

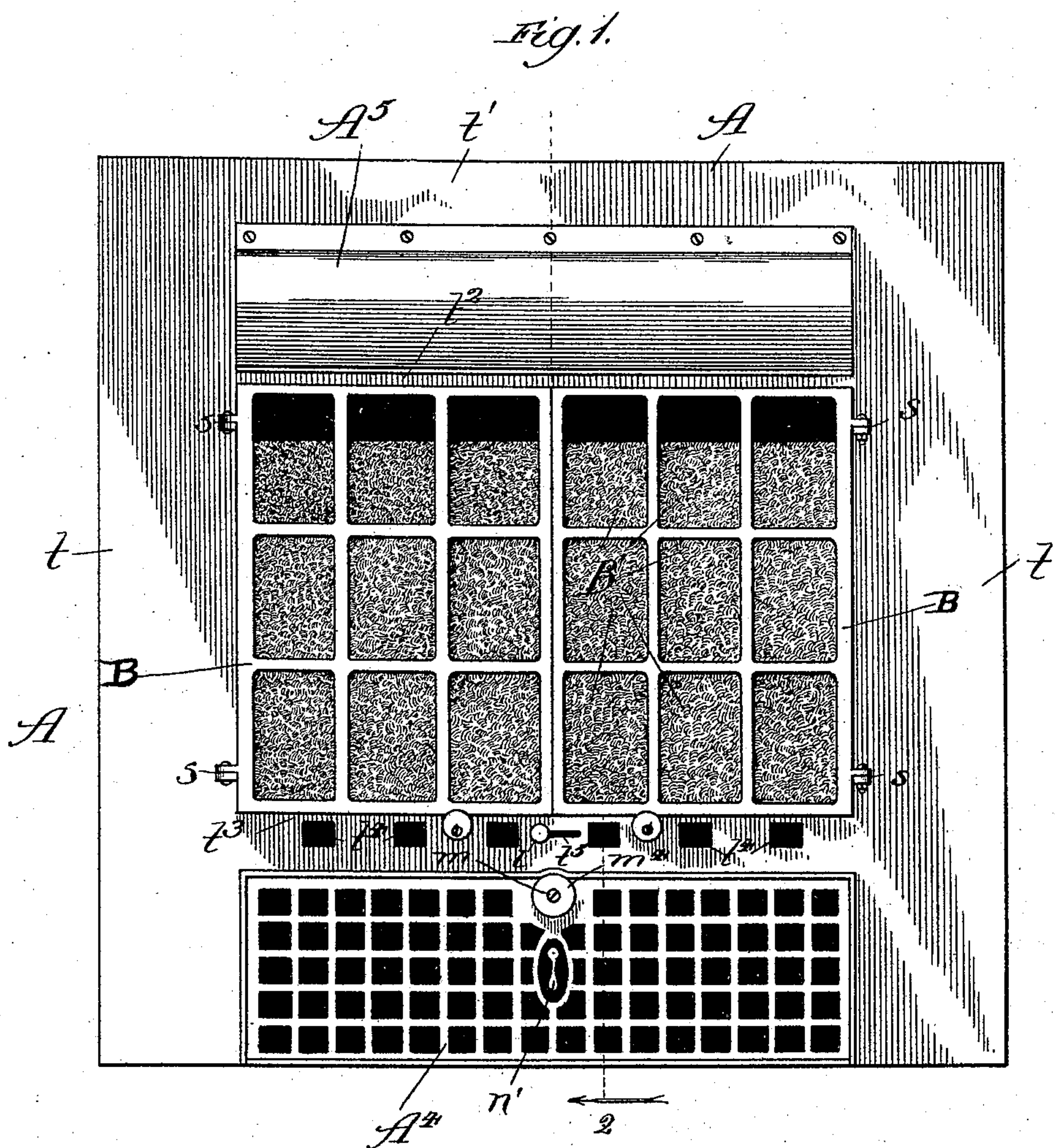
(No Model.)

3 Sheets—Sheet 1.

D. McDONALD.
FIREPLACE FURNACE.

No. 575,847.

Patented Jan. 26, 1897.



Witnesses:
Carl E. Gaylord,
Lester J. Feltner.

Inventor:
Donald M. Donald,
By Dyrenforth & Dyrenforth,
Attorneys.

(No Model.)

3 Sheets—Sheet 2.

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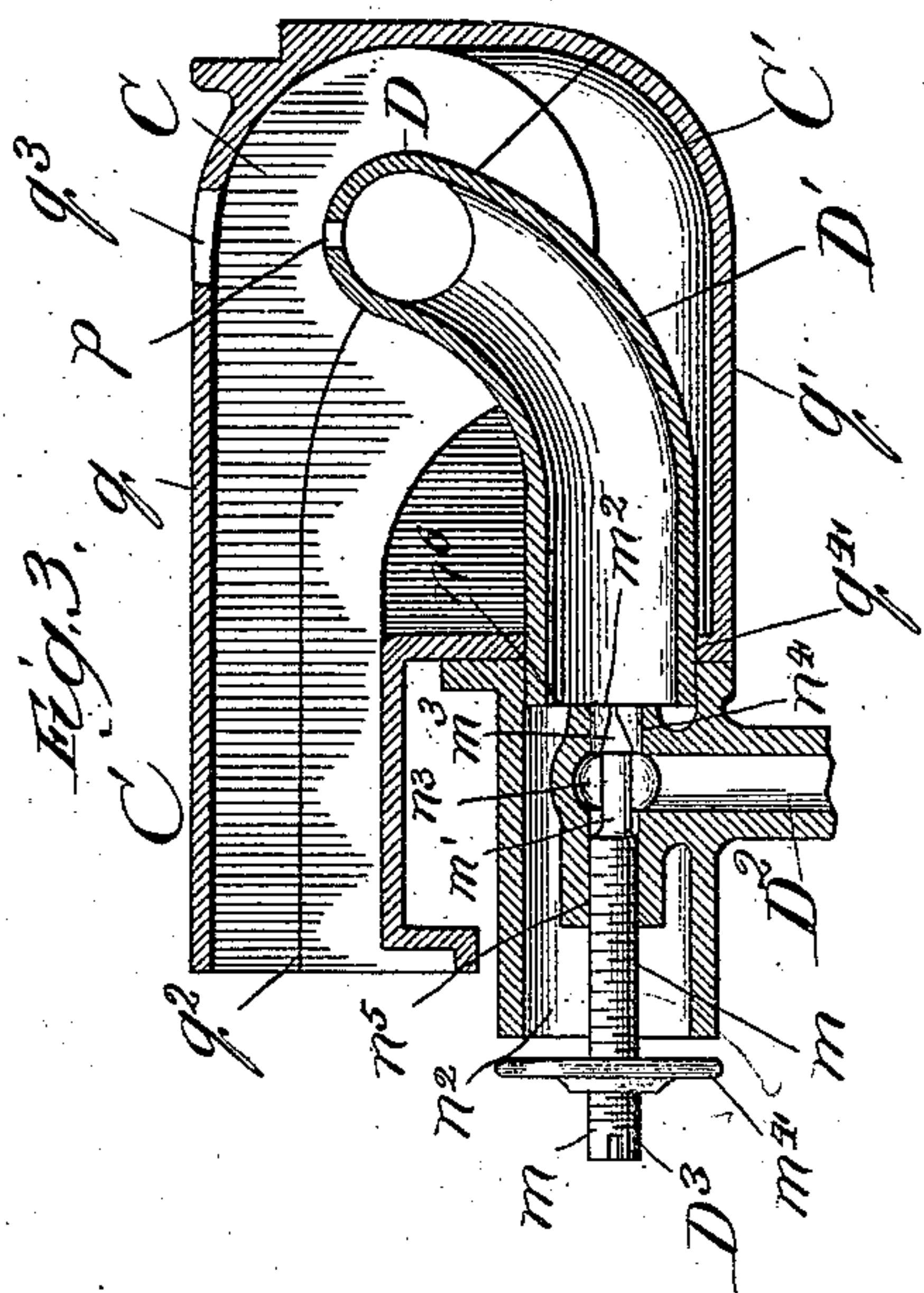


Fig. 3.

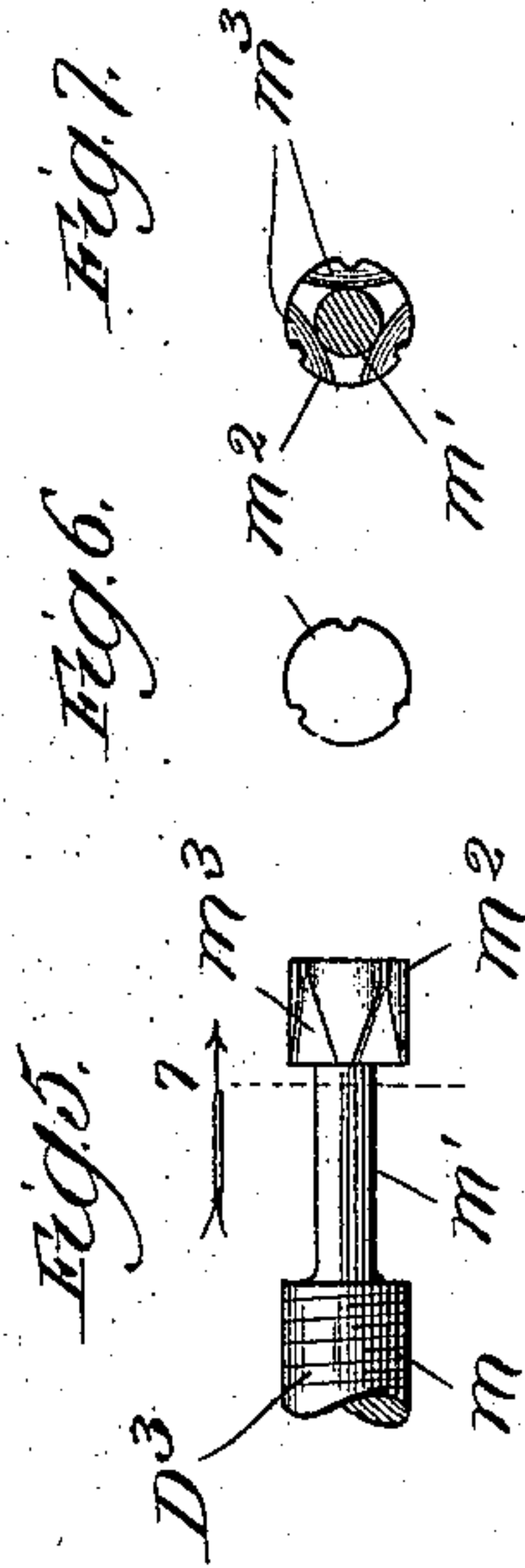
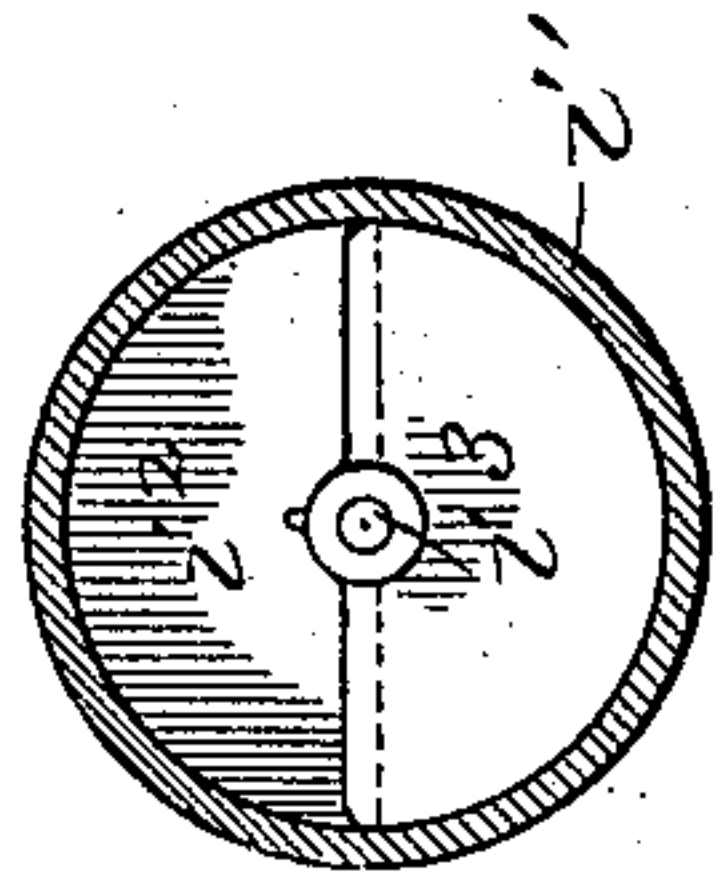


Fig. 5.

Fig. 6.

Fig. 7.

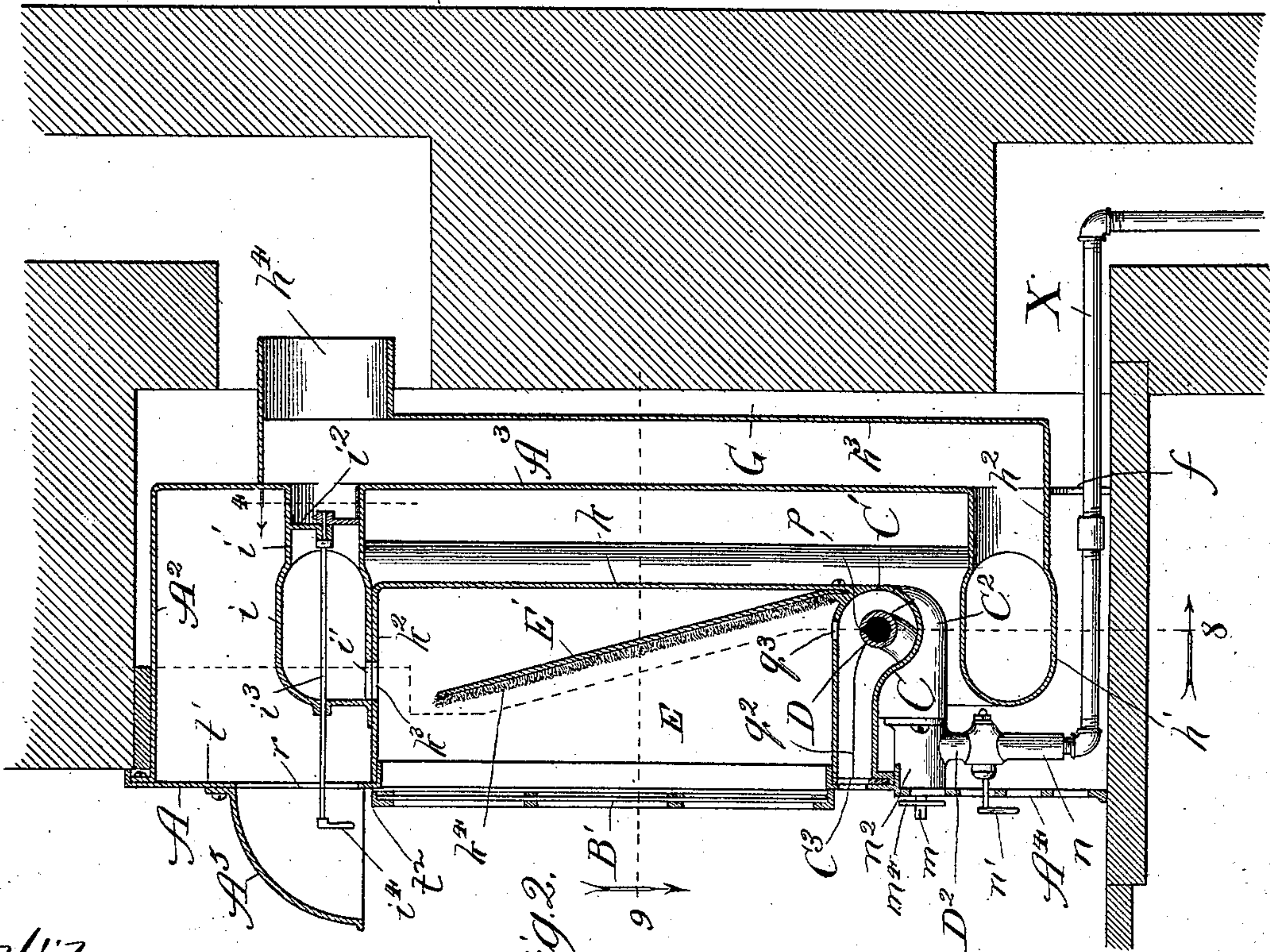


Fig. 2.

Witnesses:
Chas. E. Gaylord,
Lutw. J. Peter.

Inventor:
Donald McDonald,
By Dyrenforth & Dyrenforth,
Attys.

(No Model.)

3 Sheets—Sheet 3.

D. McDONALD.
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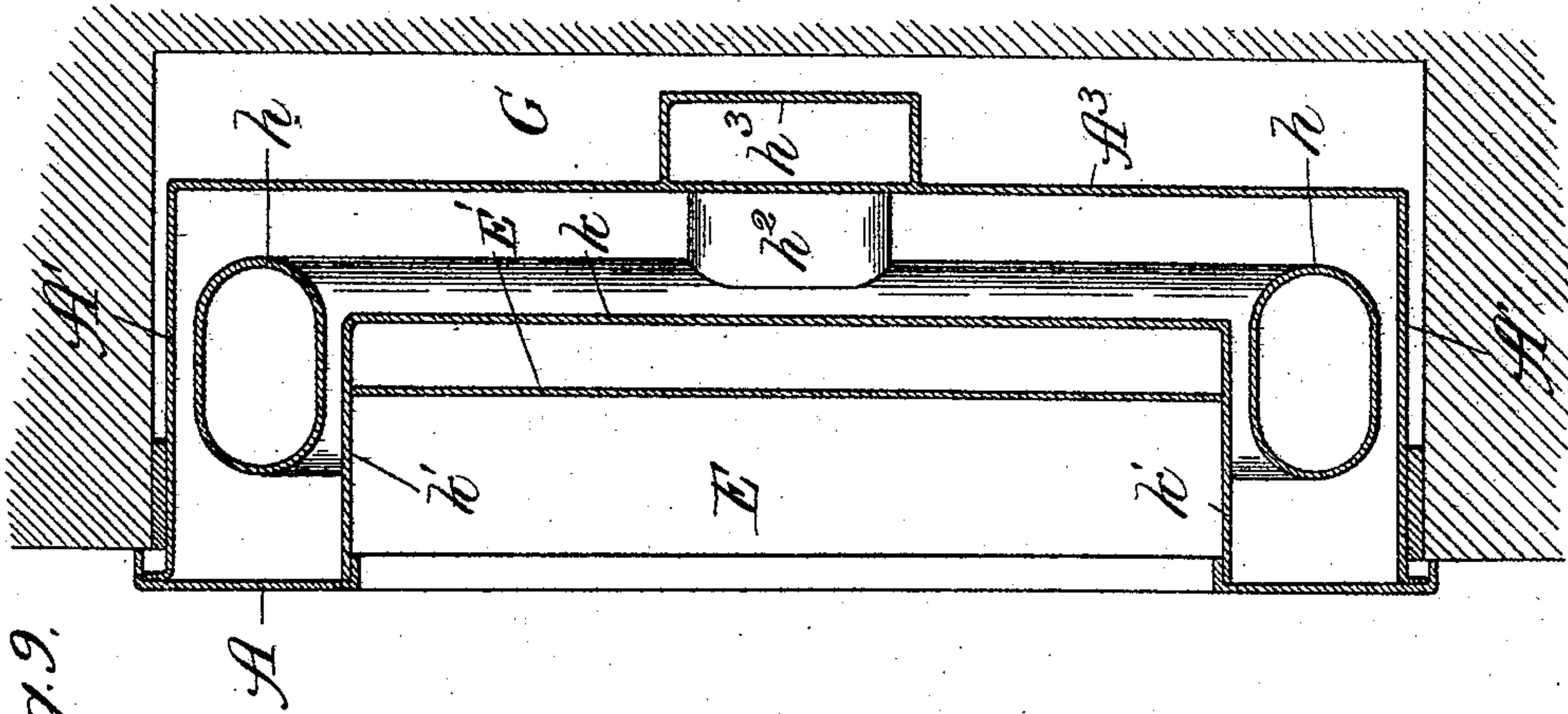


Fig. 9.

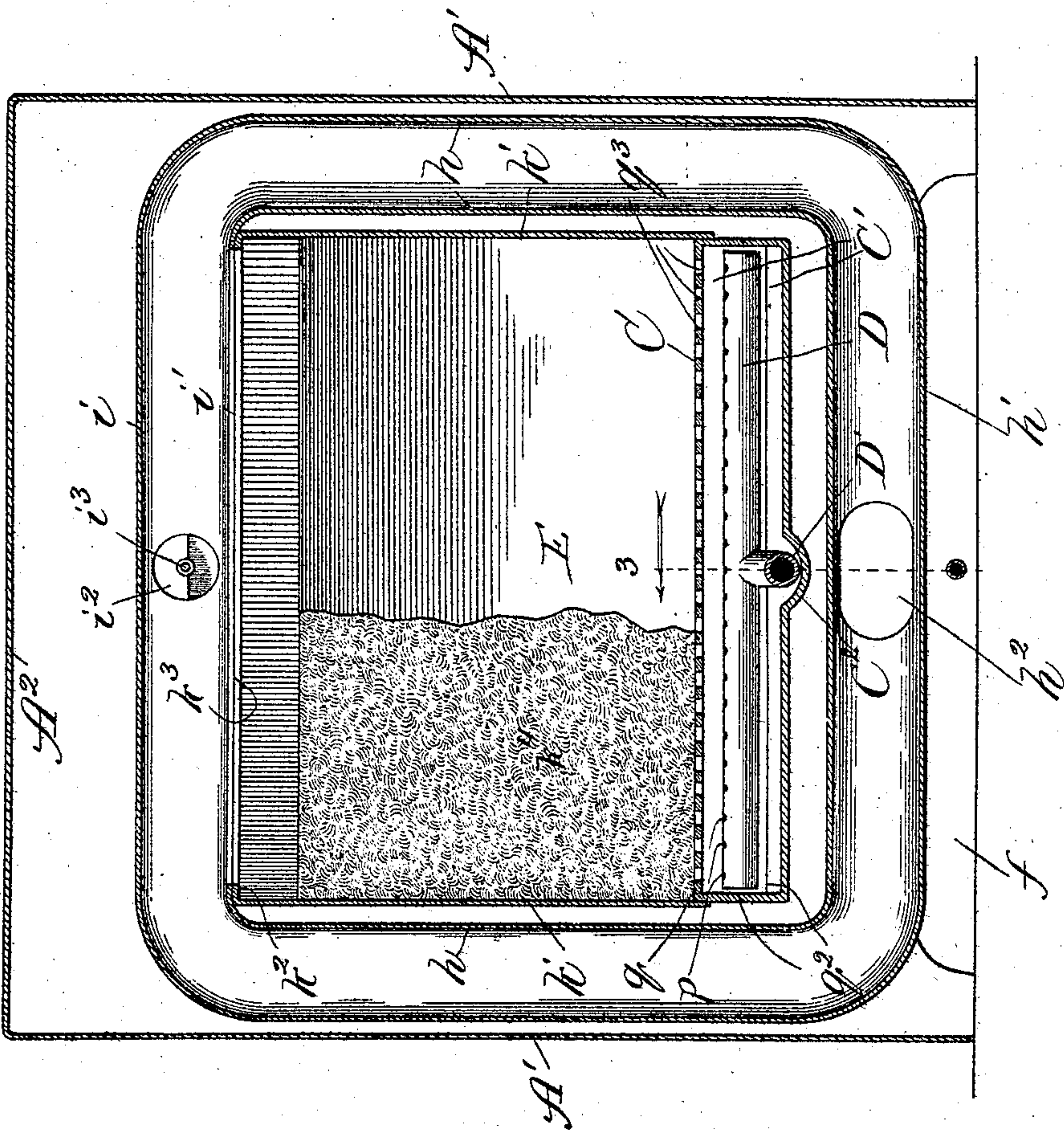


Fig. 8.

Witnesses:
Chas. E. Gaylord,
Lute J. Miller

Inventor:
Donald M. McDonald
By Dyrenforth & Dyrenforth
Attorneys

UNITED STATES PATENT OFFICE.

DONALD McDONALD, OF LOUISVILLE, KENTUCKY.

FIREPLACE-FURNACE.

SPECIFICATION forming part of Letters Patent No. 575,847, dated January 26, 1897.

Application filed June 9, 1896. Serial No. 594,813. (No model.)

To all whom it may concern:

Be it known that I, DONALD McDONALD, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented a new and useful Improvement in Fireplace-Furnaces, of which the following is a specification.

My invention relates to improvements in the construction of fireplace-grates; and the primary object of my invention is to give to such a grate the function of an air-heating furnace by the general construction to that end hereinafter set forth.

Fireplace-grates as hitherto constructed have always, so far as I am aware, been objectionable in use for the reason that they consume an undue amount of fuel, while throwing comparatively little heat into the room, and because they cause the discharge into the room of more or less of the products of combustion, which vitiate the atmosphere.

In carrying out my invention I provide a fireplace air-heating furnace to be employed more particularly in burning hydrocarbon gas, either natural or manufactured, and of the construction more especially known to the trade as "portable fireplaces," by means of which the above-cited objections to former fireplace-grates are entirely overcome and which provides ample and economical ventilation for the room and presents all the attractiveness in use of an open fireplace.

In the drawings, Figure 1 is a front elevation of my improved fireplace-furnace; Fig. 2, a broken sectional view showing the furnace in position in a fireplace, the section being taken on line 2 of Fig. 1 and viewed in the direction of the arrow; Fig. 3, a sectional view of an improved gas-burner which I employ, the section being taken on line 3 of Fig. 8 in the direction of the arrow; Fig. 4, an enlarged section taken on line 4 of Fig. 2; Fig. 5, an enlarged broken end portion of the gas-inlet valve; Fig. 6, an end view of the same; Fig. 7, a section taken on line 7 of Fig. 5 and viewed in the direction of the arrow; and Figs. 8 and 9 sections taken, respectively, on lines 8 and 9 of Fig. 2 and viewed as indicated by the arrows.

As before stated, I prefer to provide my improvements in the form of a portable fireplace for the reason that such a construction

forms a device complete in itself which may be shipped intact and placed in a chimney-recess without the necessity of mounting any of the parts in the brickwork.

The outer shell of the portable fireplace-furnace comprises a front A, sides A' A', a top A², and a back A³. The front A is formed with the pilasters *t t*, upper cross-piece *t'*, a cross-bar *t²*, and a cross plate or bar *t³*. The space bounded by the pilasters and the cross-bars *t² t³* forms a large opening to which are fitted doors B B, mounted upon hinges *s* and adapted to close tightly against the front and render the joints about them substantially gas-tight.

The doors may be of any fanciful design and adapted to receive mica sheets B', which thus render the front transparent throughout a large part of its extent.

Fitting into the opening below the cross-bar *t³*, between the pilasters, is a face-plate A⁴, formed of open-work, as shown, for the free passage through it of air. Between the bar *t²* and cross-piece *t'* is the discharge-opening *r*, and fastened upon the cross-piece *t'* and extending outward and downward across the opening *r* is a hood A⁵. In the cross plate or bar *t³* is a series of draft-openings *t⁴*.

C is a gas-burner which works upon the principle of the burner described in Letters Patent of the United States No. 525,665, granted to me September 4, 1894, but of an improved construction, adapting it particularly for use in the present connection. The burner comprises a shell or chamber C', formed, preferably, in two sections *q q'*, fitting closely together at the joint *q²*. The chamber is of a length about equal to that of the plate or bar *t³*. Along its rear side the chamber is enlarged and may describe the segment of a circle, as shown in Fig. 2. At its forward end the chamber is open, and there fits against the rear side of the plate or bar *t³*. Extending centrally through the enlarged part of the chamber C' is a pipe or burner D, provided in its upper side with a series of gas-outlets or burner-openings *p*, and just above the said pipe, in the top plate *q* of the chamber C', is a series of openings *q³*, registering in position with the openings *p*, and somewhat larger than the latter. The lower part *q'* of the shell or chamber C' is provided at its under

side, midway between its ends, with a chambered offset C^2 , provided with an opening q^4 in its forward side. A branch D' of the pipe D extends from the center of the latter through the opening q^4 to a point just beyond the front of the offset C^2 .

D^2 is a gas-supply head communicating with a gas-supply pipe X . The head D^2 comprises a lower tubular portion n , provided with a cock n' , and upper horizontally-extending tubular portion n^2 at its inner end fitting upon the pipe D' and open at its outer end, and a small gas-outlet head or chamber n^3 in the chamber n^2 , having a discharge-opening n^4 and, in line therewith, a threaded opening n^5 . The part n^2 extends through an opening in the lower face-plate A^4 of the front. Working in the threaded opening n^5 is a regulating-screw D^3 , having the threaded-shank portion m , reduced neck portion m' , and head m^2 . The head m^2 fits the gas-discharge opening n^4 and is provided around its circumference with a series of tapering discharge-passages m^3 . The part n^3 is of less diameter than the mouth of the pipe D' , leaving an annular port n^6 about the port n^4 for the passage of air, which enters through the chamber n^2 to mix with the gas discharged through the port n^4 . Upon the threaded shank m of the regulating-screw is a valve-disk m^4 , which may be screwed to or away from the end of the chamber n^2 to close the latter or open it to the extent desired.

Fitting the mouth of the chamber C' , behind the bar or plate t^3 , is a sliding grid or damper C^3 , having openings through it to register with the openings t^4 , and having an operating-handle l , passing through a slot t^5 in the plate or bar t^3 . In operating the burner described the gas is turned on at the cock n' , the handle of which may for convenience be at the front of the face-plate A^4 , as shown. The gas passes into the chamber n^3 and escapes through the port n^4 . Air to mingle with the gas and produce the desired burning mixture enters through the chamber n^2 and escapes into the pipe D' through the annular port n^6 . Air to support combustion enters through the openings t^4 to the chamber C' and escapes with the other products of combustion through the openings q^3 . The object of this construction is to facilitate adjustment of the moving parts for gases of varying heating capacity and of varying pressures, so that perfect combustion may always take place and the minimum amount of gas consistent with the heat desired may be employed.

To produce the best results and obtain perfect combustion and the maximum amount of heat from the gas, it is necessary that the flow of the burning mixture to the pipe or tube D shall be regulated according to the heating capacity and pressure of the gas. The adjusting-screw D^3 with the distributor-head m^2 , constructed as described, affords means for regulating the flow of gas into the

pipe or mixing-chamber D' and divides the supply into two or more streams, thereby effecting a more intimate mixture with the air entering at the port n^6 than could be obtained were the gas to enter through a single opening. Turning of the screw D^3 to move the head m^2 to the right in Fig. 3 enlarges the gas-outlets, while movement of the screw to the left in that figure reduces the outlets. Besides separating the inflowing gas into two or more streams, as described, the adjusting-screw affords a very satisfactory means for regulating the supply. When once adjusted, the screw need not necessarily be disturbed. The valve or disk m^4 may be turned to regulate the inflow of air to the chamber n^2 and mixing-chamber D' , so that enough and no more air may enter than is desirable to produce a burning mixture which will give the best results. The inflow of air to the draft-chamber C' through the openings t^4 may be regulated with great exactness by means of the sliding damper C^3 , so that enough but no more air than is required to supply combustion may enter.

E is the combustion-chamber, of which the burner C forms the base, and having a back plate k , side plates k' k' , and a top plate k^2 . The side and top plates fit closely against the front A , and the back plate at its lower end fits closely against the burner C , so that the joints are substantially gas-tight. In the top plate k^2 is a longitudinal outlet-opening k^3 , extending nearly the full length of the chamber E . In the chamber is an inclined plate E' , which is preferably provided with an asbestos facing k^4 . The outlet-ports q^3 of the draft-chamber C' open into the combustion-chamber E at the base of the asbestos facing.

Fastened upon the top plate k^2 and extending longitudinally thereof in the space between the plates k^2 A^2 is the section i of a flue, which carries off the products of combustion. In the section i is an opening i' , which registers with the opening k^3 in the plate k^2 . The flue-section i connects at opposite ends with vertical flue-sections h h , extending in the spaces between the side walls k' of the combustion-chamber and the side walls A' of the casing. The flue-sections h at their lower ends connect with a horizontal flue-section h' , which extends below the burner C . Communicating with the flue-section h' , at the back and center thereof, is a flue-section h^2 , communicating with a vertical flue-section h^3 , extending upward along the outer side of the wall A^3 and terminating near the top of said wall in an outlet h^4 . Extending from the center of the flue-section i to the upper end portion of the flue-section h^3 is a short direct-draft section i' , provided with a damper i^2 . This damper is upon a stem i^3 , passing transversely through the flue-section i and through the opening r into the hood A^5 , where it carries a handle i^4 . By turning the handle i^4 the damper i^2 may be opened or tightly closed. The back A^3 of the casing is cut away below the flue-section h^2 , leaving an opening f .

As before stated, all the air necessary to supply combustion enters the draft-chamber C' through the valved openings t^4 , and when the gas is ignited at the burner-openings p the flame rises through the openings q^3 and plays against the asbestos facing k^4 , causing the latter to glow and present an attractive appearance. Owing to the presence of the substantially gas-tight doors B B, the products of combustion are prevented from escaping into the room, and they fill the combustion-chamber E both at the front and rear sides of the inclined wall E' and escape to the flue-section i through the opening or slot $k^3 i'$. When the fire is first started, the handle i^4 may be turned to open the direct draft to the chimney and the damper may be left open until the chimney is heated and the draft established, after which the handle should be turned to close the direct-draft damper. The products of combustion flowing into the flue-section i will then pass in equal proportions downward through the vertical flue-sections h into the flue-section h' and thence through the flue-sections $h^2 h^3$ to the outlet h^4 . The air of the room will pass through the openings in the face-plate A⁴ and rise across the sides and back of the combustion-chamber, flowing out through the opening r .

In setting the fireplace-furnace into a chimney-recess like that, for example, illustrated in the drawings, the gas-supply pipe X may extend down through the ash-chute, usually provided, or in any other suitable direction, and the opening h^4 may be provided with a short collar to extend into the chimney-flue, leaving ample space around it for ventilation. It is desirable in all cases to provide a collar at the opening h^4 to prevent soot or other substance falling down the chimney-flue from entering and clogging the flue-section h^3 . The space between the wall or back A³ and adjacent chimney-wall forms a ventilating-passage G, communicating with the chamber below the burner, through the opening f , and leading to the chimney-flue.

When the furnace is in operation, the air entering through the open face-plate A⁴ first strikes the flue-section h' , thence rises, as before stated, about the flue-sections h and along the wall k and lastly strikes the flue-section i . Thus the passage of the air is in the direction opposite to the flow of the products of combustion, and as the heat is absorbed from the flues by the air-current the cold air as it first enters strikes the cooler portion of the flue and in its progress meets a gradually-increasing temperature, reaching the maximum heat at the flue-sections i just before escaping into the room through the opening r . The hood A⁵, besides being an ornament to the furnace, operates as a deflector for the hot air, which, being given an initial downward course, is driven far out into the room.

The products of combustion in passing through the flue-sections travel such an ex-

tended course that all but a small fraction of the heat thereof is absorbed by the air circulating around the walls of the chamber E and flues. As a consequence the products of combustion escaping through the outlet h^4 contain relatively little heat, in fact no more than is necessary to keep up a substantial draft through the chimney-flue. Ventilation of the room is kept up by a constant discharge of air through the lower part of the fireplace upward through the passage G, and as the air is taken from the floor of the room but a small proportion of heat is wasted. This mode of ventilating is much more economical than is the case where (as in other fireplaces) the air passes over the fire and out through the chimney. Owing to the transparent gas-tight combustion-chamber front which I provide, my improved furnace presents all the attractiveness in use of an open-front gas-grate, with none of the attendant objectionable features of the latter. In my improved construction a large volume of air is taken from the floor of the room and after absorbing substantially all of the generated heat is discharged back into the room without any of the unhealthy products of combustion being mixed therewith. The flues $i h h'$ may be corrugated, if desired, to increase their heating-surfaces. The transparent front, besides preventing the escape of products of combustion to the room, prevents the air of the room from mingling with the hot products of combustion to increase the quantity and lower the temperature thereof and greatly increase, as it would, the amount of heat escaping to the chimney.

While I prefer to construct my improvements throughout as shown and described, the construction may be modified in the matter of details without departing from the spirit of my invention as defined by the claims, and although for various reasons the best results in a furnace of this kind are obtained by employing hydrocarbon gas for the fuel a liquid burner or support for solid fuel may be substituted for the gas-burner without changing the general construction of the fireplace, which gives to it the function of an air-heating furnace.

What I claim as new, and desire to secure by Letters Patent, is—

1. A furnace adapted for location within a fireplace-opening and to cover the same, and provided with a front having an opening and a transparent closure therefor, and provided also with an air-inlet at its base and an air-outlet near its top and also with air-openings below said closure, an approximately gas-tight combustion-chamber, having for its front wall said transparent closure, a draft-chamber communicating with said air-openings and having a burner therein, a circuitous passage for the products of combustion leading from the combustion-chamber, and a passage for air extending from the said inlet upward and around the combustion-chamber

and the circuitous passage for the products and terminating in the discharge-outlet, substantially as described.

2. A fireplace-furnace adapted to be set
5 with its front alone exposed and having in combination a combustion-chamber rendered approximately gas-tight by a transparent closure, a passage for the products of combustion leading from said combustion-chamber,
10 a draft-chamber below said combustion-chamber and having valved openings for air, a burner within said draft-chamber, and a passage for air having an inlet in the base of the furnace and extending upward and
15 around the sides and rear of said combustion-chamber, and the passage for the products of combustion but have no connection therewith, and having a discharge-outlet immediately
20 above said chamber and in the front of the furnace, substantially as described.

3. In a fireplace-furnace, a front having an air-inlet at its lower end and an air-discharge outlet at its upper end, and an opening intermediate thereof, controlled by a transparent
25 approximately gas-tight closure, a combustion-chamber having for its front wall the said closure, a draft-chamber below said combustion-chamber having valved openings for the admission of air, a burner in said
30 draft-chamber, a passage for the products of combustion leading from said combustion-chamber downwardly at each side of the latter, and thence upwardly at the rear thereof, and a passage for air extending from said
35 inlet upward and around the said combustion-chamber, and the passage for the products of combustion and terminating in the discharge-outlet, substantially as described.

4. A fireplace-furnace adapted to be set
40 with its front alone exposed and having in

combination a combustion-chamber rendered approximately gas-tight by a transparent closure, an inclined wall in the combustion-chamber having an asbestos facing, a draft-chamber below said combustion-chamber
45 having valved openings for the admission of air, a hydrocarbon-burner in said chamber, a passage for the products of combustion leading from said combustion-chamber, and a passage for air having an inlet in the base
50 of the furnace and extending upward and around the sides and rear of said combustion-chamber, and the passage for the products of combustion but having no connection therewith, and having a discharge-outlet immediately
55 above said combustion-chamber and in the front of the furnace, substantially as described.

5. A fireplace-furnace adapted to be set with its front alone exposed and having in
60 combination a combustion-chamber rendered approximately gas-tight by a transparent closure, a draft-chamber adjacent to and below said combustion-chamber and having outlets q^3 to said combustion-chamber and an air-
65 inlet located in the furnace-front and provided with a damper, a burner-tube in the draft-chamber having outlets p registering with the outlets q^3 , a mixing-chamber communicating with the burner-tube, an air-
70 supply tube for said mixing-chamber, a gas-supply pipe leading to the mixing-chamber and means for controlling the gas-supply and the air-supply, substantially as and for the purpose set forth.

DONALD McDONALD.

In presence of—

THOS. W. KENNEDY,
WM. H. CRUTCHER.