

No. 712,271.

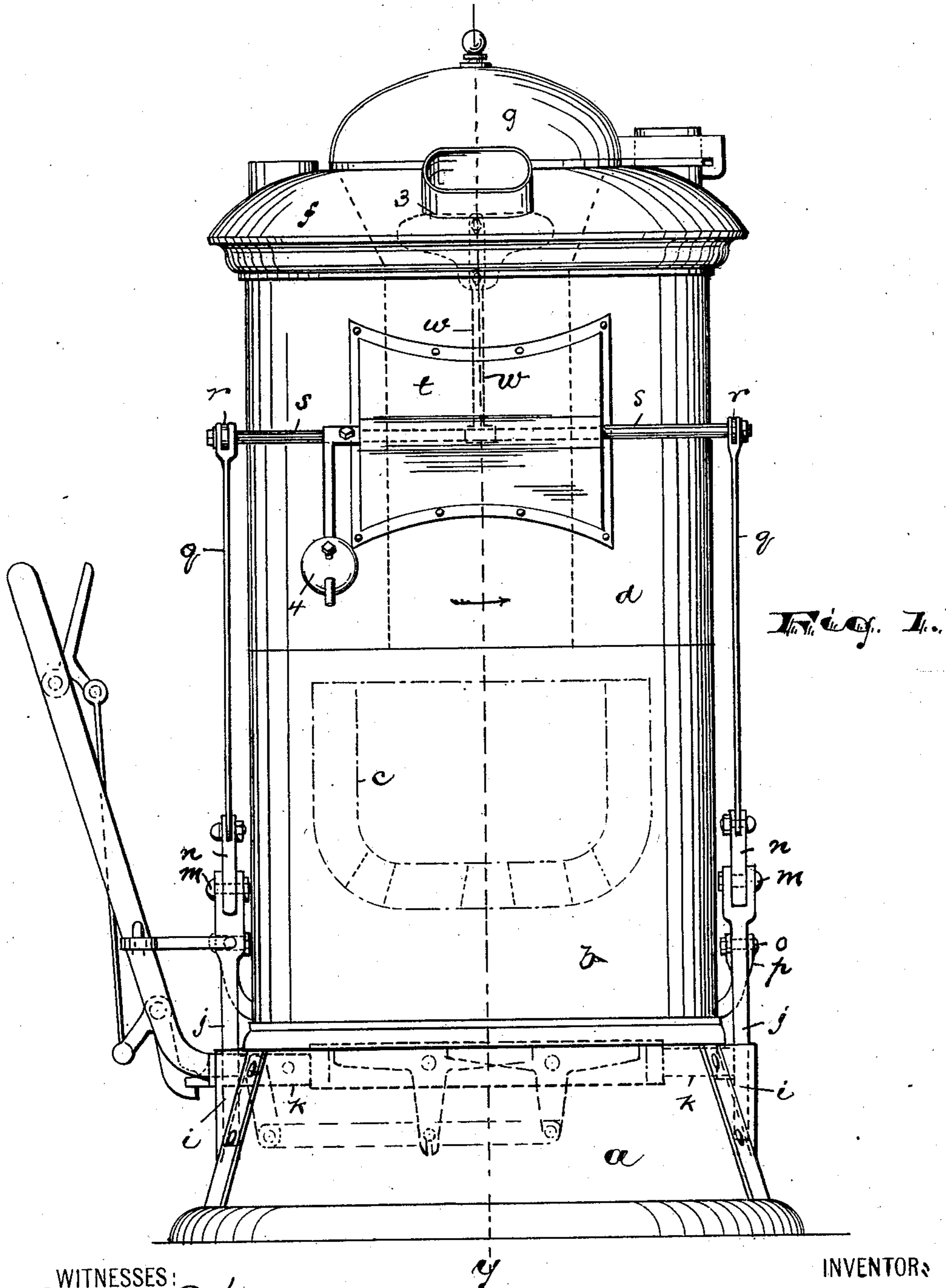
Patented Oct. 28, 1902.

W. H. DRAKE.
FURNACE.

(Application filed Dec. 7, 1900.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES:

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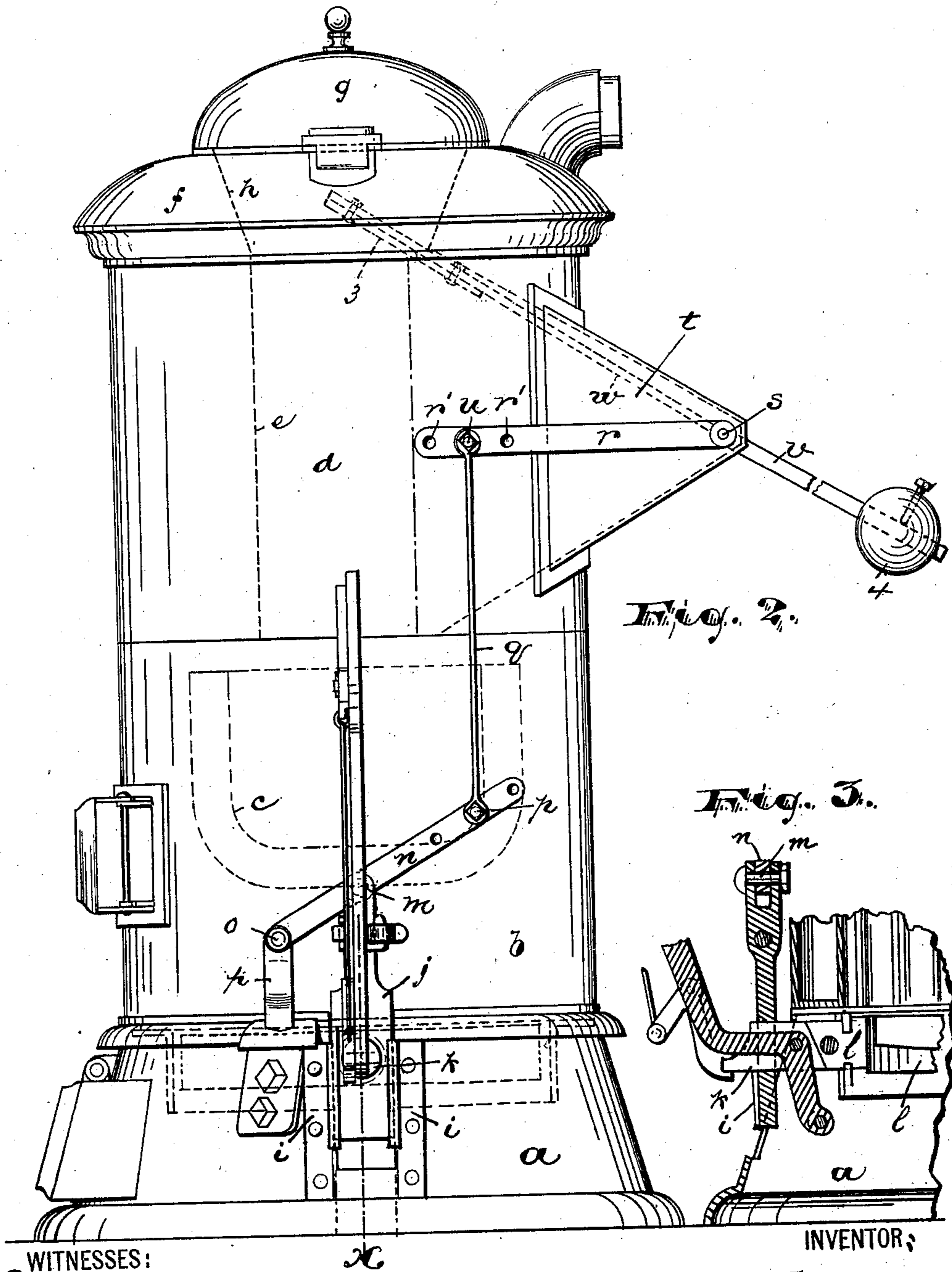


Fig. 2.

Fig. 3.

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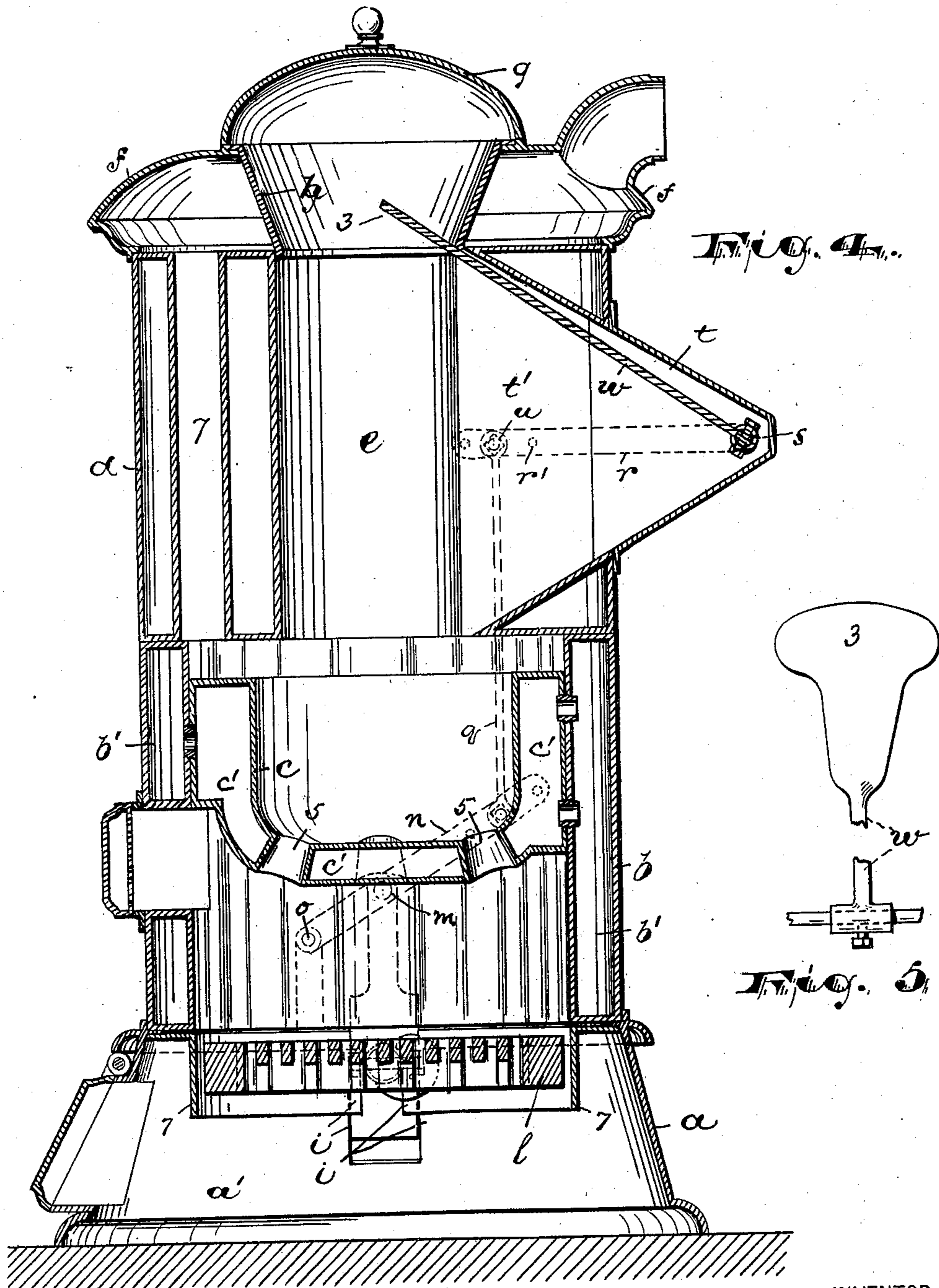
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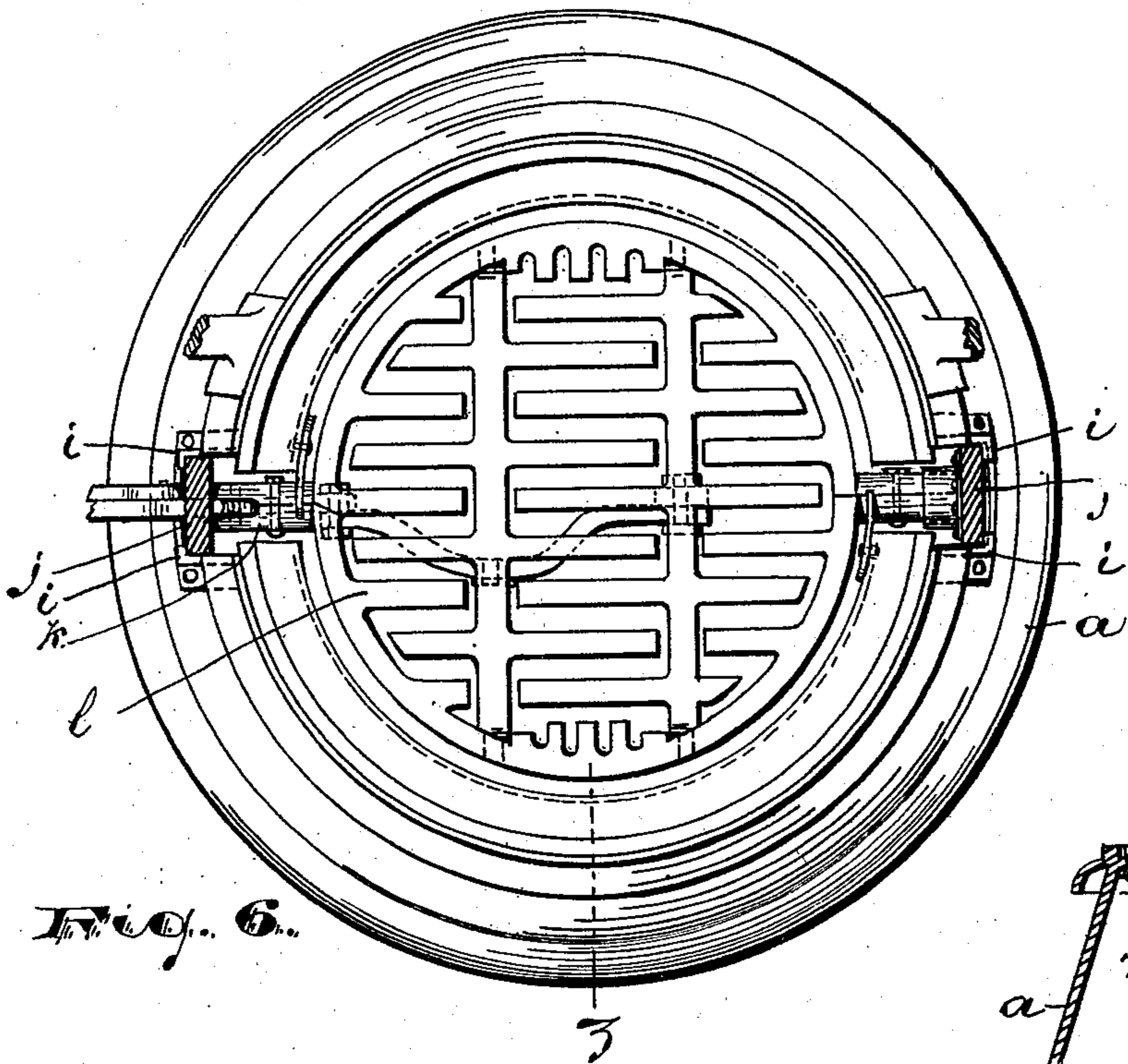


Fig. 6.

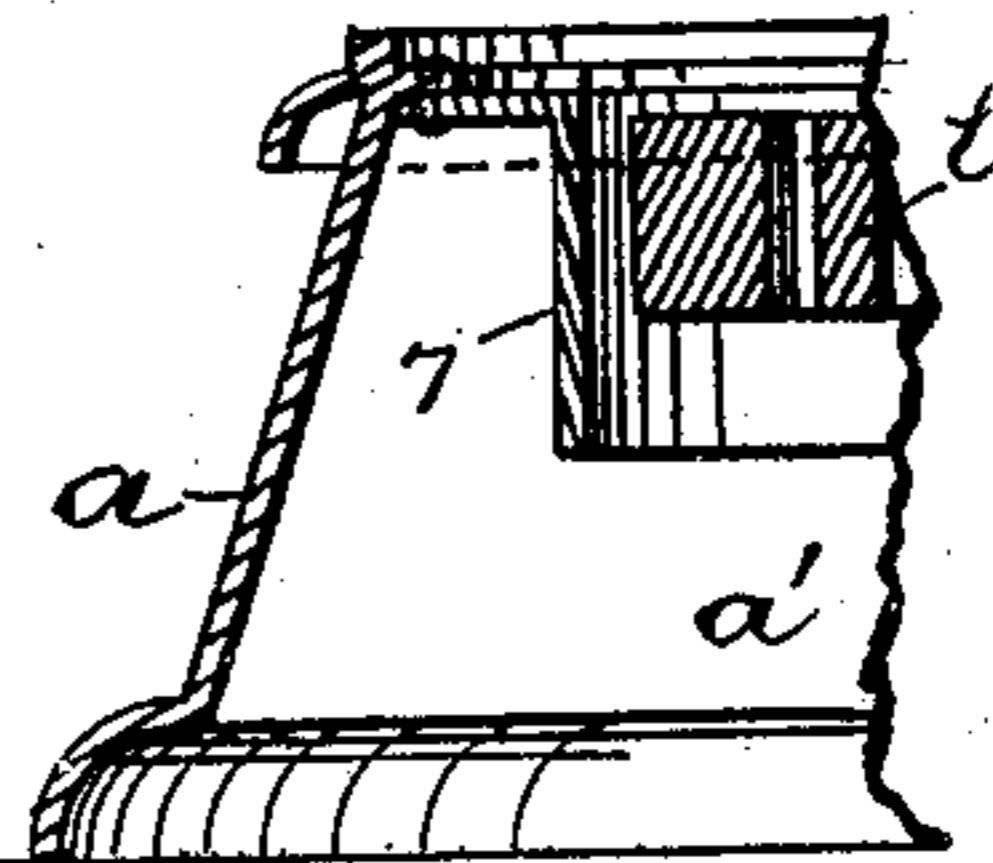


Fig. 7.

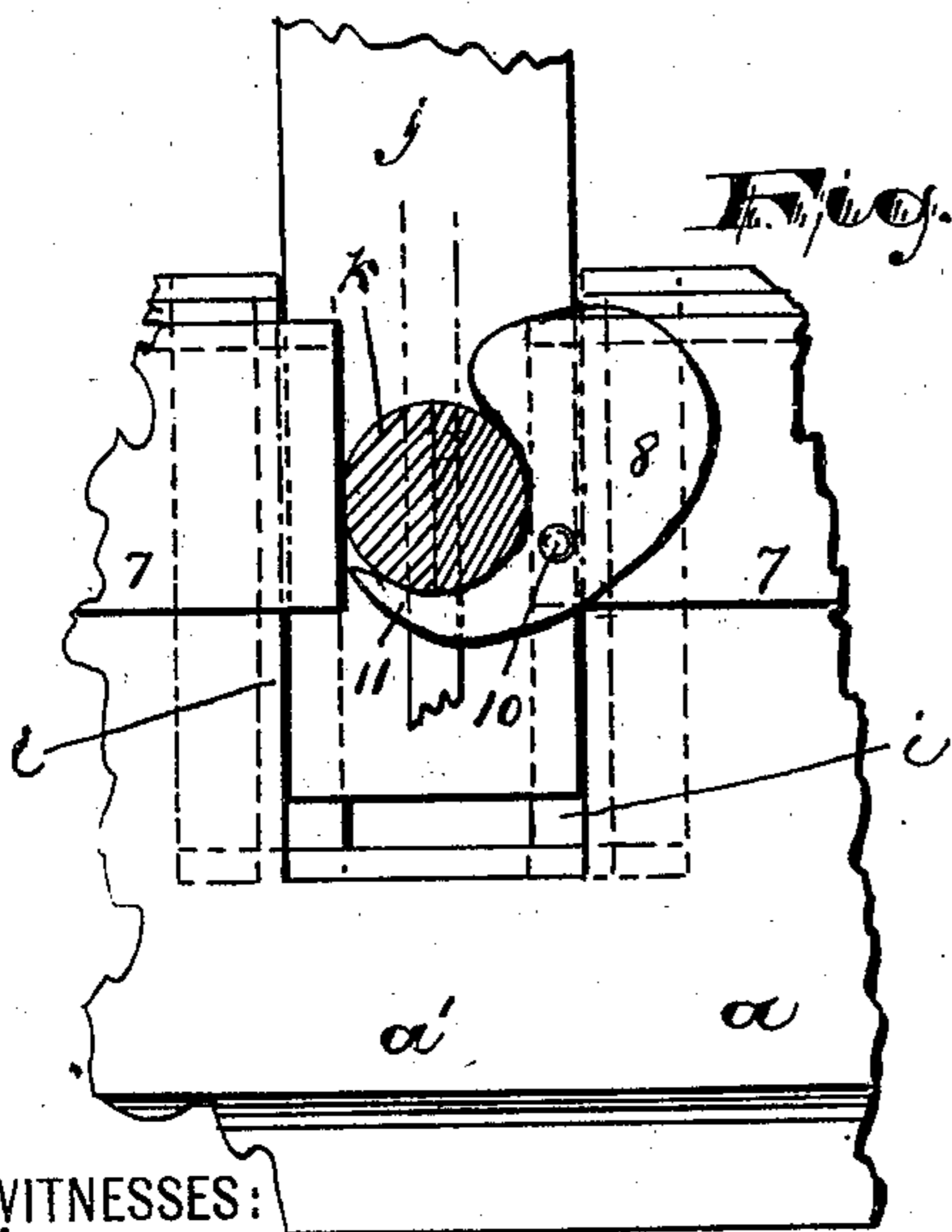


Fig. 8.

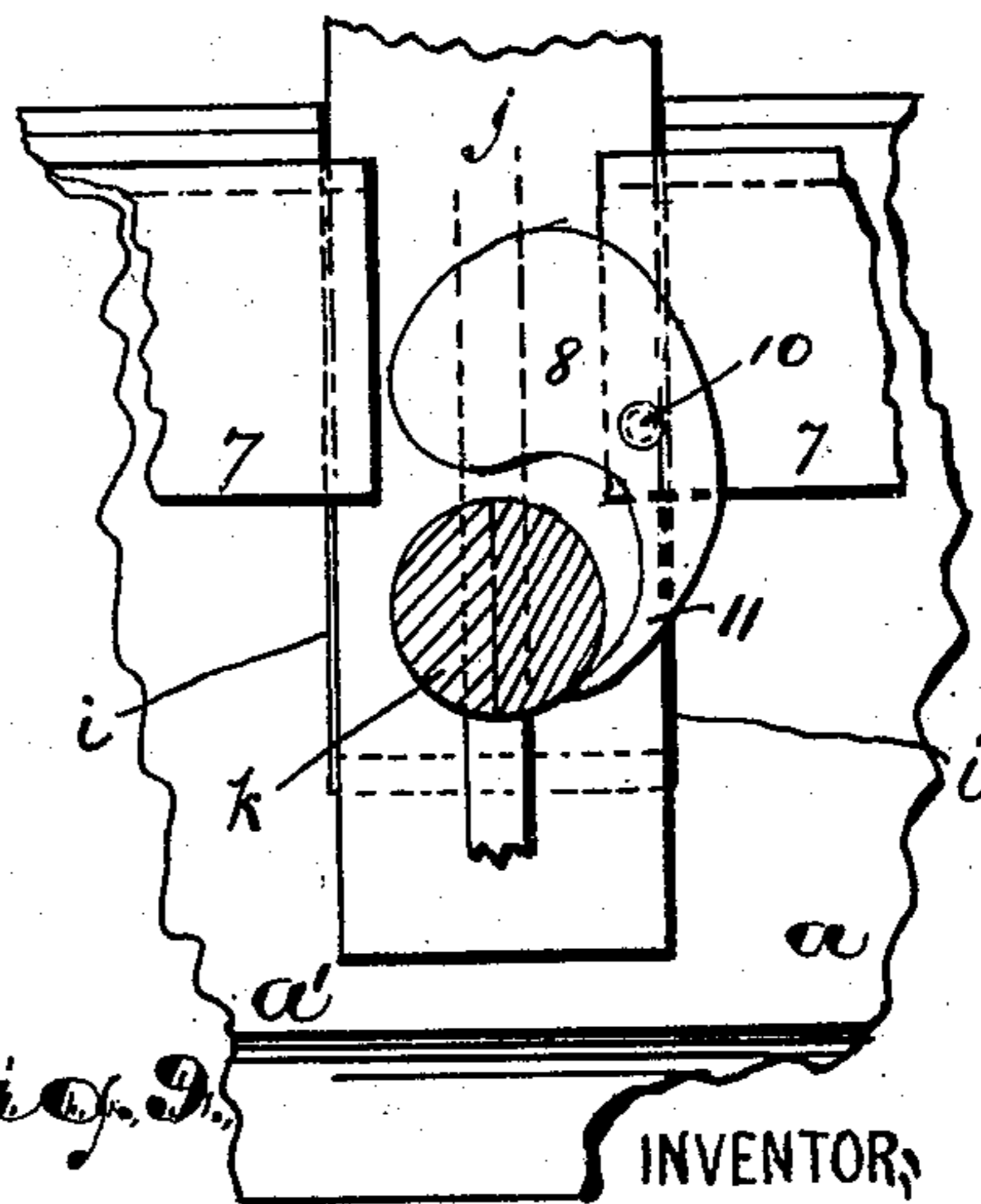


Fig. 9.

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UNITED STATES PATENT OFFICE.

WILLIAM H. DRAKE, OF HACKETTSTOWN, NEW JERSEY.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 712,271, dated October 28, 1902.

Application filed December 7, 1900. Serial No. 39,020. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. DRAKE, a citizen of the United States, residing at Hackettstown, in the county of Warren and State of New Jersey, have invented certain new and useful Improvements in Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The general object of this invention is to secure a more perfect combustion of fuel, particularly when very fine coal is employed, and thereby secure the advantages due to the use of the cheaper grades of coal, such as those commonly known as "buckwheat" or "pea" coal.

Other objects may be referred to hereinafter in connection with the description of the working parts.

In self-feeding furnaces heretofore in use where the fuel has been supplied automatically by gravity the storage-receptacle for the coal has been so arranged in connection with the fire-box as that should very small coal be employed a thick layer of fuel is formed at the top of the bed of fire. Because of the compactness of the mass when fine coal such as the grades above referred to is employed a sufficient upflow of oxygen or air has been prevented, so that the "self-feeders," so called, commonly in use have been practically inoperative with such grades of fine or small coal.

By my construction the fuel is spread in a thin layer over the fire, and this thin layer is maintained automatically for a considerable period, and because of the thinness of the layer the oxygen or atmospheric air has free passage therethrough to support combustion.

The invention consists in the improved furnace and in the arrangements and combinations of parts of the same, all substantially as will be hereinafter set forth, and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like characters of reference indicate

corresponding parts in each of the several figures, Figure 1 is a rear elevation of the improved furnace. Fig. 2 is a side elevation of the same. Fig. 3 is a detail section taken at line *x* of Fig. 2. Fig. 4 is a central vertical section taken at line *y*, Fig. 1. Fig. 5 is a detail plan of a grate-controller adapted to regulate and control the movements of my improved grate. Fig. 6 shows in plan the base of the furnace, showing certain parts of the grate-controlling means in horizontal section. Fig. 7 is a section taken through line *z*, Fig. 6; and Figs. 8 and 9 are inside detail views at the base of the furnace, showing certain sliding members providing supports for the grate.

In said drawings, *a* indicates the base of a furnace, in which is formed the ash-pit or chamber *a'*, and *b* indicates the fire-box, which is preferably provided with a water-chamber *b'*, by means of which the steam may be generated to the best advantage. Said fire-box also supports interiorly a supplemental box *c* for a purpose hereinafter more particularly referred to.

d indicates the flue-section, centrally providing a reservoir or storage-receptacle *e* for the coal.

f represents the dome, and *g* a closure for the top of the storage-chamber, which latter extends through the said dome, the dome being interiorly provided with a funnel-shaped part *h*, into which the coal is poured and directed into the narrower tube or cylinder forming the body of the said storage-receptacle.

The several parts thus described may be of any ordinary construction and modified in shape and arrangement to suit varying conditions, and under some circumstances certain of said parts may be omitted without departure from my invention.

At the opposite sides of the base *a* are formed slideways *i-i*, adapted to receive and hold in operative position the vertically-movable slides *j*, which last provide pivotal bearings or boxes in which the pivotal arms *k* of the grate *l* are held and are free to be turned when shaking down the ashes. The said grate *l*, provided with the said arms *k*, arranged as described, is thus adapted to be raised or lowered with the said slides *j* to ef-

fect the results hereinafter more particularly described. At the upper ends of the slides the same are pivotally connected, as at *m*, with the levers *n*, fulcrumed at *o* upon a fixture *p*, formed on or fastened to the base *a* at opposite sides of the furnace, the connections of the said slides being at points between the fulcrum and free ends of the levers. At said free ends the said levers *n* are connected, as at *p*, by means of connecting-rods *q* to the arms *r* of crank-levers *s*, the said crank-levers having pivotal bearings in an extension *t* of the flue-section *d* or upper part of the furnace. The said lever *s* is provided with the said arms *r* at its opposite ends, and the said arms *r* are adjustably connected at their free ends to the connecting-rods *q*, as at *u*, the adjustability of the said arms being secured, preferably, by means of a series of bolt-holes *r'* formed in said arms, so that by loosely bolting the connecting-rods near to the fulcrumal part of the lever the movement of the levers *n* will be reduced, and by throwing the connecting end of said rods *q* toward the free extremities of the arms *r* the movement of the lever *n* will be increased, and thus by adjusting the connections as described the vertical movements of the grate may be increased or diminished to suit varying conditions. For example, in cases where a chimney has a strong draft and a deeper bed of fine coal can be employed then a faster movement of the grate is desirable. Varying grades of coal may also render it necessary or desirable to vary the adjustments.

In connection with the lever *s* is arranged a weighted lever-arm *v*, which is bolted, welded, or otherwise connected to the fulcrumal portion of the lever *s*, the said weighted arm being connected to said fulcrumal portion of the lever on the outside of the extension *t*. The said fulcrumal part of the lever is also provided on the inside of the extension *t* with a movable arm *w*, which with the plate or flange 3 at its upper or free extremity forms what I have termed hereinbefore the "grate-controller." Said arm *w* is fastened to or formed integral with the lever *s* and extends upward at an inclination through the chamber *t'* in the extension *t* into the body of the coal receptacle or reservoir *e*, where it is provided with the said flange or plate 3. When the reservoir is supplied with coal, the weight thereof is to a large extent taken by the supplemental box *c*, secured within the fire-box at the upper part thereof, as indicated in Fig. 4. This box is constructed to permit an outflow of coal to the top of the grate, it being provided, preferably, with a series of bottom openings 5 5, through which the coal may gravitate. The weight of this body of coal on the grate and the parts connected with said grate more than counterbalances the weight 4, so that the controller plate or flange 3 is caused to press down upon the top of the body of stored coal, and thus the said controller is prevented from dropping by gravity,

excepting as the coal lowers by the removal of matter from beneath the same as it burns away and as the grate lowers beneath the said coal, as will be hereinafter described. As the controller lowers with the upper body of coal the arms *r* drop downward at their free ends, and with them the connecting-rods *q* and supporting-levers *n*, so that the slides *j* are permitted to fall with them, thus permitting a gradual gravitation of the bed of fire, and an outflow of the stored fuel from the openings 5 in the supplemental fire-box 6. Because of the number of openings 5 5 the coal is spread in a comparatively thin layer over the bed of fire.

The supplemental box *c* or supporting-feeder for the stored coal is preferably provided with a water-chamber *c'*, which is in open communication with the chamber *b'* in the water-jacket of the fire-box *b*. The said supporting-feeder or box *c* does not completely fill, in plan, the fire-box; but openings are formed at opposite sides, through which the heat and products of combustion from the consumed coal is permitted to pass upward through the flues 7 in the ordinary manner to secure the heating of the water. The base *a* at its top is open, the opening corresponding approximately in plan with the chamber in the fire-box, and at the inner edge of said opening the said base *a* is provided with a depending flange 7, which corresponds with and in practice forms a continuation of the side walls of the fire-box, so that the fire-chamber extends down into the base of the furnace, and thus when the grate is in its lowered position the bed of fire or ashes lies to a greater or less extent within the base. The said flange prevents the coal from falling from the grate when the same is in its lowered position. The said flange is necessarily slotted at opposite sides to permit the down movement of the pivotal arms of the grate.

To close the slots or openings in the flange provided to permit the down movement of the pivotal arms of the grate, and thus prevent the coal upon the grate from passing through said openings and occasion a waste of fuel, I have provided automatic gates 8, adapted to close said openings as the grate drops to its lowered position, and to this end the said gates each comprise a lever-like plate fulcrumed, as at 10, at one side side of the opening and provided with a curved arm 11, which extends downward and beneath the grate-arms *k*, thus lying in the path of the grate-arms, and when the said grate-arms drop with the grate the said pivotal arms engage the curved arms of the lever-like gates and cause said gates to turn pivotally on their fulcrums to close said openings in the flange, as illustrated in Fig. 9.

In operation the grate controlled by the coal in the reservoir *e* slowly gravitates and causes the top of the bed of fire to lower at a rate somewhat more rapid than what would

normally occur by the mere consumption of the coal by burning, and thus in practice a proper spreading of the fine fuel in a thin layer results, the said best results being obtained largely because of the supplemental box or feeder having the series of openings.

Having thus described the invention, what I claim as new is—

1. The improved furnace herein described having therein a movable grate, and a controller a part of which is arranged in the coal-storage reservoir and is in connection with said grate and supports the same and is adapted to move with the lowering coal or fuel and thus permit a lowering of the grate, substantially as set forth.

2. The combination with the fire-box and fuel-storage reservoir of a furnace, of a movable grate arranged on vertical slides, a controller-plate arranged in the fuel-storage reservoir and adapted to rest on the fuel and gravitate therewith and connections of said slides and controller-plate whereby the downward movement of the plate is communicated to the slides and grate, substantially as set forth.

3. The improved furnace herein described, comprising a base, fire-box, a storage-reservoir for fuel, a grate arranged on movable bearings and a controller free at one end or part to lower with the coal in said storage-reservoir and connected with the grate by connections permitting downward movements of said controller and grate together substantially as set forth.

4. In a furnace, the combination with a box, and a box for supporting the stored fuel and serving as a fuel-feeder to the fire beneath in the fire-box, of a movable grate in said fire-box supported by a controller adapted to rest on the stored fuel and said controller adapted to lower with the stored fuel, and connections transmitting downward movement to said grate, substantially as set forth.

5. In a furnace, the combination with a fire-box, having a water-chamber in the walls thereof, fuel-receptacle, and a feeder arranged beneath said receptacle and made hollow to receive water, the water-chambers of the fire-box and feeder being in open communication and the said feeder having a series of fuel

passages or openings, of a downwardly-movable grate and a controller arranged in said fuel-receptacle and adapted to lie on the fuel and gravitate as the fuel lowers from beneath said controller, and connections of said controller and grate governing the movements of said grate, substantially as set forth.

6. In a furnace, the combination with a fire-box, and base, the latter having a downwardly-extending, slotted flange, a grate having pivotal arms movable in said slots, and means for moving said grate-arms in said slots, of gates fulcrumed on said flange adjacent to said slots and having arms extending into engagement with the arms of the grate and adapted to close said gates as the grate-arms move in the slots, substantially as set forth.

7. In a furnace, the combination with a fire-box, and base, the latter having slideways at opposite sides, and a grate, of slides arranged on said slideways and supporting said grate and a controller connected to said slides by a train of levers and connections and extending to the fuel-receptacle whereby the movement of the fuel may govern the movement of the controller, slides and grate, substantially as set forth.

8. In a furnace, the combination with a fire-box and base, the latter having slideways at opposite sides, slides arranged in said slideways, a grate having arms engaging said slides, slide-supporting levers *r*, connecting-rods *q*, controller-lever *s*, having a controller extending into the fuel-receptacle of the furnace, substantially as set forth.

9. In a furnace, the combination with a base, fire-box and its grate, and flue-section, the last having a fuel-receptacle and extension *t*, of a controller working in said receptacle and extension and connected with the grate whereby the said grate may gravitate as the controller lowers, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 13th day of November, 1900.

WILLIAM H. DRAKE.

Witnesses:

CHARLES H. PELL,
C. B. PITNEY.