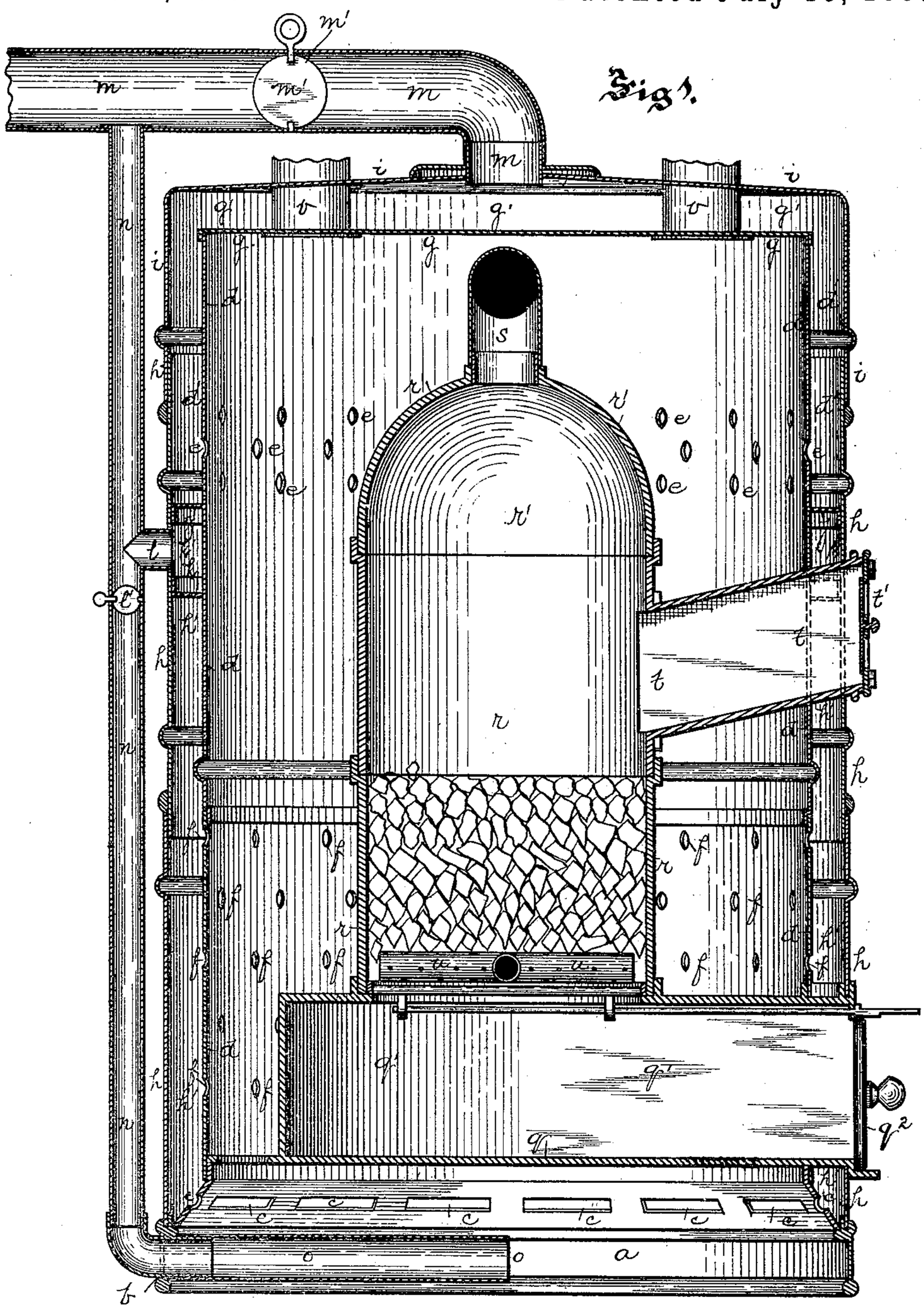
(No Model.) 2 Sheets—Sheet 1.

H. A. ALTER.

FURNACE.

No. 366,807. Patented July 19, 1887.

Fig. 1.



Witnesses:

J. N. Cooke

N. S. Stockwell

Inventor.

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By James D. Ray

Attorney

(No Model.) 2 Sheets—Sheet 2.

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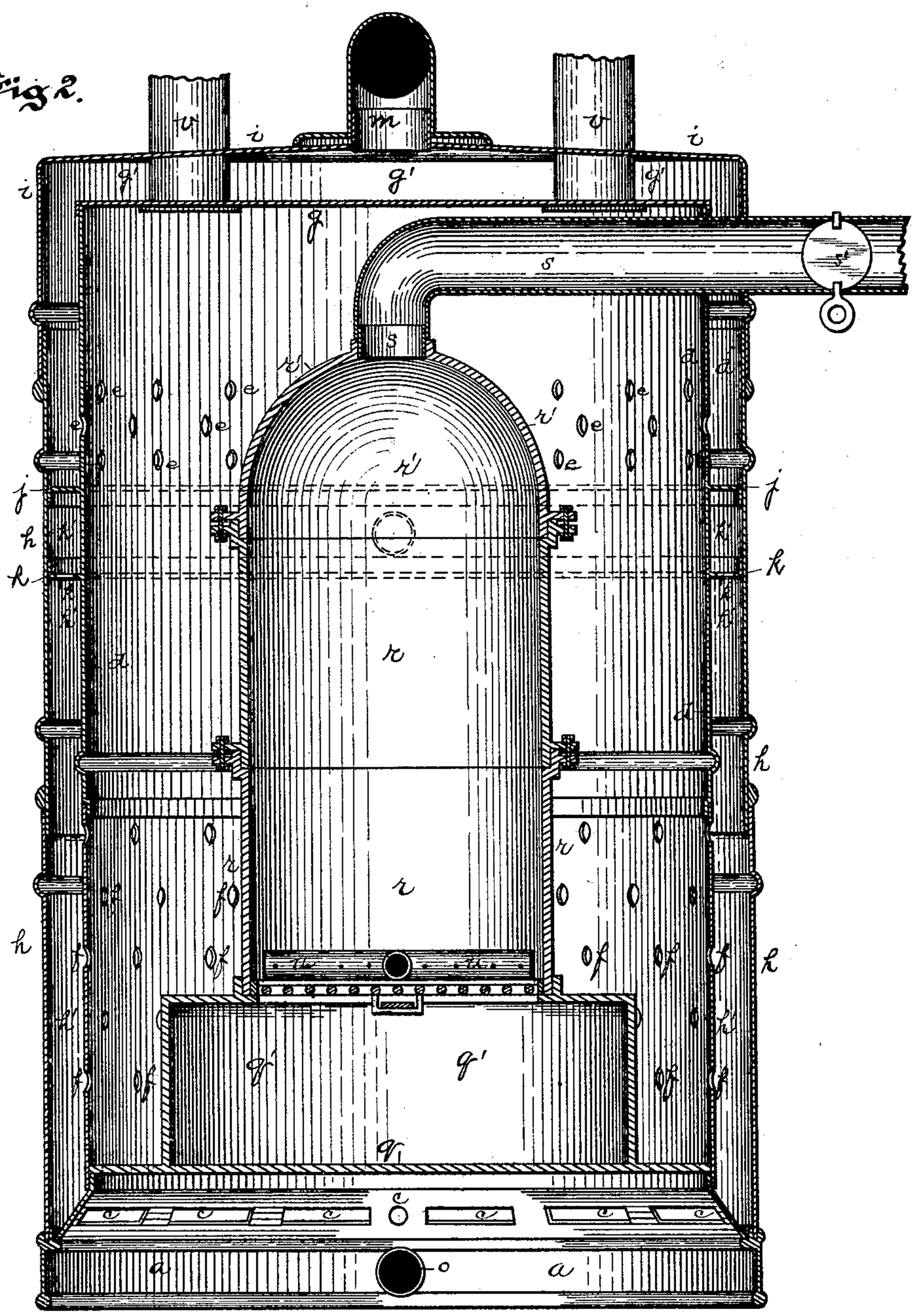
Fig 2.



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UNITED STATES PATENT OFFICE.

HIRAM A. ALTER, OF PITTSBURG, PENNSYLVANIA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 366,807, dated July 19, 1887.

Application filed March 2, 1887. Serial No. 229,436. (No model.)

To all whom it may concern:

Be it known that I, HIRAM A. ALTER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Hot-Air Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to hot-air furnaces, its principal object being to cool the top or crown of the furnace, and at the same time secure a large supply of air for the hot-air chamber, where the air, in consequence of the strong draft obtained, only lingers a sufficient time to secure the proper temperature.

In most of the furnaces heretofore in use the top or crown of the furnace frequently becomes heated to such a high temperature by the air in the hot-air chamber that not only is there a great loss of heat, but there is a constant danger of setting fire to the ceiling or other woodwork in the vicinity of the furnace. This is particularly the case when natural gas is used as a fuel, as the heat produced is so intense that the roof or crown of the furnace frequently becomes heated to such a temperature that many fires have been traced to this cause. A further objection has also been that the cold air after passing into the hot-air chamber remains so long therein as to become devitalized by its contact with the red-hot iron stove and otherwise vitiated, so as to be injurious to the health of persons breathing the air of rooms heated by it. To correct the first of these objections, it has been proposed to have an annular air-chamber surrounding the hot-air chamber and extending to the bottom thereof and having openings into the latter at its lower end, and communicating at its upper end with a chamber over the roof or crown, into which chamber the cold-air-supply pipes lead; but this construction has been a failure on account of the defective draft through the furnace and the consequent small supply of hot air which the furnace gives off. This is due to the fact that the cold air entering the chamber over the roof becomes heated as it passes down through the annular chamber around the hot-air chamber, so that by the time it has reached the entrance-ports into the latter it is so highly heated and expanded by radiation through the walls that the flow of cold air in at the top is checked, and the air, on account of the substantially equal temperature in the two chambers at their connecting-point, flows but slowly from one to the other. Thus it is clear that the volume of air which flows into and through the furnace is very materially reduced, and another disadvantage incident to the retarding of the flow of the air arises—that is, the devitalizing and vitiation of the air while in the furnace.

My improved furnace obviates all the objections heretofore pointed out; and to that end it consists, generally, of an annular air-chamber surrounding the hot-air chamber and body of the furnace, said chamber being divided into an upper and lower part having no communication with each other, but each having openings into the hot-air chamber, a chamber over the crown or top of the furnace communicating with the upper part of said annular chamber, and air-supply pipes leading into said crown-chamber, and also into the lower portion of the annular chamber, as will be more fully hereinafter set forth and claimed.

To enable others skilled in the art to make and use the same, I will describe it, referring to the accompanying drawings, in which—

Figure 1 is a central vertical section on one plane, and Fig. 2 a like section on another plane.

Like letters refer to like parts in each of the figures of the drawings.

a is the supporting or base ring, in which is an opening, *b*, for an air-supply pipe, and also a series of openings or ports, *c*, leading into chambers *h'*, hereinafter described. Resting on a ledge or shoulder on said ring *a* is the inner casing, *d*, which is made up of any number of sections of sheet metal, preferably two, braced by the usual flanged rings between the sections, and having in the upper part thereof a series of holes or ports, *e*, therein, and in the lower part a similar series of holes, *f*, and provided with a suitable cover or top plate, *g*. Surrounding said casing *d*, at a distance therefrom and resting on the supporting-ring *a*, is an outer casing, *h*, composed of two or more sections of sheet metal braced by the usual flanged rings between the sections, and resting on its upper edge is the cap *i*, which extends over the top plate, *g*, of the inner casing and forms the crown-chamber *g'* between them. The annular chamber formed between

the inner and outer casings, *d* and *h*, is divided into two parts, *h'* and *d'*, by an annular flange or diaphragm, *j*, secured to either or both of said casings at a point preferably about two-thirds the height of the chamber, said diaphragm being to prevent the passage of the air from one part of the chamber to the other. A short distance below this diaphragm *j* is another annular diaphragm, *k*, having a number of perforations or holes therein, so as to form a connection with the lower part, *h'*, of the annular chamber, and the annular flue *k'*, formed by the diaphragms *j* and *k*, a segment of the diaphragms being unperforated or plain where the air-flue *l* enters the flue *k'*, so as to distribute the supply of air around the annular chamber *h'*.

Leading into the crown-chamber *g'*, preferably about the center, is a cold-air-supply pipe, *m*, which has a branch pipe, *n*, running down the side of the furnace and supplying air to the flue *k'* through the pipe *l*, and to a pipe, *o*, leading into the base of the furnace through the opening *b* in the supporting or base ring *a*. For the purpose of controlling the flow of air from the supply-pipes into the different parts of the furnace, a damper, *m'*, is provided in the pipe *m* and a damper, *l'*, in the pipe or flue *n*.

Resting on and supported by the base-ring *a*, within the inner casing, *d*, is the base-plate *q* of the ash-pit *q'*, which is provided with a suitable door, q^2, on the exterior of the furnace, and on which base-plate rests the stove or fire-pot *r*, of any suitable shape, or, as shown in the drawings, composed of a number of cylindrical sections fitted together and covered by a semi-spherical top, *r'*, from the pole of which passes out the flue *s* for the products of combustion, said flue passing out through the inner and outer casing into the chimney, and being provided with a damper, *s'*, for controlling the draft. This stove or fire-pot is provided with the usual charging-chute, *t*, extending out to the exterior of the furnace and closed by a suitable door, *t'*, and when natural gas is used with a suitable burner, *u*, at the base of the stove. Leading from the hot-air chamber are the usual hot-air pipes, *v*.

When the furnace is in operation, cold air enters through the pipe *m* into the crown-chamber *g'*, distributing itself through said chamber and cooling off the top plate, *g*, of the hot-air chamber, from whence the air passes into the annular chamber *d'*, and thence through the holes *e* into the top part of the hot-air chamber A, being heated as it passes through the chambers by the radiation of heat from the hot stove. As the air in its passage from the pipe *m* through the chambers *g'* and *d'* does not become very much heated and expanded, the difference in temperature between the hot-air chamber A and the annular chamber *d'* will be so great as to insure a strong current of air passing into the hot-air chamber, and at the same time keeping the top cool and preventing the loss of heat by radiation. The air from the pipe *m* also passes down the branch pipe *n* into and through the pipe or flue *l* to the annular flue *k'*, where it is distributed evenly to all parts of the lower annular chamber, *h'*, and passes down the same until it comes to the opening *f*, through which the air passes into the hot-air chamber A. As the difference in temperature between the air in the chamber *h'* and that in the hot-air chamber A is very great, the air will flow rapidly from one to the other, and thence up in the hot-air chamber to the hot-air pipes. The advantage of dividing this annular chamber into the two non-communicating parts is that the incoming air does not have sufficient time to become heated and expanded before it reaches the inlets into the hot-air chamber to effect the retardation of the flow of air into the hot-air chamber, as heretofore described, and therefore a larger volume of air passes into the hot-air chamber and is delivered by it than in the form of furnace heretofore referred to. At the same time there is no loss of heat by radiation or through the walls of the furnace, as a large amount of cold air is constantly circulating around all exposed parts of the furnace-shell. Thus the advantage of an air-chamber entirely surrounding the furnace-shell is obtained, with none of the disadvantages heretofore attending its use.

If a still larger supply of air is required, it may pass in at the base through the pipe *o*, and thence into the annuler chamber *h'* through the opening *c* in the base-ring *a*, thence into the hot-air chamber.

It is apparent by this construction that all loss of heat by radiation through the side walls or casing of the furnace is obviated, that a rapid flow of cold air in large volumes to and through the hot-air chamber is effected, and that the air, being compelled to flow quickly through the furnace, does not stay long enough in the hot-air chamber to become deoxidized or devitalized.

Having now described my invention, what I claim is—

1. In a hot-air furnace, an annular chamber surrounding the hot-air chamber and divided into two parts, the upper one of which communicates with the upper part of the hot-air chamber and a chamber over the crown of the furnace and the lower one with the hot-air chamber at the lower part thereof, with cold-air-supply pipes leading into said crown-chamber and into the lower annular chamber, substantially as described.

2. In a hot-air furnace, the combination of an inner casing having perforations at the upper and lower parts of the sides thereof, an outer case inclosing the top and sides thereof and forming an air-chamber between them, a diaphragm between said inner and outer casings, and air-supply pipes leading into the air-chamber above said diaphragm and below the same, substantially as described.

3. In a hot-air furnace, the combination of an inner casing having perforations at the up-

per and lower part thereof, an outer casing inclosing the top and sides of said inner casing and forming an air-chamber between them, a diaphragm between said inner and outer casings dividing the air-chamber into two parts, and a perforated diaphragm below the other diaphragm, and forming between them an annular flue, with cold-air-supply pipes leading into the upper part of the air-chamber and into the annular flue, substantially as described.

In testimony whereof I, the said HIRAM A. ALTER, have hereunto set my hand.

HIRAM A. ALTER.

Witnesses:
JAMES I. KAY,
I. E. BARNES.