

No. 713,210.

Patented Nov. 11, 1902.

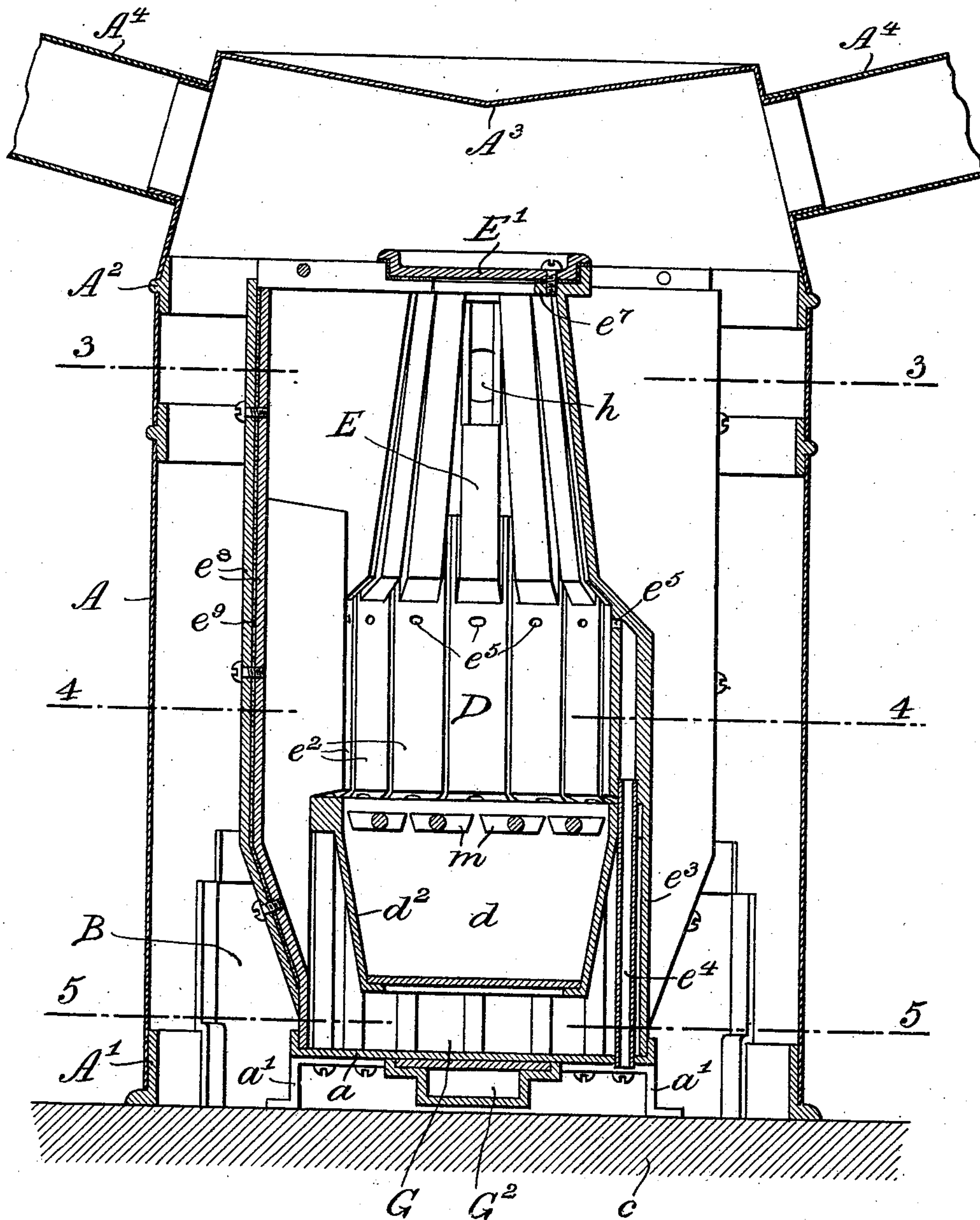
J. EVANS.
HOT AIR FURNACE.

(Application filed May 22, 1902.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.



Witnesses:
Wilhelm Vogt
Thomas M. Smith

Inventor:
John Evans,
By J. Walter Douglas
Attorney

No. 713,210.

Patented Nov. 11, 1902.

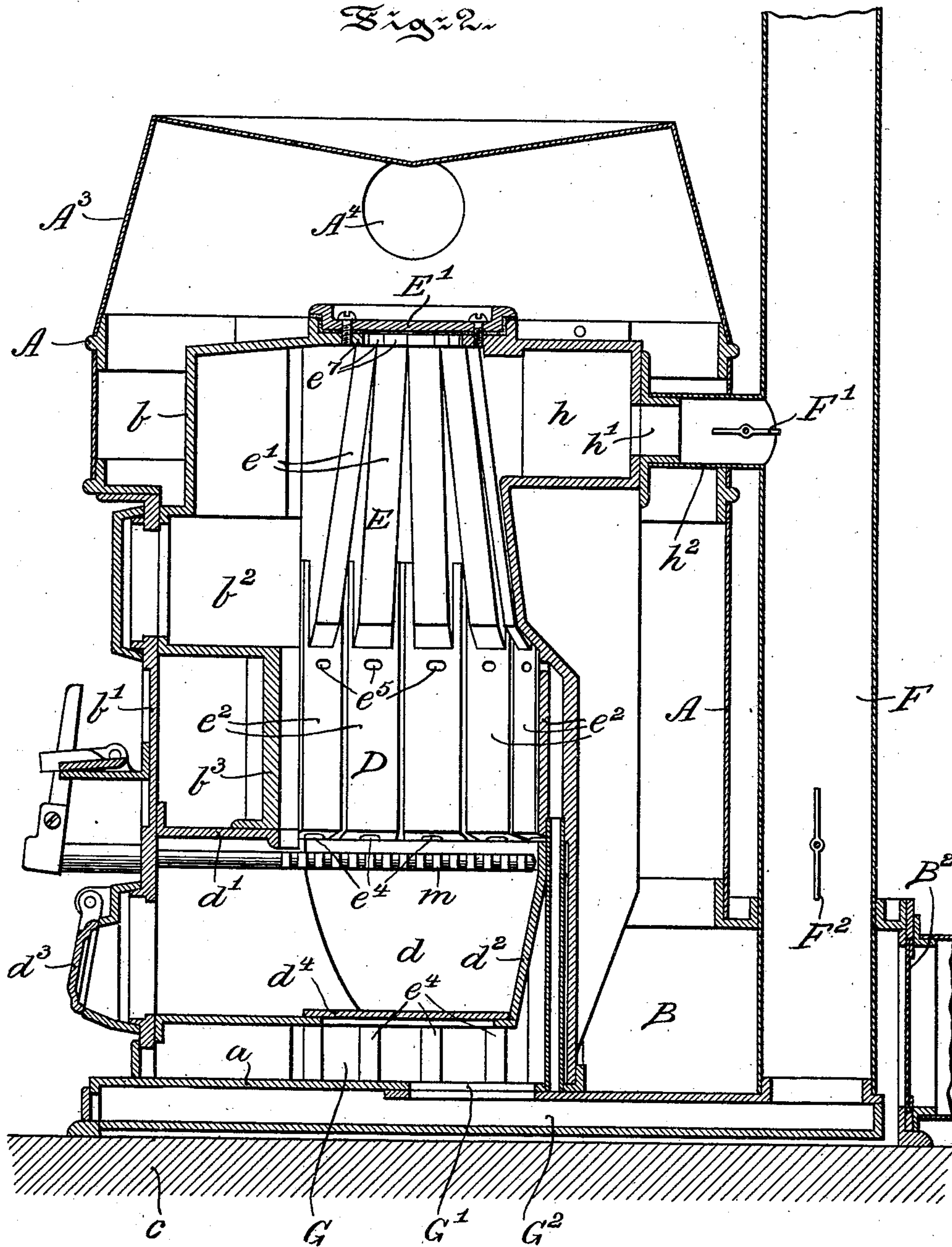
J. EVANS.
HOT AIR FURNACE.

(Application filed May 22, 1902.)

(No Model.)

4 Sheets—Sheet 2.

Fig. 2.



Witnesses:
Wilhelm Vogt
Thomas M. Smith.

Inventor:
John Evans,
By *Walter Dwyer*
Attorneys.

No. 713,210.

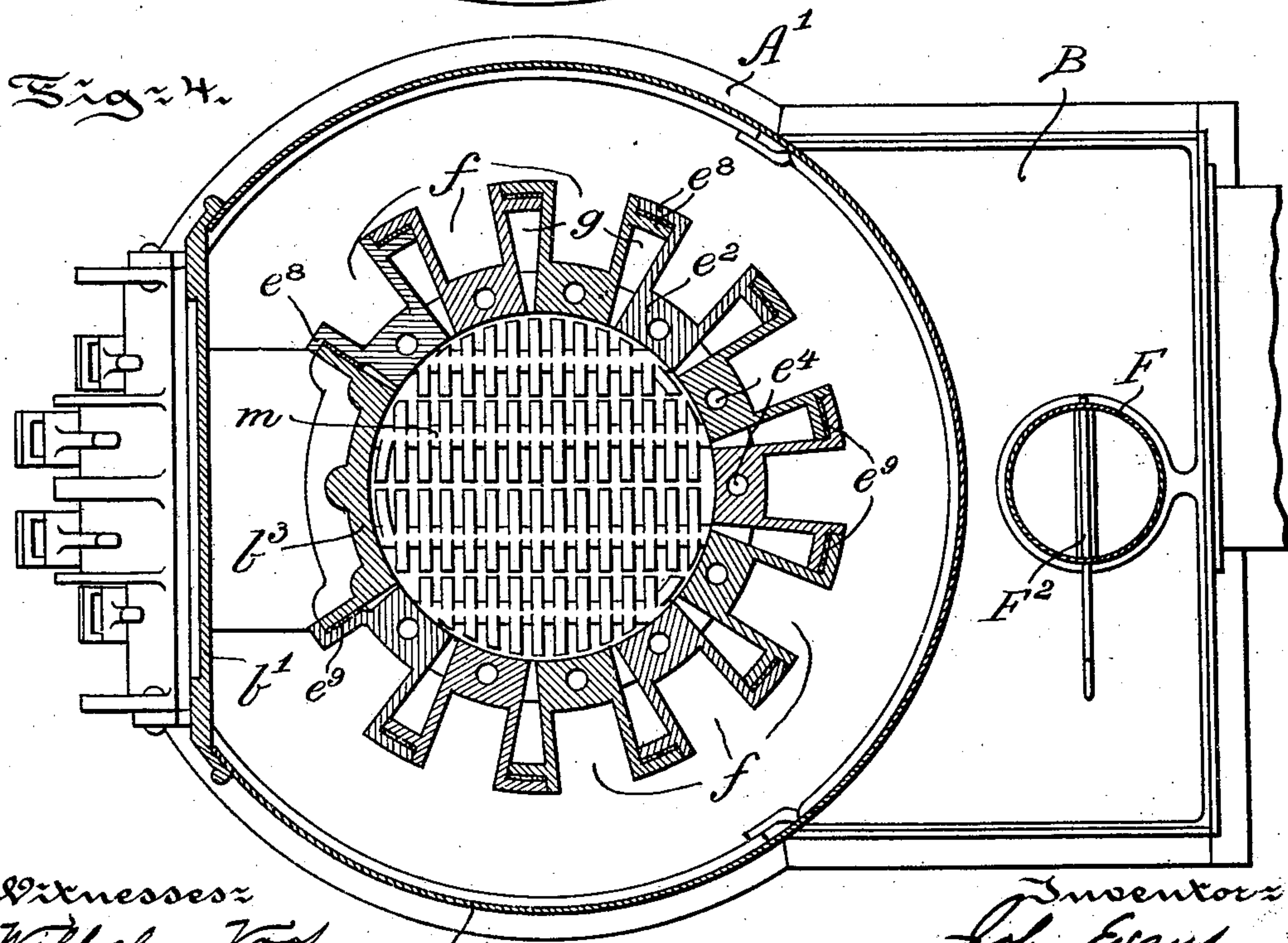
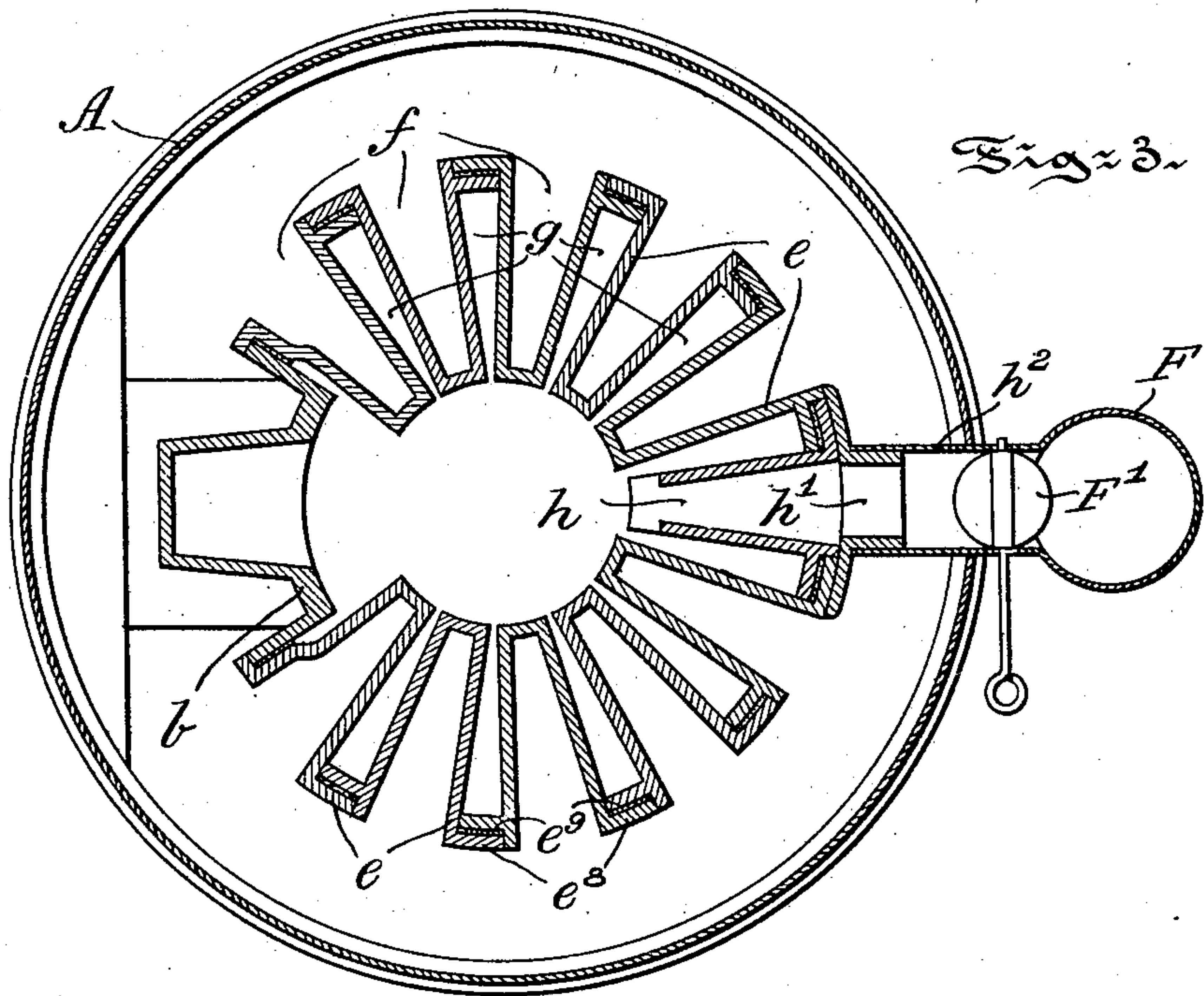
Patented Nov. 11, 1902.

J. EVANS.
HOT AIR FURNACE.

Application filed May 22, 1902.)

(No Model.)

4 Sheets—Sheet 3.



Witnesses:
Wilhelm Vogt
Thomas M. Smith

Inventor:
John Evans,
By J. Walter Dwyer
Attorney.

No. 713,210.

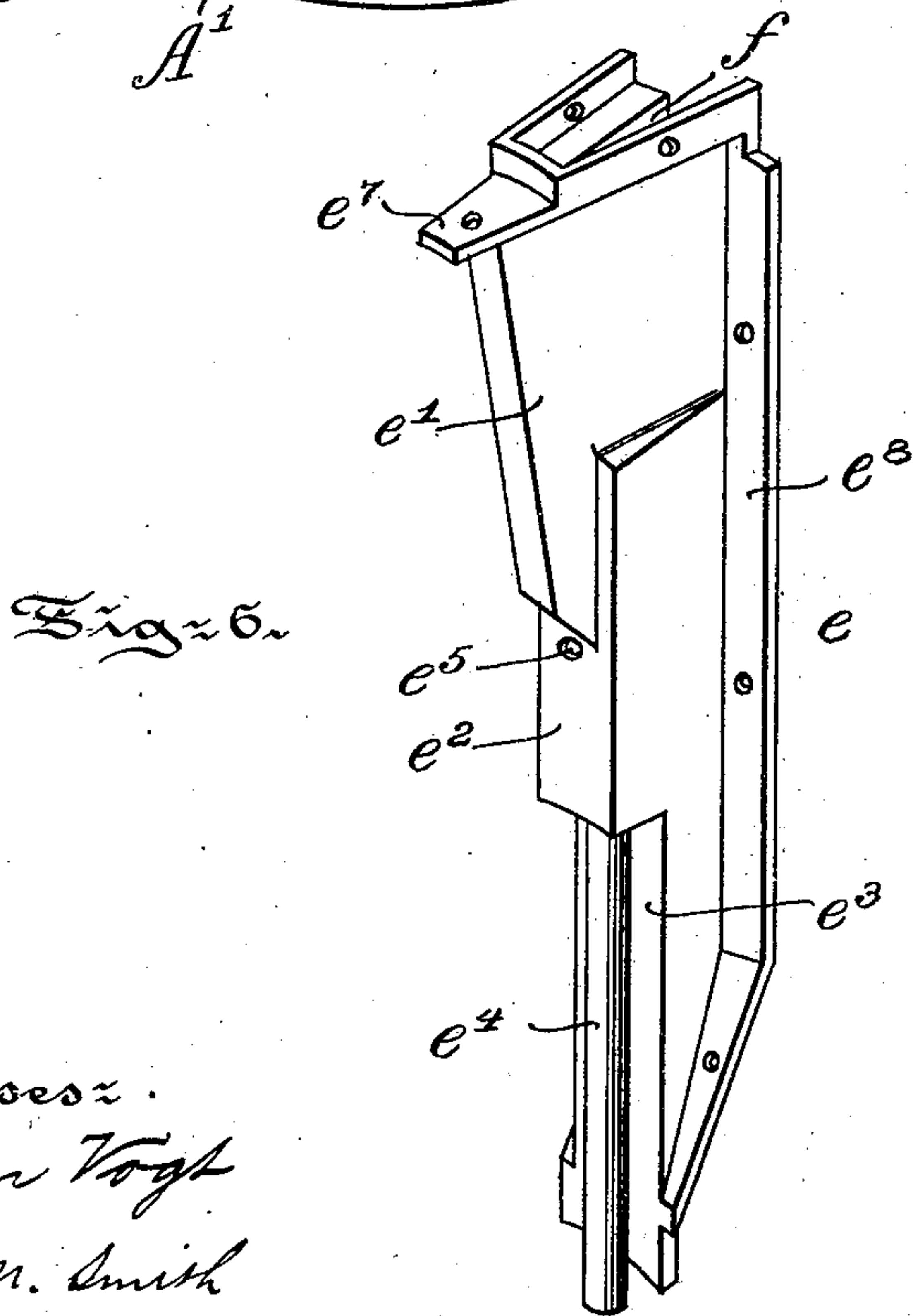
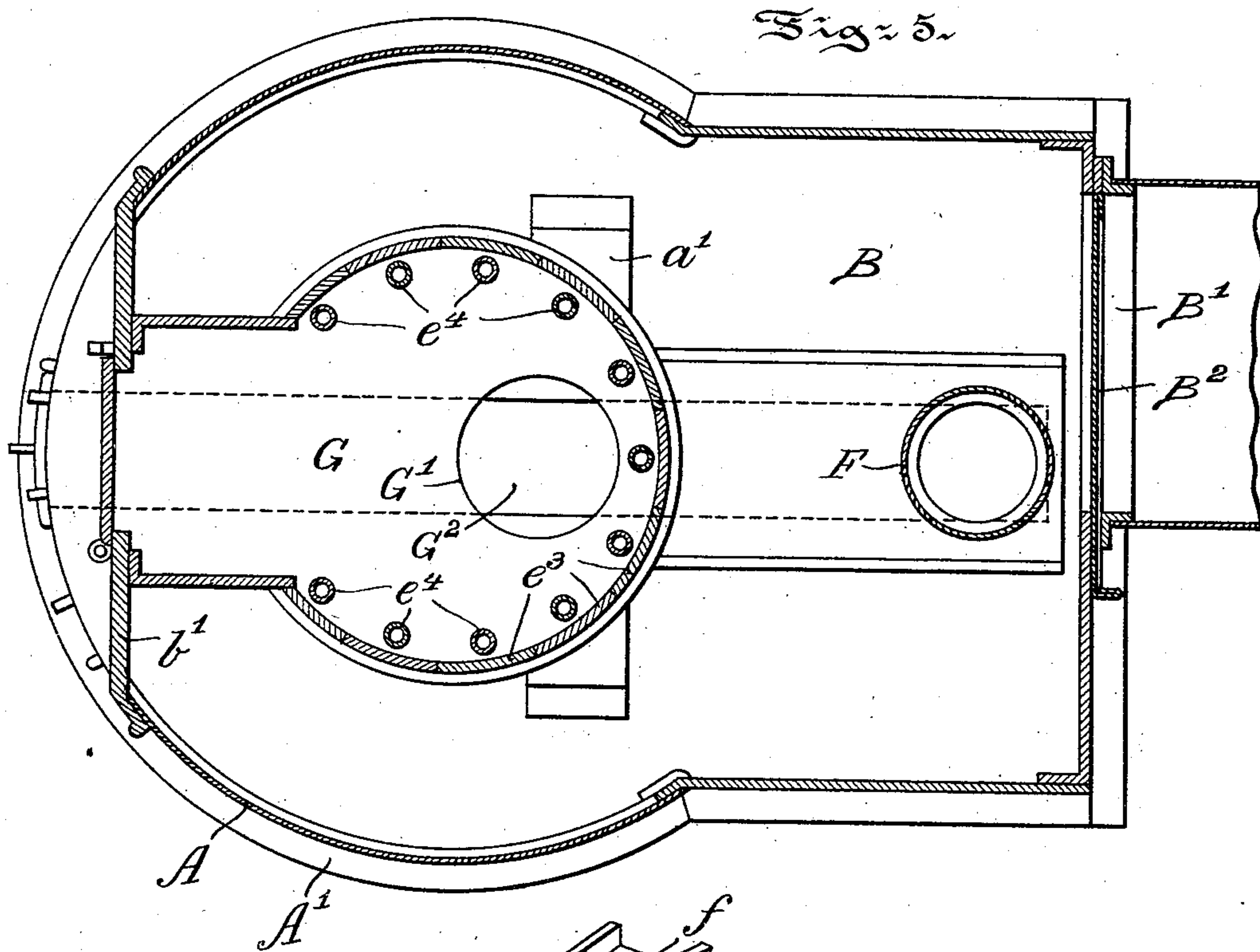
Patented Nov. 11, 1902.

J. EVANS.
HOT AIR FURNACE.

(Application filed May 22, 1902.)

(No Model.)

4 Sheets—Sheet 4.



Witnesses:
Wilhelm Vogt
Thomas M. Smith

Inventor:
John Evans,
By J. H. Walker & Co.
Attorneys

UNITED STATES PATENT OFFICE.

JOHN EVANS, OF PHILADELPHIA, PENNSYLVANIA.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 713,210, dated November 11, 1902.

Application filed May 22, 1902. Serial No. 108,478. (No model.)

To all whom it may concern:

Be it known that I, JOHN EVANS, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Hot-Air Furnaces, of which the following is a specification.

My invention has relation to a hot-air furnace, and in such connection it relates to the construction and arrangement of parts constituting such a furnace.

The principal objects of my invention are, first, to reduce the cost and increase the efficiency of such a furnace by simplifying the construction and arrangement of the parts thereof and by arranging the parts so that the heat from the products of combustion may be economically utilized; second, to provide in such a furnace a fire-pot, a combustion-chamber located above the fire-pot, a closed ash-pit located below the fire-pot, a direct draft leading from the combustion-chamber to the offtake or stack, a series of revertible draft-flues arranged in the interior of the fire-pot and combustion-chamber and on the exterior of the ash-pit, said flues leading to the offtake or stack, and means for conveying fresh air from outside the fire-pot directly into the interior of the fire-pot below the combustion-chamber; third, to provide in such a furnace a series of separable sections adapted when assembled in the furnace to form part of the interior of the fire-pot and of the combustion-chamber, each section having an intermediate hollow portion forming the wall for the fire-pot and through which fresh air is fed to said fire-pot, means for conducting the products of combustion directly away from the combustion-chamber, means for conducting said products from the combustion-chamber by revertible draft, and means for feeding fresh air to the intermediate hollow portions of the sections; fourth, to provide in such a furnace a series of metallic sections of substantially V shape in cross-section and arranged radially in the furnace to form a central fire and combustion chamber and a series of triangular exterior pockets or flues into which the fresh air enters to be heated, the sections being spaced from each other to form a series of internal flues into which the gases flow when

the direct draft from the furnace is closed and down which the gases escape into a revertible draft-flue when the revertible draft is opened; fifth, to provide in conjunction with this arrangement of sections and the provision for direct and revertible draft an ash-pit below the grate of the furnace, which is closed to prevent the revertible draft from entering the ash-pit, and, sixth, to provide in conjunction with this arrangement of sections in each section a hollow metallic chamber forming a portion of the circular wall of the fire-box and said chamber having an inlet for fresh air from the exterior of the furnace and an outlet into the interior of the fire-box above the fuel.

My invention, stated in general terms, consists of a hot-air furnace constructed and arranged in a manner substantially as hereinafter described and claimed.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a vertical sectional view of a hot-air furnace embodying main features of my invention. Fig. 2 is a similar view, the section being taken on a plane at right angles to the section in Fig. 1. Figs. 3, 4, and 5 are horizontal sectional views taken, respectively, on the lines 3 3, 4 4, and 5 5 of Fig. 1; and Fig. 6 is a perspective view of one of the metallic sections detached from the adjacent parts.

Referring to the drawings, A represents the exterior casing of the furnace, supported upon the base A' and supporting at its upper edge the ring A². Above the ring A² is supported the dome or air-drum A³ of the furnace, from which dome a series of hot-air pipes A⁴ conducts the hot air to the various registers in the house. At the back of the furnace forming a rear extension to the casing is arranged a chamber B, into which the fresh air is led from an opening B', controlled by a slide B². As illustrated in the drawings, this opening B' is arranged in the rear wall of the chamber B; but it may be located in one of the side walls or in the roof, if required. Within the casing A and above the base A' is arranged a plate or platform a, supported

some distance above the foundations c by a frame or bracket a' and by the base A' of the casing A . This plate a forms the support for the series of separable metallic sections, the interior of which when assembled constitutes the fire-pot and the combustion-chamber of the furnace. The front section b of this series of sections is supported by and projects inward from the front plate b' of the furnace, in which front plate the openings for the feeding of fuel and for the removal of ashes are located. The front section b is substantially box-shaped at its upper extremity to form a chamber b^2 , through which the fuel may be introduced into the furnace. Its lower portion is segmental, as at b^3 , to form a part of the circular wall of the fire-pot D , and it rests upon the roof-plate d' of the ash-pit d . The remaining sections e of the furnace are each substantially V-shaped in cross-section, and, as illustrated in Fig. 6 in detail, each section has an inwardly-projecting upper extension e' , an intermediate portion e^2 , which forms, in conjunction with corresponding portions e^2 of the other sections e and with the segmental wall portion b^3 of the front section, a complete circular wall for the fire-pot D , as clearly illustrated in Fig. 4. The base e^3 of each section is cut away and arranged parallel with the wall d^2 of the ash-pit d , as clearly illustrated in Figs. 1 and 2. The intermediate portion e^2 of each section is hollow, and the interior of the portions e^2 communicate by means of a tube or inlet e^4 , extending outside the wall d^2 and communicating directly with the fresh air circulating in the box or chamber B and below the plate a , upon which the sections e are supported. The chambers or openings in the hollow portions e^2 of the sections also open into the fire-pot D through the perforations e^5 in the interior of the sections. Each section e has on its exterior a channel f , open to the space between the section and the casing A and forming, in effect, a flue through which the fresh air travels in its passage from the box or chamber B to the dome or air-drum A^3 . When the sections e are assembled, it will be found that by reason of their triangular or V-shaped form the sides of adjacent sections do not meet, but only approach to form a series of flues g , open at the top to the combustion-chamber E of the furnace and at the bottom to a chamber G , located below the floor of the ash-pit. As hereinafter explained, these flues f form revertible draft-flues, through which the gases and products of combustion must pass when the direct draft to the off-take or stack F is closed. The combustion-chamber E , by reason of the inwardly-projecting upper extensions e' of the sections e , is substantially frusto-conical, and the top of the chamber E is closed by a cap-plate E' , secured to an upper flange e^7 on each section e , as clearly illustrated in Figs. 1 and 2. Each section e has vertical flanges e^8 on the exterior edge of each of its diverging sides,

and in assembling the sections together the flanges e^8 of adjacent sections overlap and may be bolted or otherwise secured together after a layer e^9 of asbestos or similar material has been interposed to make a gas-tight joint between the flanges e^8 . As previously explained, the fresh-air flues f extend along the exterior of each section e . However, to permit of a direct connection between the combustion-chamber E and the stack F one of these flues f is traversed by a box or outlet-chamber h . The floor and base of this chamber h , together with the sides of the section e , form a passage-way for the products of combustion entering from the combustion-chamber E through an opening h' cut through the upper extension e' of one section e and passing out through a pipe h^2 directly into the stack F without permitting the products of combustion to commingle with the fresh air in the remainder of the flue f or in the interior of the casing, as clearly illustrated in Figs. 1, 2, and 3. Below the grate m is located a closed ash-pit d , having, however, a front door d^3 , and also in its bottom a removable plate d^4 , which, if required, may be taken out for the purpose of more thoroughly cleaning the base of the furnace. The ash-pit d has no communication with either the flues f or flues g in the sections e and is not open to the fresh air circulating in the box B or within the casing A . Below the floor or bottom of the ash-pit d is arranged a chamber G , into which the revertible draft-flues g empty, and this chamber G communicates by opening G' with a flue G^2 , leading to the base of the stack F . The outlet direct from the combustion-chamber E to the stack F is controlled by a damper F' , and the revertible draft from the flue G^2 to the stack F is likewise controlled by a damper F^2 . When the parts are assembled, as shown in Figs. 1 and 2 of the drawings, above the grate m will be arranged the circular fire-pot topped by the frusto-conical combustion-chamber E , and below the grate will be arranged a closed ash-pit d , having a front door d^3 , and below the floor of this ash-pit are arranged the revertible draft-chamber G and flue G^2 and below this again a space in which fresh air from the box B may circulate. The wall of the fire-pot D is formed by the segmental portion b^3 of the front or fuel-feeding section b in conjunction with the hollow intermediate portions e^2 of the sections e , and the combustion-chamber E is formed by the section b in conjunction with the inwardly-projecting inclined extensions e' of the sections e , surmounted by the cap-plate E' . In using direct draft in the furnace the damper F' is opened and the damper F^2 closed. The door d^3 to the ash-pit d is opened and air passes through the grate m and fuel into the combustion-chamber E and passes through the chamber h in one of the sections e directly to the stack F . When, however, revertible draft is used, the damper F' is closed and the damper F^2 opened. The

door to the ash-pit *d* is closed. The unconsumed products of combustion arising from the fuel in the fire-pot D are now supplied with fresh air at the points where the products enter the combustion-chamber, the air passing through the perforations *e*⁵ in the sections *e*. This fresh air is drawn, as previously explained, from without the ash-pit and furnace proper through the tubes *e*⁴ and the hollow portions *e*² of the sections *e*. The feeding of this fresh air to the fire-pot D serves to furnish sufficient oxygen to almost entirely consume the products of combustion in the combustion-chamber E, and the surplus gases pass downward from said chamber E through the flues *f* to the revertible draft-chamber G and flue G² to the stack F. Of course, if desired, a combination of both direct and revertible drafts may be obtained by regulating the dampers F' and F². The revertible draft-chamber G and the flue G² extend to the front plate *b*' and have openings therein, whereby when required both chamber G and flue G² may be cleaned by the introduction of a suitable scraping-tool.

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

1. In a hot-air furnace, a fire-pot, a combustion-chamber located above the fire-pot, a closed ash-pit located below the fire-pot, an offtake or stack communicating directly with the combustion-chamber, a series of revertible draft-flues arranged in the interior of the fire-pot and combustion-chamber and outside the ash-pit, said flues discharging into the offtake or stack, a source of fresh-air supply entering the furnace outside the fire-pot, combustion-chamber and ash-pit, and means for conveying air from the fresh-air supply directly into the interior of the fire-pot below the combustion-chamber.

2. In a hot-air furnace, a series of separable sections adapted when assembled in the furnace to form part of the interior of the fire-pot and of the combustion-chamber, each section having an intermediate hollow portion forming the wall for the fire-pot and through which fresh air is fed to said fire-pot, in combination with means for conducting the products of combustion directly away from the combustion-chamber, means for conducting said products from the combustion-chamber

by revertible draft, and means for feeding fresh air to the intermediate hollow portions of the sections.

3. In a hot-air furnace, a series of separable sections adapted when arranged in the furnace to form part of the wall of the fire-pot and of the combustion-chamber, each section having a hollow intermediate portion forming the wall of the fire-pot and through which fresh air is fed to said fire-pot.

4. In a hot-air furnace, a section of substantially V shape in cross-section, said section having an upper, inwardly-inclined extension forming part of the combustion-chamber of the furnace and an intermediate hollow portion forming part of the wall of the fire-pot, the exterior of said section being open to form a flue for the passage of fresh air over the exterior of the fire-pot and combustion-chamber.

5. In a hot-air furnace, a series of separable sections, each substantially V shape in cross-section, said sections having upper inwardly-inclined extensions forming part of the combustion-chamber, and intermediate hollow portions arranged to form conjointly a part of the wall of the fire-pot, and a means for conducting fresh air through the section into said fire-pot, said sections having contiguous sides separated from each other to form flues for the downward passage of the products of combustion, said flues traversing the interior of the combustion-chamber and fire-pot.

6. In a hot-air furnace, a closed ash-pit, a fire-pot arranged above said ash-pit, and a combustion-chamber arranged above said fire-pot, the wall of said fire-pot and of the combustion-chamber being formed of separable sections, each having a lower portion extending below the fire-pot and outside the wall of the ash-pit, and said sections when combined forming along the interior of the combustion-chamber and fire-pot a series of revertible draft-flues terminating outside the wall of said ash-pit.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

JOHN EVANS.

Witnesses:

J. WALTER DOUGLASS,
THOMAS M. SMITH.