

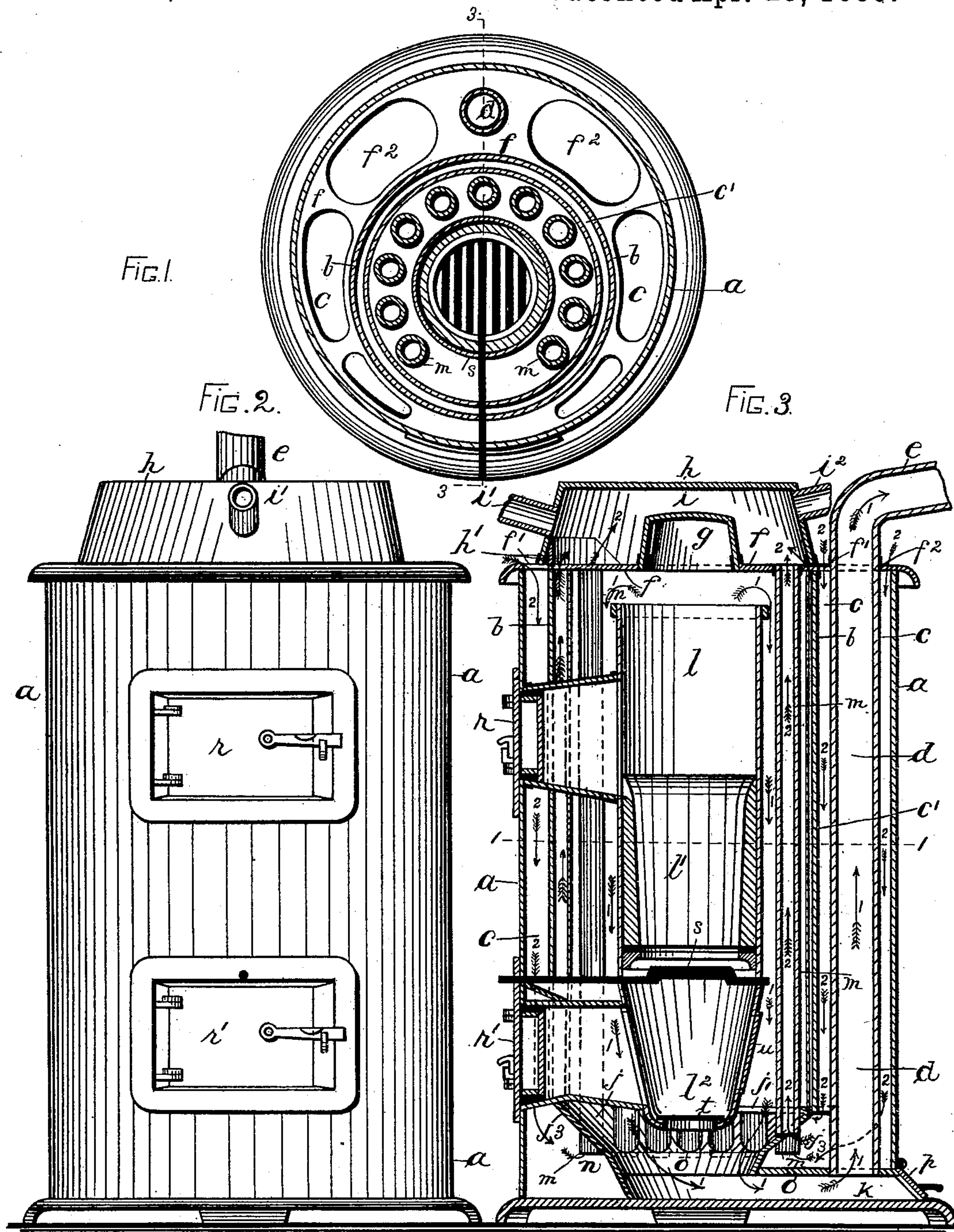
(No Model.)

2 Sheets—Sheet 1.

J. EVANS.
HOT AIR FURNACE.

No. 496,193.

Patented Apr. 25, 1893.



WITNESSES:
Thomas M. Smith.
Richard C. Maxwell.

INVENTOR.
John Evans,
By Walter Douglas,
ATTY

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FIG. 4.

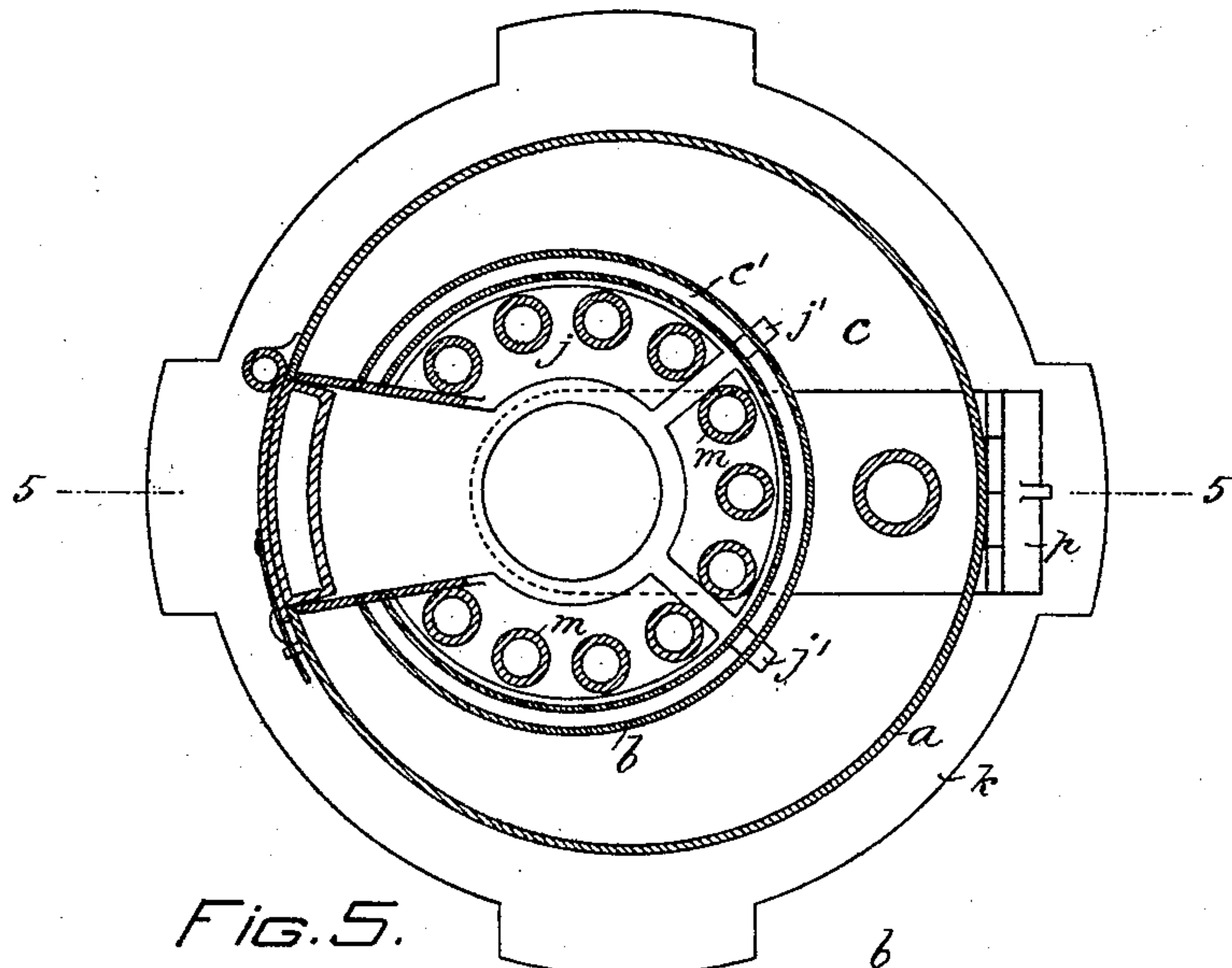


FIG. 5.

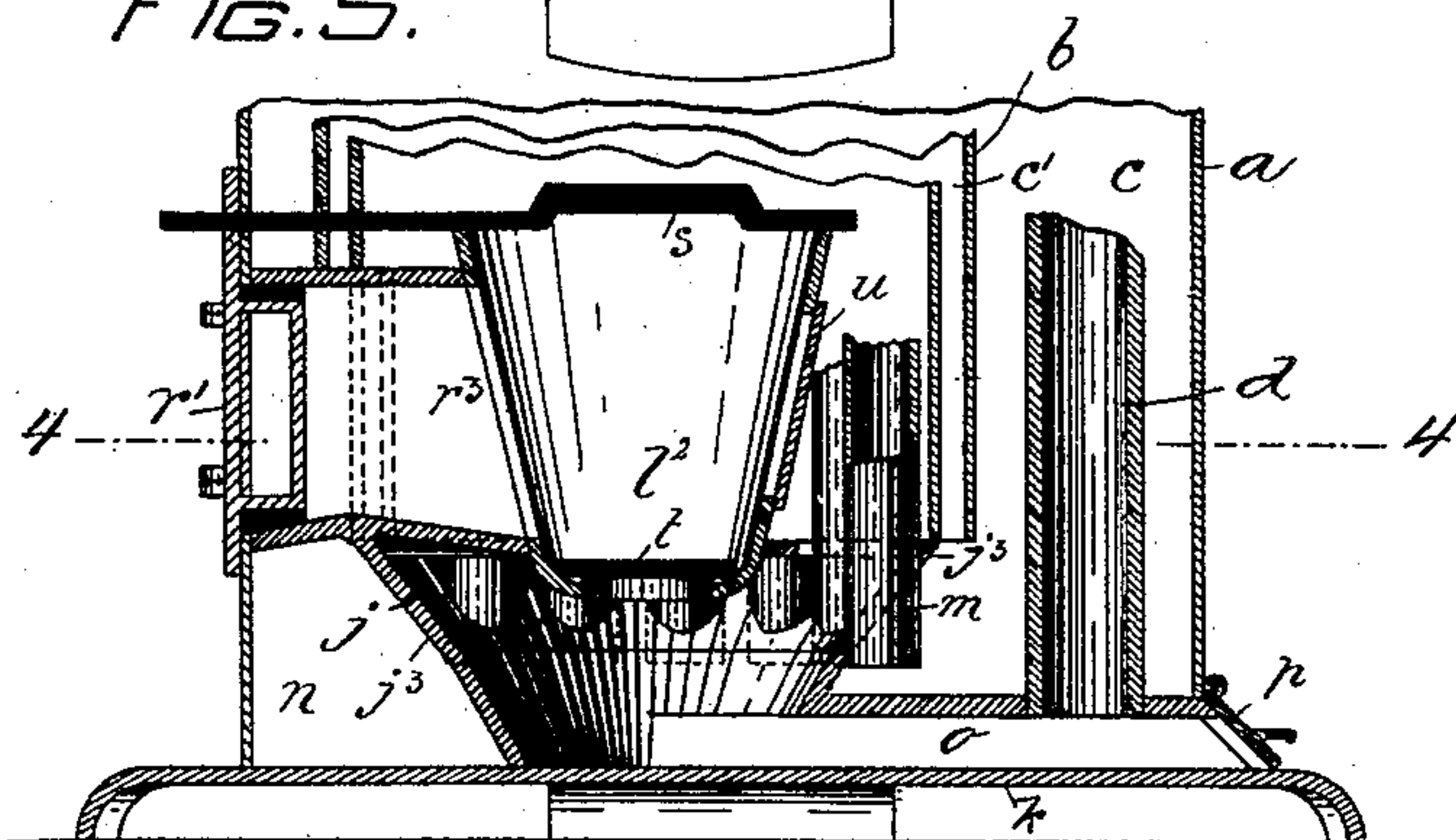
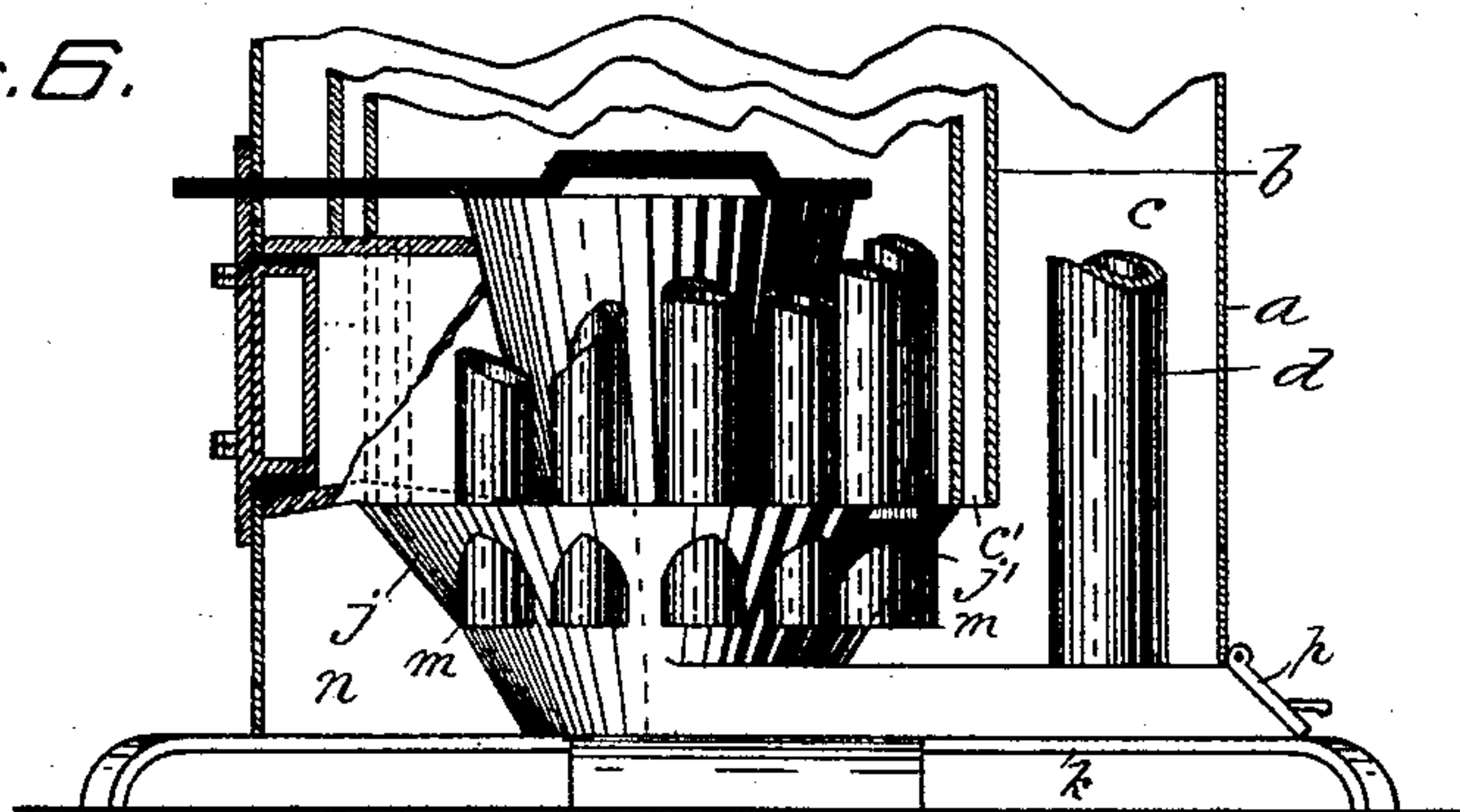


FIG. 6.



WITNESSES:

John W. Achard
Thomas M. Smith.

INVENTOR:

John Evans.
BY J. Walter Douglas
ATT'Y.

UNITED STATES PATENT OFFICE.

JOHN EVANS, OF PHILADELPHIA, PENNSYLVANIA.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 496,193, dated April 25, 1893.

Application filed May 27, 1892. Serial No. 434,644. (No model.)

To all whom it may concern:

Be it known that I, JOHN EVANS, a citizen of the United States, residing in 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 present invention relates to hot air furnaces in which the heat radiated from the combustion chamber and its accessories is employed or utilized for warming the incoming cold air preparatory to its final heating and delivery.

The principal object of my present invention is to provide a simple, durable, comparatively inexpensive and efficient hot air furnace; and to this end my invention consists in the improvements hereinafter described and particularly pointed out in the claims.

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

Figure 1, is a top or plan view, partly in section on the line 1—1, of Fig. 3, of a hot air furnace embodying features of my invention. Fig. 2, is a side elevation thereof. Fig. 3, is a section taken on the line 3—3, of Fig. 1. Fig. 4, is a view partly in section and partly in elevation of the furnace taken on the line 4—4, of Fig. 5, showing the funnel shape or tapering casting with its spider consisting of arms radiating inward therefrom. Fig. 5, is a sectional elevation of the lower portion of the furnace taken on the line 5—5, of Fig. 4, showing the funnel shape or tapering and flaring casting mounted on the base-plate of the furnace and provided with a spider having inclined or beveled walls; and Fig. 6, is a view partly in section and partly in elevation of so much of the furnace as is illustrated in Fig. 5, in order to expose to view the exterior surface of the funnel-shape or tapering and flaring casting connected with the base-plate of the furnace of my invention.

In the drawings *a*, is the exterior shell of the furnace within which all the internal flues, passages, channels and accessories are contained. *b*, is a similar internal casing located within the exterior shell *a*. This cas-

ing *b*, may be made double, or in other words, jacketed so as to afford a passage *c'*, for air to pass in order to prevent cold air from impinging directly upon the hotter or interior member of the double casing.

The shell *a*, and the casing *b*, are not concentric. The center of the casing *b*, is located between the center of the shell *a*, and the front of the furnace, as shown more particularly in Fig. 1. The space *c*, between the exterior shell *a*, and the casing *b*, is wider at the rear than at the front of the furnace to accommodate the flue *d*, that conducts the products of combustion to the smoke off-take *e*, as fully illustrated in Fig. 2.

f, is a plate supported upon the top of the external shell *a*, and provided with air inlets or openings *f'*, and with an aperture *f*², through which the flue *d*, passes.

g, is a dome or hood fitted over a central aperture provided in the plate *f*.

h, is a hot air receiving chamber supported on top of the casing *b*, by means of a fillet *h'*, in order to prevent the cap from closing the openings *f'*.

The space *i*, included by the plate *f*, dome or hood *g*, and receiving chamber *h*, comprises the hot-air reservoir in which the previously warmed air is thoroughly heated and from which the same is distributed by means of pipes or flues *i'* and *i*².

j, is a funnel-shaped or tapering and flaring casting mounted on the base-plate *k*, of the furnace provided with a spider *j'*, and with inclined or beveled circular walls *j*³, for purposes to be presently more fully explained. In the present instance this spider *j'*, comprises arms radiating inward from the casting and supporting at their extremities a ring or annulus.

Within the furnace is provided an open top tubular housing forming the wall of the combustion chamber *l*, fire-pot or chamber *l'* and ash-pit or chamber *l*². This housing *l*, is supported upon the spider *j'* at some distance from the base-plate *k*, and extends upward to within a short distance from the top plate *f*, so that the housing *l*, extends from substantially the top to the bottom of the internal portion of the furnace.

m, are air-pipes extending through the plate *f*, and through the inclined or beveled annu-

lar wall or plate j^3 , so that these pipes m , communicate with the hot air reservoir i , and with an air supply reservoir n , located at or about the bottom of the furnace and included

5 or bounded by the shell a , base k and exterior surface or wall of the casting j .

o , is a rectangular or annular chamber or conduit extending from the exterior surface a , of the furnace and communicating with

10 the flue or off-take d , and affords a channel for the passage of the products of combustion, as well as a receptacle for soot or other extraneous matter.

p , is a hinged door located at the outer end

15 of the chamber o , and adapted for the reception of a hoe or other scraping appliance for the purpose of removing dust or other extraneous matter from the chamber or conduit o , and to permit of the ingress of air therein for

20 regulating or checking the draft *ad libitum* of the furnace.

r , is a door connected with an internal chute r^2 in communication with the combustion chamber l , and fire-pot or chamber l' .

25 This door r affords the means for permitting of the introduction of fuel into the fire-pot mass above the grate s , interposed between the fire-pot l' , and ash-pit l^2 .

r' , is a door provided with an internal chute

30 r^3 , communicating with the ash-pit l^2 , and affording the means for removal of ashes, clinker and other extraneous matter from said pit or chamber.

The ash pit or chamber l^2 , is preferably provided with a false or removable bottom t , which normally serves to support ash or other extraneous matter from time to time deposited therein and which bottom when removed permits of access being had to the interior of the

40 lower part of the furnace for cleaning or removing collecting soot or other matter into the chamber or conduit o . The curved walls of the ash-pit may be provided with one or more doors u , through which access may be

45 had for removing dust, soot or other matter that may adhere to the surface of the air pipes m , or to any of the other internal parts of the furnace around or about the ash-chamber l^2 . However, very little dust or soot can accumulate on and around the pipes m , because such

50 dust or soot or other matter falls upon the inclined wall j^3 , or beveled collector j , and by gravity is discharged from its sloping surfaces into the chamber or conduit o , from which it

55 may be readily removed by means of a scraping device by raising the door p . It may be remarked that dust or soot falling from the flue d , also collects in the chamber or conduit

60 o , and from which it may be readily removed in the manner hereinabove fully explained. It will be observed that substantially all dust, soot or other extraneous matter given off by escaping products of combustion collects in the chamber or conduit o , and may be readily

65 removed from the furnace. By these means the internal area or parts of the furnace may be kept perfectly free from dust or other ex-

traneous matter, so that the efficiency of the furnace is materially increased and is never impaired even when the furnace has been in use for a considerable length of time.

The dish-shaped extraneous matter collecting device j , it will be observed serves a two-fold purpose, that as before stated and as a director of the smoke or of the gaseous products of combustion in their downward course

75 from the top of the combustion chamber l , along the whole extent or surface of the housing constituting the wall of the chambers l , l' and l^2 to the chamber or conduit o , and

80 through the same to the vertical flue d , from whence they pass outward through the off-take e , thereof, into the open air, whereby it will be observed by special reference to Fig. 3, that the heat of the escaping products of

85 combustion is thoroughly or completely imparted by radiation to the downward currents or volumes of incoming or cold air as well as to the upward currents in their ascent through the series of pipes disposed adjacent to the

90 annular passage or space through which the escaping products of combustion are drawn before reaching the off-take d , its elbow extension e , and escaping into the open air.

The mode of operation of the hereinabove

95 described furnace is as follows:—The products of combustion escape from the combustion chamber l , around and in a downward direction through the annular chamber or space included between the housing of the

100 combustion chamber l , and casing b , through the funnel-shaped soot collecting and directing device j , into the chamber or conduit o , and then upward through the flue d , to the off-take e , as is indicated by the arrows num-

105 bered 1, in Fig. 3. The cold air enters the openings f' , provided in the top plate f , mounted on the top of the furnace and descends through the passage or flue c , to the air supply reservoir n , at or near the bottom of the

110 furnace and to the interior annular space c' , Fig. 1, of the double casing c , and then ascends through the pipes m , and space c' , to the hot air reservoir i , as is indicated by the

115 arrows numbered 2, in Fig. 3. Thus both the air and gaseous products of combustion traverse the length of the furnace once in a downward direction and once in an upward direction. The products of combustion, in

120 traversing the exterior surface of the housing l , are super-heated by radiation from the combustion, fire-pot and ash-pit chambers, and these super-heated products of combustion impart their heat to the pipes m , double casing b , funnel-shaped casting j , rectangular

125 chamber o , and flue d , and escape in a comparatively cool state or condition into and through the off-take e , into the open air. The incoming air is warmed during its downward passage by contact with the casing c , and flue d . It is further warmed in the air

130 supply reservoir n , by contact with the casting j , and it is similarly warmed by passing through the pipes m , and space c' , to the hot

air reservoir *i*, where it is super-heated preparatory to its distribution through the outlets *i'* and *i''*. In the latter reservoir it will be understood that the same is heated by direct radiation from the fire and preparatory to its distribution through the above mentioned flues.

The draft of the furnace may be regulated or diminished *ad libitum* by the opening of the door *p*, that is to say, when air is admitted to the flue *d*, the latter is cooled and the normal draft of the furnace is consequently diminished or checked. Moreover is this advantageous, especially when it is desired to remove soot or other extraneous matter from the chamber or conduit *o*, without drawing the fire-bed for that purpose.

It will be obvious to those skilled in the art to which my invention appertains that as to minor details modifications may be made without departing from the spirit of the invention, and hence I do not wish to limit myself to the precise construction and arrangement of the parts as hereinbefore explained, for example, the doors in the ash-pit wall may be omitted, if preferred, or they may occupy a different position to that shown in the drawings without departing from the spirit of the invention.

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

1. A hot air furnace provided with an exterior shell, a plate provided with air inlet apertures and mounted on said shell, a hot air reservoir supported by said plate, air channels or chambers communicating with the apertures of said plate and leading to an air supply reservoir in the bottom of the furnace, an internally supported casing forming the wall of a combustion chamber, fire-pot and ash-pit, an internal smoke flue and dust-collector located beneath said ash-pit, and air pipes directly connecting said top and bottom reservoirs with each other, substantially as and for the purposes set forth.

2. A hot air furnace provided with a top plate having peripheral openings therein, an internally supported casing forming the wall of a combustion chamber, fire-pot and ash-pit, a tapering collecting chamber and directing device located beneath said casing and communicating with an internal conduit or chamber, and an internal vertical pipe or flue extending through one of the openings of the top-plate, substantially as and for the purposes set forth.

3. A hot air furnace provided with an exterior shell, a top-plate having a flanged periphery engaging said shell and having openings therein, an internal smoke or product of combustion flue extending through one of the openings in said plate, means for conducting the products of combustion from an internally supported casing forming the wall of a combustion chamber, fire-pot and ash-pit in

a downward direction through the interior of the furnace and beneath the ash-pit into an internal conduit or chamber in direct communication with said smoke and gaseous product flue, and an opening in the exterior shell closed by a door adapted to check the draft of the furnace, substantially as and for the purposes set forth.

4. A hot air furnace provided with a hot air reservoir at the top supported by an exterior shell and a funnel-shaped perforating casting, as described, supported beneath the internal ash-pit and with the exterior shell forming the wall of an air reservoir at the bottom, air pipes connecting the reservoirs with each other, and a combustion chamber, fire-pot and ash-pit located one above the other and the combustion chamber in communication with the interior of said casting, substantially as and for the purposes set forth.

5. A hot air furnace provided with an open top internal casing comprising a combustion chamber, fire-pot and an ash-pit, means for supporting said internal casing, a pot-shaped casting located beneath the ash-pit, a casing supported upon said casting and surrounding the internal casing for drawing or conducting the products of combustion downward around the interior casing and through the pot-shaped casting to the base plate of the furnace, substantially as and for the purposes set forth.

6. A hot air furnace provided with an exterior shell, a funnel-shaped casting supported on the base plate of the furnace and forming together with the shell the wall of an air supply reservoir, an interior casing eccentric to the shell and supported by the periphery of the casting, a hot air reservoir at the top of the furnace, air pipes connecting the reservoirs with each other, an open top housing concentric with the casing and supported above the casting and constituting the ash-pit, fire-pot and combustion chamber and a smoke flue leading from the interior of the casting through the interior of the furnace to the top thereof, substantially as and for the purposes set forth.

7. A hot air furnace provided with a funnel-shaped casting carrying a spider-frame, an exterior shell constituting together with the casting an annular air supply reservoir, an open top housing carried by the spider-frame and provided with an ash-pit, fire-pot and combustion chamber, and an internal casing carried by the funnel-shaped casting and adapted to direct the products of combustion through the casting, substantially as and for the purposes set forth.

8. A hot air furnace provided with a funnel-shaped casting having a spider-frame, an exterior shell forming with the casting the walls of an annular air supply chamber, an ash-pit supported in position by said spider-frame, an interior casing forming with the wall of the combustion chamber a passage for deflecting the gaseous products of combustion around and beneath the ash-pit pro-

vided with openings through which access may be had to the interior of the gaseous product passage, substantially as and for the purposes set forth.

5 9. A hot air furnace provided with an internal funnel-shaped perforated casting having a spider-frame, an open top internal casing supported by said casting, pipes located
10 around said casing and extending through the wall of said casting, an internal shell supported by said casting for deflecting the gaseous products of combustion to a flue or conduit connected directly with an internal vertical off-take and an ash-pit in the internal
15 casing having doors for affording access to said pipes, substantially as and for the purposes set forth.

10. A hot air furnace provided with a funnel-shaped casting supporting the housing of
20 a combustion chamber, fire-pot and ash-pit and forming a director for the passage of the products of combustion to a conduit or flue directly connected with an internal vertical off-take and a receiver for extraneous matter discharged by a gravity fall into said conduit or flue, substantially as and for the purposes set forth.

11. A hot air furnace provided with an exterior shell, internal casings separated from
30 each other to form the walls of annular chambers or passages, a top-plate provided with inlet openings and rims or projections adjacent thereto, a detachable cap supported in position against said rims or projections, an
35 internal smoke and gaseous product off-take connected directly with a flue or conduit, an internal housing forming the wall of a combustion chamber, fire-pot and ash-pit supported by a funnel-shaped casting, and pipes
40 extending through said casting and connected with the interior of said detachable cap, substantially as and for the purposes set forth.

12. A hot air furnace provided with a pot shaped casting carried by the base-plate, an
45 exterior shell encircling the casting and forming the wall of an air supply reservoir, an internal casing and an ash-pit, fire-pot and combustion chamber supported by the casting and forming a smoke and gaseous product
50 passage, and air pipes traversing the smoke passage and communicating with the air supply reservoir through the inclined and curved walls of said casting, substantially as and for the purposes set forth.

13. A hot air furnace provided with an open
55 top internal housing comprising the wall of the combustion chamber, fire-pot and ash-pit, and the latter having a removable false bottom and a door or doors in the wall thereof, a funnel-shaped dust collector and gaseous
60 product directing device supporting in position said housing, a hot air reservoir in the top of the furnace, an air reservoir beneath said funnel-shaped collector and director, air pipes projecting through the wall of said device, and means provided in the top-plate of
65 the furnace for admitting in a downward direction currents of cold air into the interior of the furnace and lower reservoir, substantially as and for the purposes set forth. 70

14. In a hot air furnace, a funnel-shaped dust collector and gaseous product director provided with radial arms having a ring, and an ash-pit supported by said ring, substantially as and for the purposes set forth. 75

15. A hot air furnace provided with a funnel-shaped dust and soot collector and gaseous product director connected with a conduit or flue leading to an internal smoke and gaseous product flue or off-take and supporting the
80 housing of a combustion chamber, fire-pot and ash-pit, and means, substantially as described, for regulating or checking the discharge of smoke and gaseous products from the combustion chamber in a downward direction to said flue or off-take, substantially
85 as and for the purposes set forth.

16. A hot air furnace provided with means, as described to permit from a point central with respect to the internal area of the furnace of the discharge in a downward direction of smoke and gaseous products of combustion to a point substantially central with respect to the area of the base-plate and then in an upward direction through the interior
90 of the furnace off-take and the admission and conduction of cold air in a downward direction and then in an upward direction through the furnace preparatory to the super-heating of the same and the distribution thereof, substantially as described. 95 100

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

JOHN EVANS.

Witnesses:

THOMAS M. SMITH,
RICHARD C. MAXWELL.