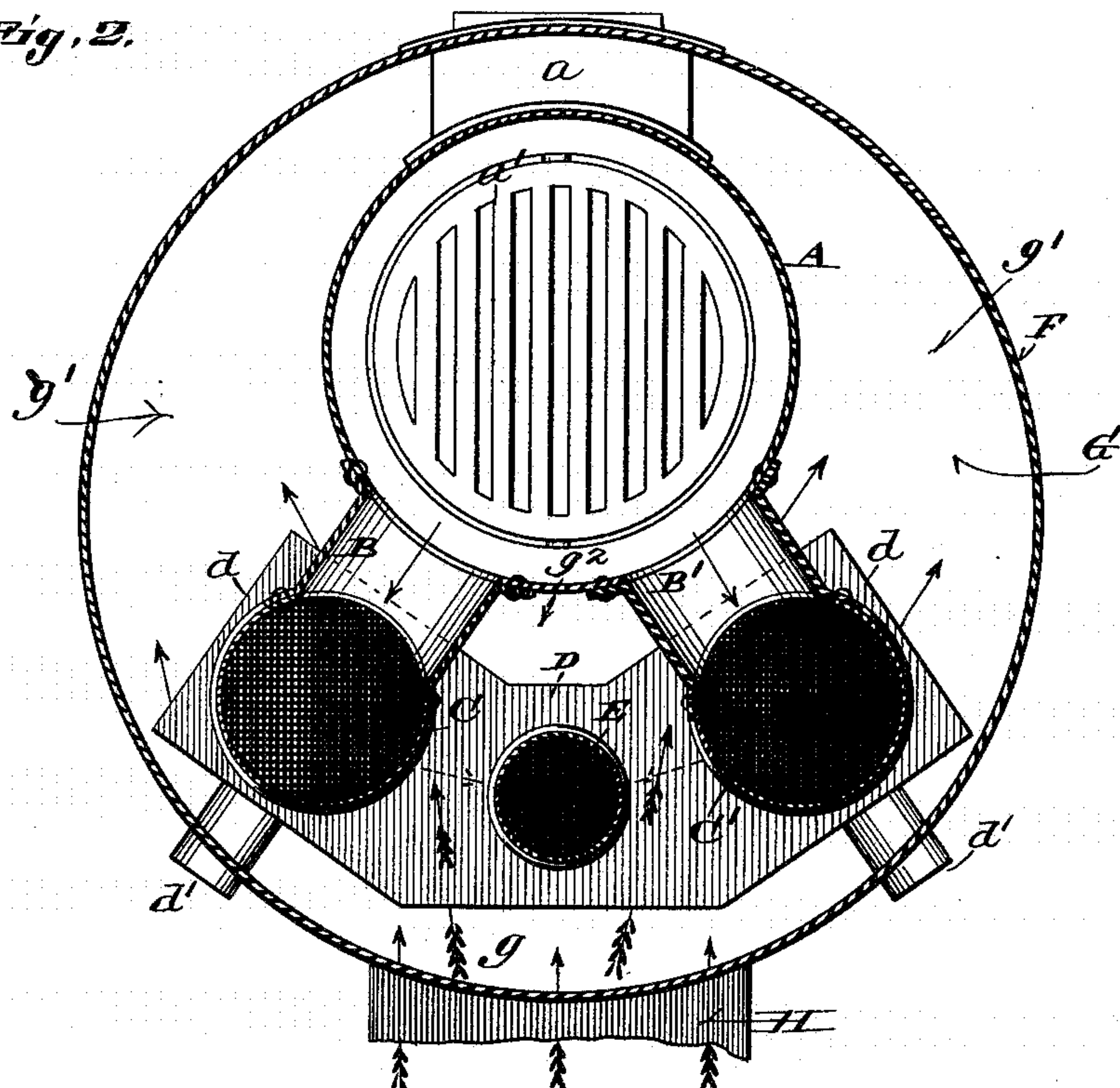
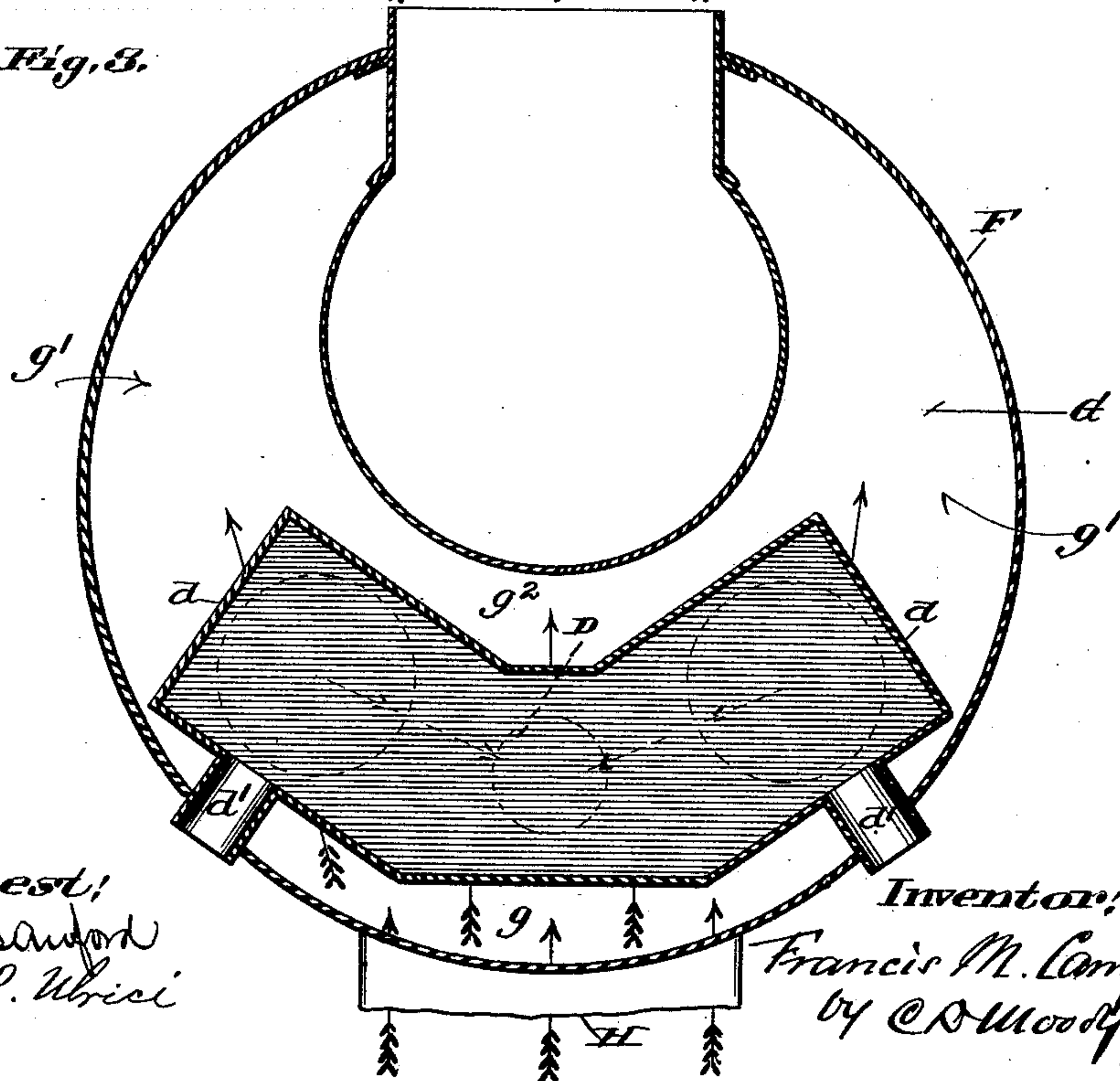


Fig. 3.



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# UNITED STATES PATENT OFFICE.

FRANCIS M. CAMPBELL, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO  
WILLIAM THUENER, OF SAME PLACE.

## HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 414,018, dated October 29, 1889.

Application filed February 25, 1889. Serial No. 301,116. (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 especially 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, reference being had to 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, and Fig. 3 a horizontal section on the line 3 3 of Fig. 1.

The same letters of reference denote the same parts.

A represents the combustion-chamber of the furnace. It is of the customary form, saving 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 two escape-flues BB', Figs. 1 and 2. The flues respectively lead into two upright flues C C', at or toward the upper portion thereof. The flues C C' at the lower end thereof connect with a horizontal chamber D and respectively toward the ends *d d'* thereof. The exit from the chamber D is by means of an upright flue E, Figs. 1 and 2, which rises from the chamber D, midway between the flues C C', 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, Figs. 1, 2, and 3. The cold-air inlet to the chamber G is at H, Figs. 1, 2, and 3, at the back part of the chamber G, as shown, and the chamber D is also at the back part of the chamber G, and it is arranged above the level of the inlet H, and the chamber D, as shown substantially in Figs. 2 and 3, is at its rear portion extended forward to come near the case F, and laterally is extended to come well to the sides of the combustion-chamber A, by which means

a narrow space *g* is provided immediately above the inlet H, at the back of the combustion-chamber and in the rear of the chamber D and flues C C E, and a much larger space *g'* at each side of the combustion-chamber for the air as it becomes heated to rise in. By reason of this a larger portion of the air is directed toward the central portion of the chamber G, and thus to the best advantage so far as heating it is concerned.

The operation is as follows: The heated products of combustion escape from the chamber A into the descending flues C C', which are quite large in diameter, and larger than the flue E. Owing to their size and to the use of a pair of them the flues C C' are sufficient for the chamber A and no direct escape is needed. The course from the flues C C' is downward into the chamber D, which serves not only to provide an additional heating-surface, but also as a dust-chamber and as a guard to favor the delivery of the incoming cold air toward the central portion of the chamber G. From the chamber D the escape is, as stated, upward through the flue E.

It will be observed that the horizontal chamber D is not connected with the chamber A, but is separated therefrom, thereby providing additional heating-surface, and space *g''* between the chambers A and D for the air to rise in. The chamber D is provided at its lateral extension with horizontal air-ports *d' d'*, which extend through the wall of the hot-air chamber and by drawing in air increase the draft up the flue E. When desired, these parts may be closed. The combustion-chamber A is situated eccentrically within the hot-air chamber G, and the chamber D, to produce heat within the hot-air chamber, is situated at the side of the latter opposite that containing the combustion-chamber, and is moreover directly and centrally above the air-inlet H, so that said chamber heats the air as it is entering and heats it at the farthest possible point from the combustion-chamber. The descending flues C C' are of much larger diameter than the ascending flue E. This is for the purpose of retarding the descent through the flues C C' and increasing the radiating-surface thereof, so that by means of said retard-



ing and increased surface the greatest possible amount of heat will be thrown out from the descending flues into the air-chamber. As the ascending flue E is much smaller in diameter than the descending flues C C', the air will of course pass much more rapidly upward therethrough than it can descend in the flues C C'.

I claim—

1. In a furnace, the combination, with the hot-air chamber having an air-inlet in one side near its bottom, of the combustion-chamber situated eccentrically within the hot-air chamber and adjacent to the side thereof opposite that having the air-inlet, the flues B B', extending from the inner side of the combustion-chamber near the top thereof, the descending flues C' C', communicating at top with the flues B B', respectively, the chamber D, communicating with the lower ends of the flues C C', and the ascending flue E, rising centrally from the chamber between the flues B B', substantially as specified.

2. The combination, with the hot-air chamber having the air-inlet in one side near its bottom, of the combustion-chamber situated eccentrically within the hot-air chamber near

the side opposite that having the air-inlet, the chamber D, immediately above the air-inlet, and provided with the air-ports  $d' d'$  at its lateral extensions, the flues B C and B' C', respectively connecting the said lateral extensions with the upper portion of the combustion-chamber, and the ascending flue rising from the chamber D midway between the flues C C', substantially as specified.

3. In a furnace, the combination, with the hot-air chamber and the combustion-chamber situated eccentrically therein, of the flues B B', extending from the top of the combustion-chamber, the descending flues C C', of large diameter, communicating, respectively, with the flues B B', the heating-chamber D, communicating with the lower ends of the flues C C', and the ascending flue E, rising from the chamber D between the flues C C' and of much smaller diameter than the latter flues, as and for the purposes set forth.

Witness my hand this 21st day of February, 1889.

FRANCIS M. CAMPBELL.

Witnesses:

C. D. MOODY,

D. W. A. SANFORD.