(No Model.) 4 Sheets—Sheet 1.

# A. H. CALKINS.

## OIL BURNER.

No. 516,363. Patented Mar. 13, 1894.

Fig. 1.

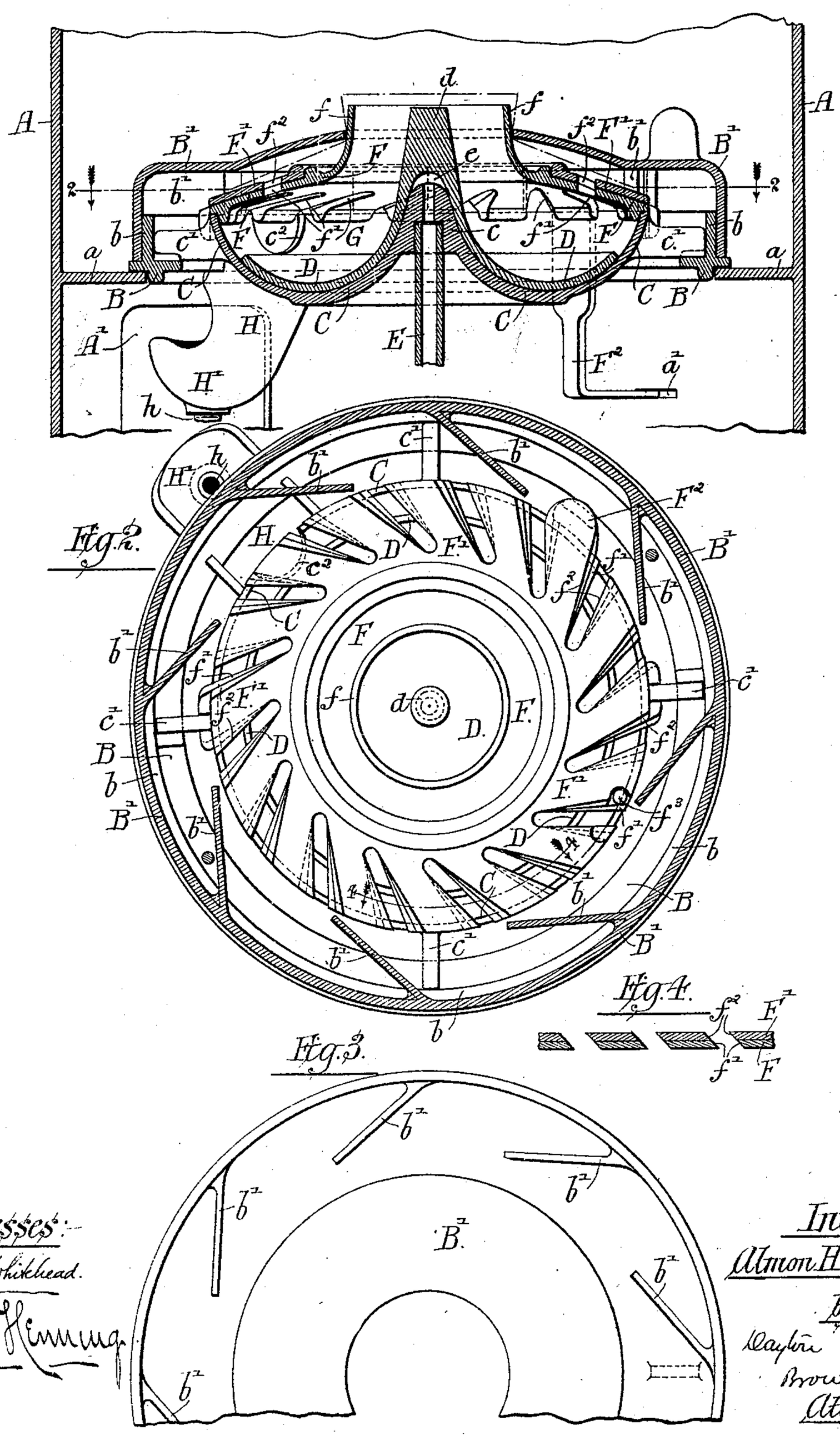


Fig. 4.




Fig. 3.

Witnesses:—
Louis H. Whitehead.
Wm. F. Hemming.

Inventor:—
Almon H. Calkins.
by:—
Clayton Poole Brown
Attorneys.—

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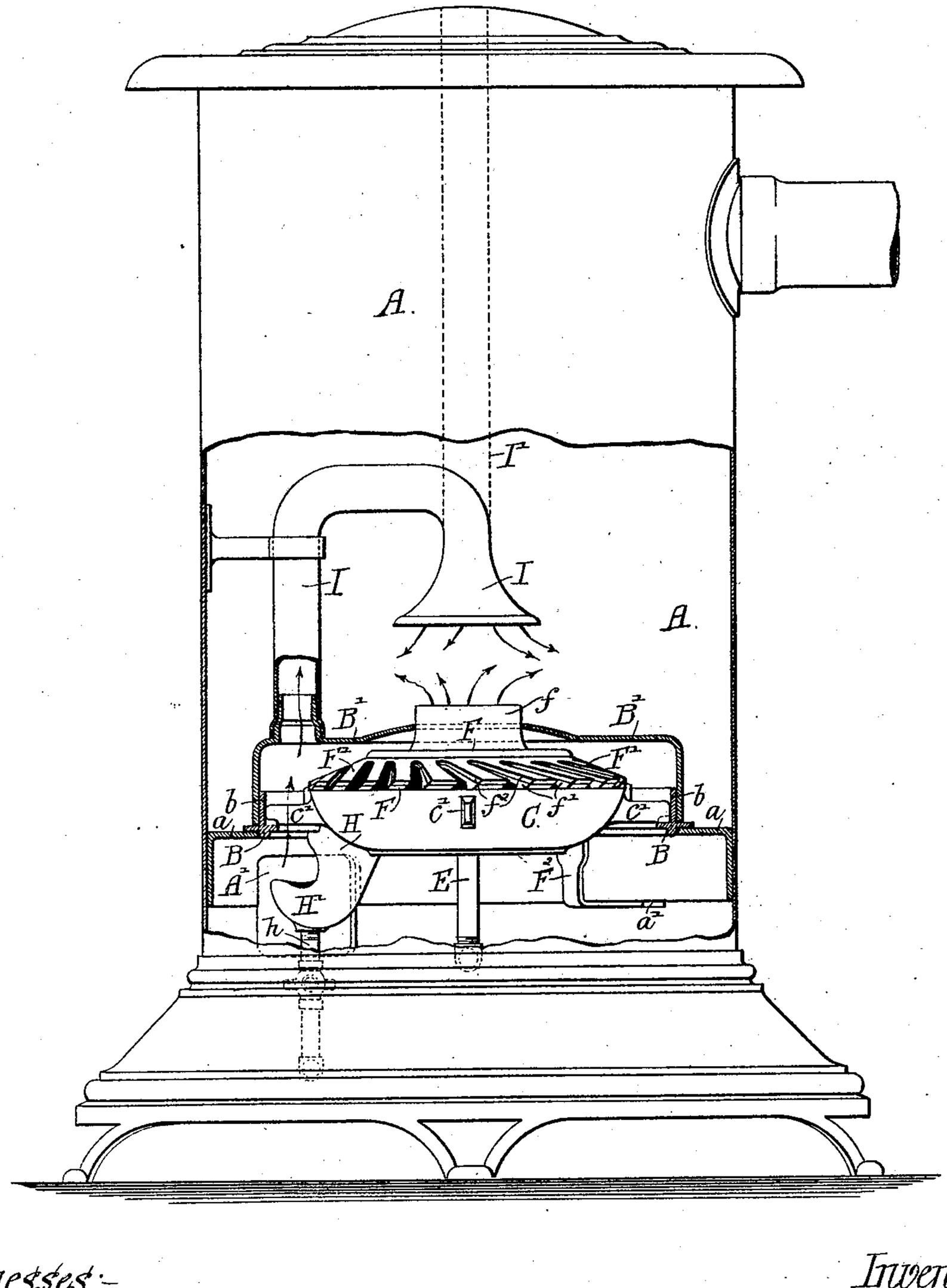
Fig. 5.




Witnesses:-
Louis M. T. Whitehead.
Wm. F. Fleming

Inventor:-
Almon H. Calkins.-
by:- Baylis, Poole & Brown
Attorneys.-

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WASHINGTON, D. C.

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## OIL BURNER.

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Fig. 6.

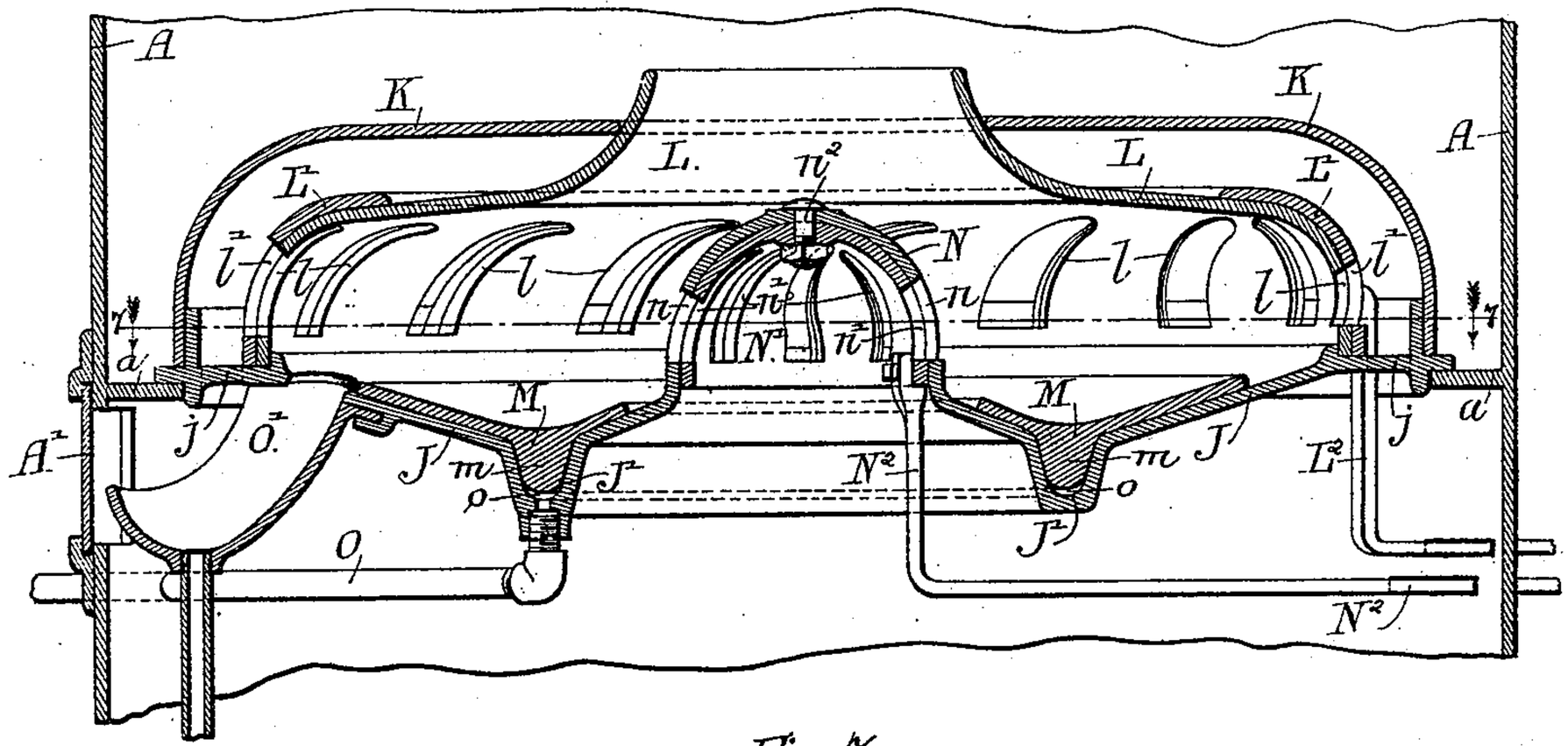
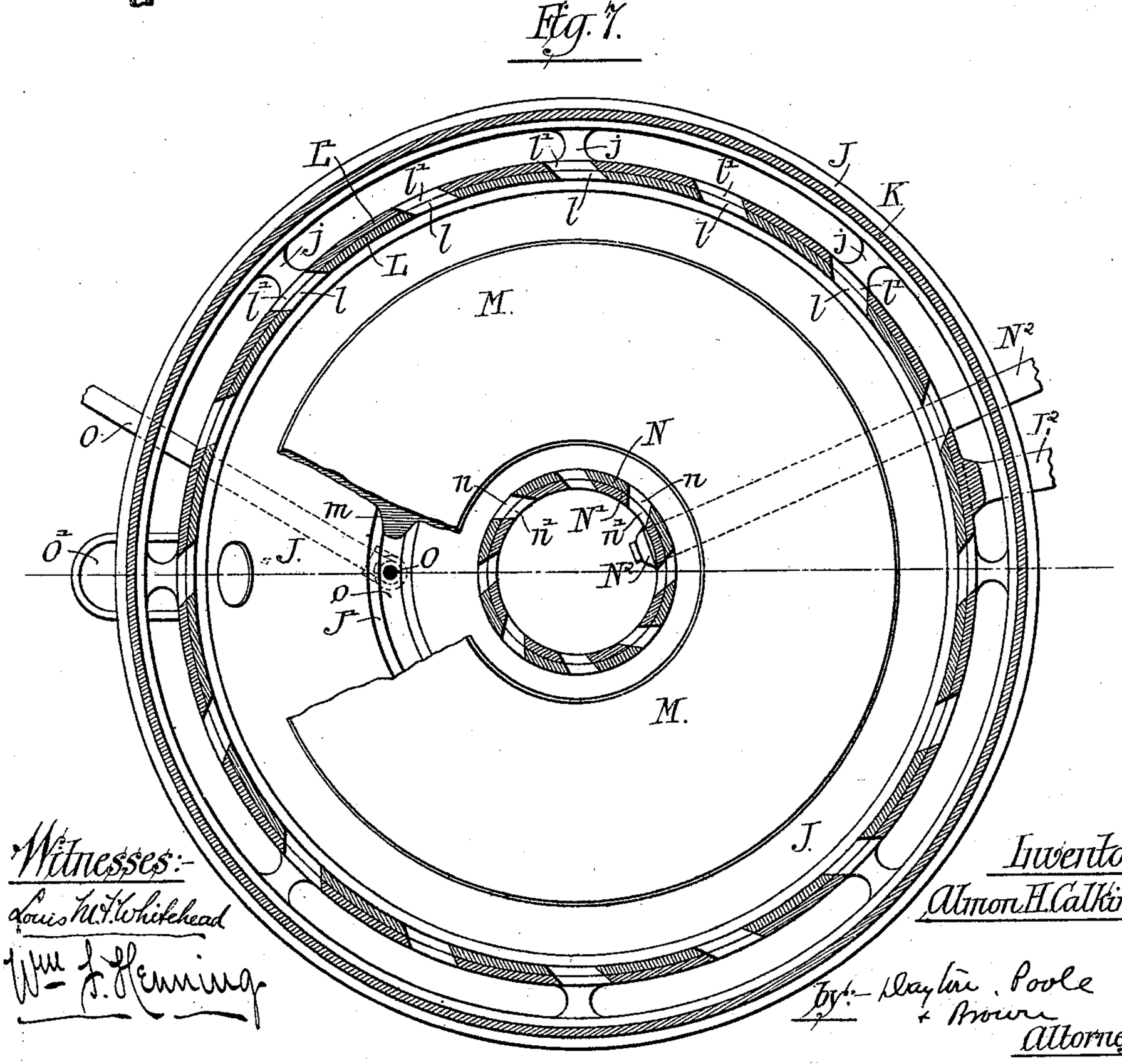



Fig. 7.




Witnesses:-
Louis M. T. Whitehead
Wm. F. Fleming

Inventor:
Almon H. Calkins.

by:- Clayton, Poole & Brown
Attorneys.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

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# A. H. CALKINS.

## OIL BURNER.

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Fig. 8.

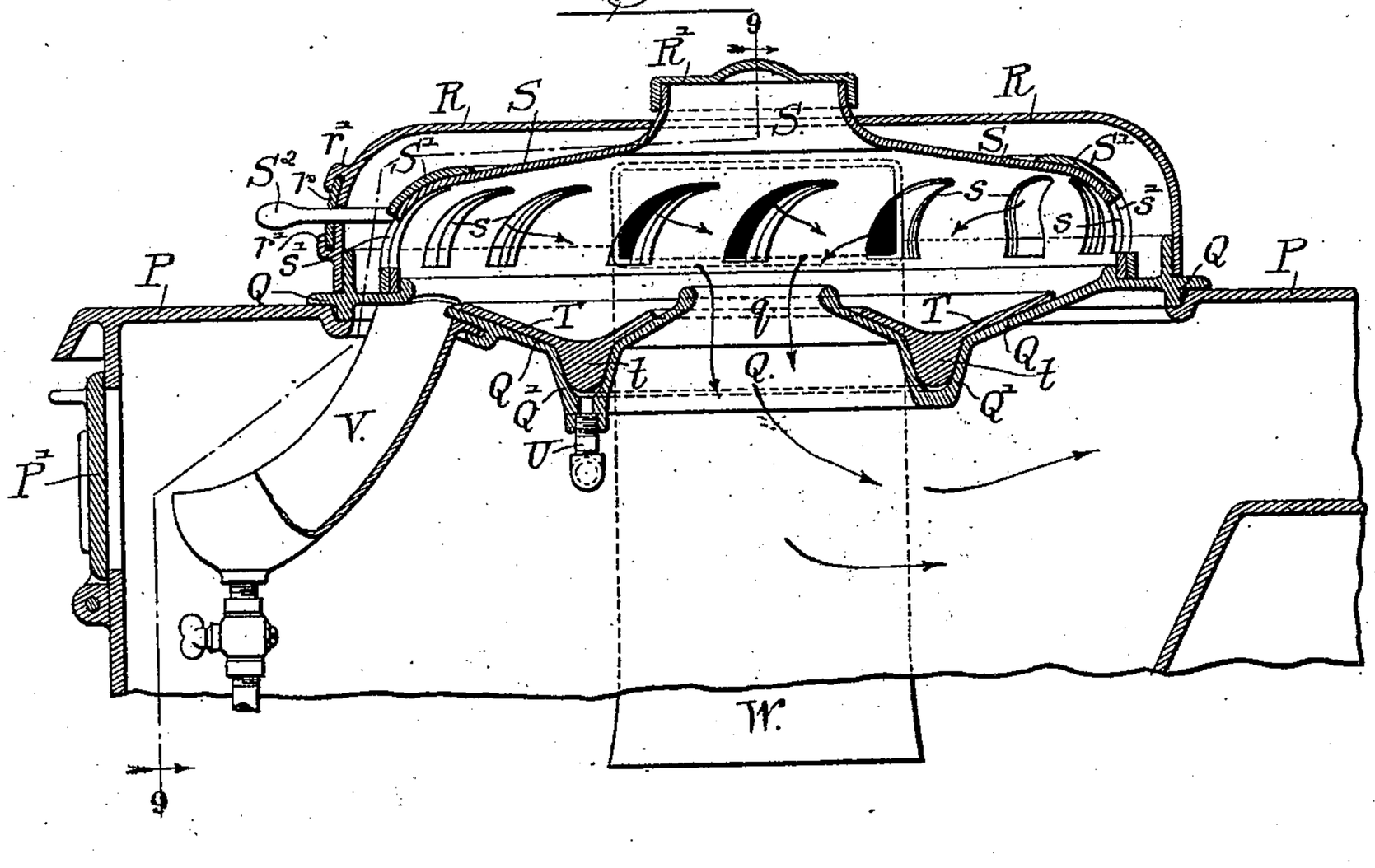
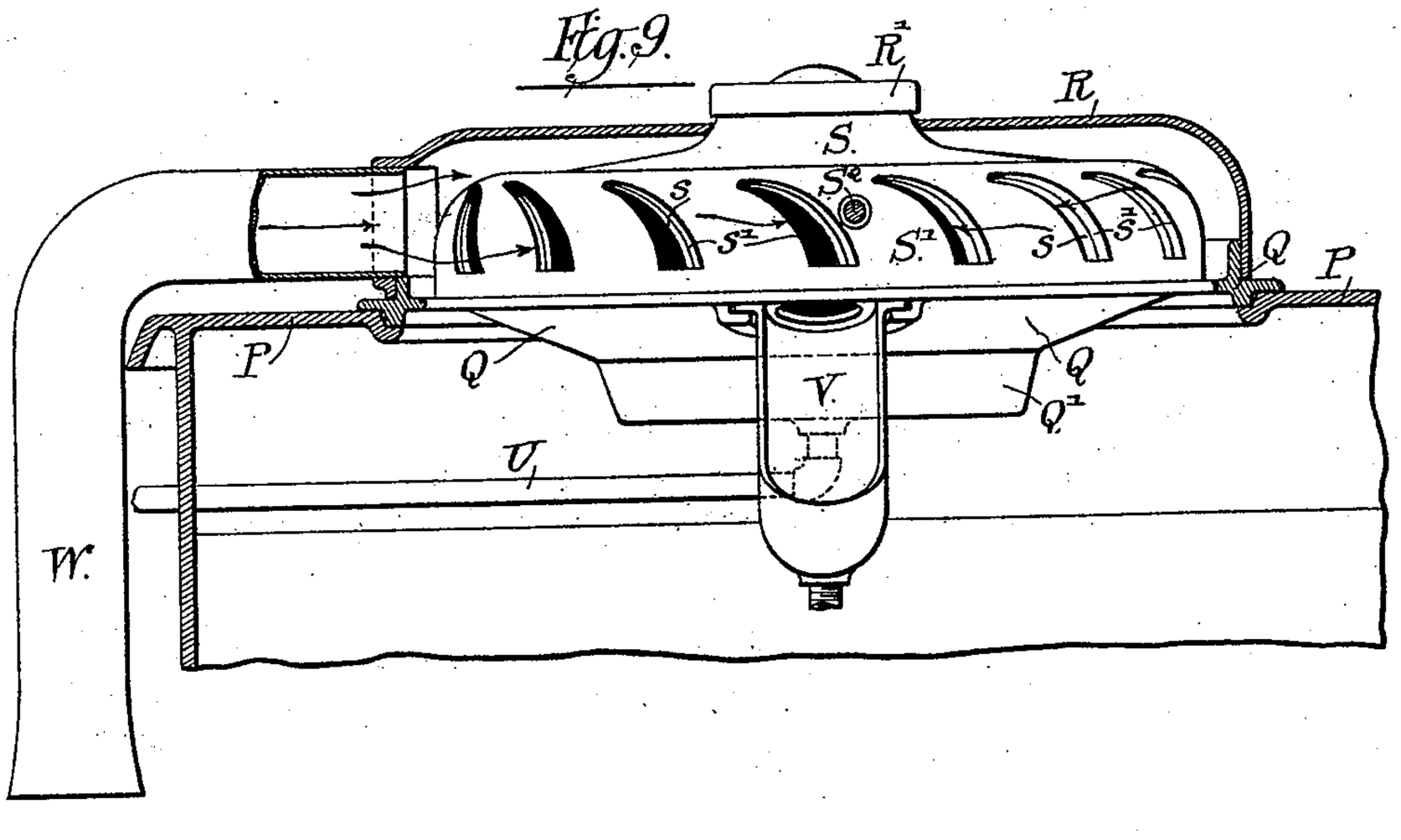



Fig. 9.




Witnesses:-
Louis M. F. Whitehead.
Wm. L. Fleming.

Inventor:-
Almon H. Calkins.

by:- Dayton, Poole & Brown.

Attorneys.-

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

ALMON H. CALKINS, OF EVANSTON, ASSIGNOR TO THE CHICAGO OIL BURNER AND STOVE COMPANY, OF CHICAGO, ILLINOIS.

## OIL-BURNER.

SPECIFICATION forming part of Letters Patent No. 516,363, dated March 13, 1894.

Application filed December 16, 1890. Renewed August 11, 1893. Serial No. 482,926. (No model.)

*To all whom it may concern:*

Be it known that I, ALMON H. CALKINS, of Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Oil-Burners; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to an improvement in oil-burners, and it consists in the matters hereinafter described and pointed out in the appended claims.

In the accompanying drawings illustrating my invention: Figure 1 is a central vertical section of one form of burner embodying my invention, the same being shown as placed within a cylindric heating stove. Fig. 2 is a sectional plan view of the same, taken upon line 2—2 of Fig. 1. Fig. 3 is an underneath view of the top part of the outer shell or casing of the burner. Fig. 4 is a detail section, taken upon line 4—4 of Fig. 2. Fig. 5 is a sectional view of a stove containing a burner like that shown in Figs. 1 to 4, with certain additional features hereinafter described. Fig. 6 is a central vertical, sectional view of a burner similar to that shown in Figs. 1 to 4 but of annular form. Fig. 7 is a sectional plan view, taken upon line 7—7 of Fig. 6 of the burner shown in the latter figure. Fig. 8 is a central, vertical section of a burner embodying my invention adapted for use on the top of a cooking stove. Fig. 9 is a sectional view taken upon line 9—9 of Fig. 8, showing the inner shell of the burner in side view.

As shown in said drawings, Figs. 1 to 4, A indicates the walls of a cylindric heating stove of common and simple construction, and *a* an annular interior ledge thereof on which the burner is supported. The outer casing of the burner consists of a lower annular plate or casting B and a hollow top casting or shell B′ provided with a central opening in its top. The lower casting B is adapted to fit within the annular flange *a* and is provided with an upwardly extending annular flange *b* over which fits the lower margin of the shell B′, which latter is provided with a cylindric side wall and a convex top.

C and D are lower and upper burner plates of circular form, which constitute the oil vaporizing part of the apparatus.

E is a central oil supply pipe which communicates with a central opening *e* between the plates C and D at the center of said plates. The upper plate D rests by gravity upon the plate C, and the adjacent surfaces of said plates are smooth and alike in shape, so that the oil entering between the plates is maintained in an exceedingly thin layer or film. In the operation of the burner the said plates are maintained at a high temperature by the heat produced by the burning of the fuel, and the film of oil in passing between the heated plates is converted into a vaporous or gaseous form and is burned as it issues from between the plates, in a manner heretofore set forth in prior Letters Patent granted to me. In the present instance the lower plate C is larger in diameter than the plate D, and the gaseous fuel burns as it issues from between the plates at the margin of the upper plate D. The plates C and D are shown as made of convex or dish shape, with central elevations or cones *c* and *d;* the space or chamber *e* being formed at the top cone *c* of the lower plate, while the cone *d* of the upper plate extends upwardly to a considerable distance above the margins of the plates and is blunted or truncated, as shown. The lower plate C is made somewhat smaller in size than the annular casting B of the outer casing, within which casting the said plate is supported, so that an annular air-space is formed between said casting and the plate. The said lower plate is conveniently sustained from the said casting B by means of radial arms *c′ c′ c′* on the plate, which rest upon said casting.

F is a top-plate which rests upon the outer upturned margins of the lower plate C and is provided with a central opening, surrounded by an upwardly extending flange *f*. The said top-plate forms with the burner plates C and D an annular combustion chamber G having an annular exit opening at its top, formed by the space between the central projection or cone *d* and the flange *f*. The top-plate F is provided adjacent to its outer margin with a plurality of openings or slots

$f'$ $f'$ $f'$, and upon the said top-plate rests a sliding damper-ring F′ provided with corresponding openings or slots $f^2$ $f^2$ $f^2$. The sides of said slots $f'$ $f^2$ are inclined or oblique, as clearly seen in the sectional view Fig. 4. The said slots constitute the air-inlet openings through which air for supporting combustion is admitted to the combustion chamber G, the air being admitted to said slots through the annular space between the outer shell B′ and the top-plate F, which latter is located below the said shell a distance sufficient to leave a space over the top-plate ample to admit an abundant supply of air to the said slots. The slots $f'$ $f^2$ are preferably but not necessarily arranged obliquely with reference to lines radiating from the center of the burner. The damper-ring F′ is for the purpose of regulating the supply of air to the combustion chamber, slots $f^2$ $f^2$ in said ring being placed in position to register with the slots $f'$ $f'$ in the top-plate, when the maximum supply of air is desired. The movement of the ring is limited by means of a stop $f^3$, and the damper-ring is provided with a rigid arm $F^2$ extending outside of the outer shell, by which said damper-ring may be turned. As herein shown the arm $F^2$ extends downwardly through the annular space between the casting B and the lower burner plate, and its lower end is bent into a horizontal position and is extended outwardly through a slot $a'$ in the stove-wall A. The sides of the slots or openings $f'$ $f'$ are made inclined or oblique for the purpose of giving an inclined or oblique direction to the air currents entering the combustion chamber through said slots, so that a circular or rotary motion will be given to the flames within the combustion chamber, with the result of obtaining a more complete admixture of the oxygen of the air with the gaseous fuel, and thereby promoting combustion, while at the same time increasing the heating effect of the flame on the burner by retaining it in convoluted or spiral form within the combustion chamber instead of allowing it to pass in a long or thin body directly from the outlet opening of the burner to the smoke passage of the stove. The rotary motion thus given to the flames within the combustion chamber is, furthermore, retained by the flames during and after their exit from the combustion chamber, so that they are caused to rotate within the stove, and by remaining in a compact form, act to impart a greater degree of heat to the stove walls than would be the case if they passed in a direct line to the exit opening of the stove. The sides of the slots $f^2$ $f^2$ of the damper-ring are made inclined or oblique in the same manner as those of the slots $f'$ $f'$, so that when the openings afforded by the slots are partially closed by turning the damper-ring, the air currents will be drawn forcibly through the inclined slots and will thus impart the desired rotary motion to the air and flames within the combustion chamber, when the air supply is partially cut off as well as when the maximum quantity of air is entering the said chamber. It is entirely obvious that if the oblique air-inlet openings were constantly of the same size and the air supply were regulated by a damper applied otherwise than in the manner described, when a relatively small quantity of air is supplied to the burner, the currents through the said oblique slots would be weak, and the latter would have little effect in producing a rotary motion of the flames within the combustion chamber. By the use of the damper-ring made as described, the said slots are made narrower when it is desired to limit the air supply, so that the air currents will in all cases flow forcibly or rapidly through the slots and thus tend at all times to maintain the air and gases within the combustion chamber in rapid rotary motion.

To aid in producing a rapid rotary or spiral motion of the flames within the combustion chamber, oblique or spirally arranged wings or deflectors $b'$ $b'$ $b'$ are shown as located within the annular air inlet space between the outer shell B′ and the inner shell formed by the lower burner plate C and the top-plate F. Said wings serve to give an oblique or spiral motion to the air approaching the air-inlet slots or openings $f'$ $f'$ $f'$, and thereby directing the air current spirally or obliquely through the said slots. The wings or deflectors $b'$ $b'$ $b'$ are herein shown as formed by flanges cast upon the shell B′, but this construction is not essential. The said outer shell B′ which extends around the sides of the casing formed by the plates C and F, and over the top of said casing, thereby forms an air heating chamber, outside of the said casing, in which the air is heated to some extent by contact with the said casing before entering the air-inlet openings of the latter. Air enters the open bottom of said shell B′ through the annular space between the plate C and the casting B, on which the lower edge of said shell rests, as hereinbefore described.

To facilitate the lighting or starting of the burner, the lower plate C is provided at one point in its margin with a notch $c^2$ reaching downwardly to a point adjacent to the edge of the upper plate D, and a depending trough H is attached to the burner with its upper end beneath and adjacent to the said notch, so as to receive any oil flowing from the same. At its lower end the trough H is provided with a receptacle H′, conveniently provided with a valved drain-pipe $h$. The lower end of the said trough is located adjacent to a door or opening A′ in the stove-wall. When it is desired to start the burner thus constructed a small supply of oil is admitted through the oil-supply pipe, and the same, passing outwardly between the plates C and D, enters the concave receptacle formed by the plates and some of it overflows through the notch $c^2$ and enters the receptacle H′. A match or other flame being applied to the oil

within the receptacle, the flame passes upwardly along the trough H and ignites the oil held within the burner-plates and the burning of this oil soon heats the plates to the vaporizing point. Oil may then be allowed to flow between the plates and being vaporized or converted into a gas by the heat of the same, will issue from between the plates and will burn as it escapes therefrom. The flame will obviously be an annular one, and being located near the outer margins of the burner plates, and just within or beneath the air-inlet slots, the flames will be carried or drawn inward in a spiral course over and around the central part of the upper burner plate, thereby keeping the same at a high temperature, and will finally make its exit at the top of the burner casing.

In Fig. 5 is shown a stove A and a burner constructed like that above described, except that the deflectors *b' b' b'* are not present. In this instance a downwardly opening air-supply pipe I is provided the mouth or exit opening of which is located directly over the exit opening of the burner. This pipe is shown as connected with the annular air space or chamber of the burner, but it may obtain its supply of air directly from the outside of the stove, as shown, for instance, by the dotted lines at I'. The rotary motion given to the flames inside of the burner causes them to spread as they pass from the exit opening thereof and air drawn through the pipe I will aid in spreading the flames outwardly against the sides of the stove, and will at the same time tend to promote combustion by giving an additional supply of air at this point. An inward flow of air through the pipe I, even when the same leads downwardly from the top of the stove, is insured by reason of the strong outward draft through the exit or smoke pipe of the stove.

In Figs. 6 and 7 is shown another form of burner embracing the same general features of construction but differing in details from the burner above described. In this instance, A is a cylinder stove provided with an interior annular flange *a* and with a door A', as before described. The outer casing of the burner consists of a bottom plate J, which constitutes also the lower burner-plate, and a top-part or shell K. An inner shell L rests on the bottom plate J, at some distance within the outer shell K, and upon the said bottom plate within the shell L rests a top burner-plate M of annular form. At the center of the bottom plate J within the annular burner plate is located an upwardly extending hollow projection or dome N, preferably made integral with said plate J. The dome N is provided with air-inlet slots or openings *n n n*, and the inner shell L is provided with similar air-inlet slots or openings *lll*. N' is a revolving damper fitting the interior of the dome N and pivoted to the top of the latter by means of a pivot-bolt $n^2$. The damper N' is provided with a plurality of slots or openings *n' n' n'* corresponding with the slots *n n n*, and attached to said damper is an arm $N^2$ by means of which it may be turned or shifted when desired. Surrounding the inner shell L is a damper ring L' which is provided with slots or openings *l' l' l'* corresponding with the slots *l l l*, and attached to said damper ring is an arm $L^2$ for actuating the same. The sides of the several air inlet slots described are made inclined or oblique, so as to direct the inflowing air-currents in an inclined direction as they enter the burner casing, in the same manner as hereinbefore set forth in connection with the form of burner first described. For the purpose of admitting air to the space between the outer and inner shells K and L, the bottom plate J is cut away or slotted in its part between the lower margins of said shells, leaving only connecting pieces or arms *j j j* to support the inner parts of the burner. Oil is fed to the space between the plates J and M by means of a supply pipe O, which communicates with an annular space *o* formed, in the construction shown, by means of an annular depression or channel J' in the plate J, into which channel is inserted a depending rib *m* on the plate M, the said rib being made shallower than the channel J', so as to form the space *o*, which constitutes a passage for distributing the oil from the pipe O uniformly around the annular burner plates. The plates J and M are inclined downwardly toward the channel J' so that they have the form of annular troughs in which the oil is allowed to overflow and in which it is burned for heating the plates, in first starting the burner. In a burner thus made the gas or vapor formed by the passage of the oil between the heated plates J and M is burned at both margins of the plate M, so that an annular body of flame is formed adjacent to both the inner and outer air-inlet openings. The annular flames are given a rotary or spiral motion within the burner casing by the action of the oblique air-currents, and the flame makes its escape from the central opening in the top of the inner shell L which extends upwardly through the outer shell K, in the manner illustrated. The burner is shown provided with a trough O' for starting the burner, arranged in the same manner as that hereinbefore described.

Figs. 8 and 9 show a burner generally similar to that shown in Figs. 6 and 7, adapted for use upon the top of a cooking stove. In this instance P is the horizontal top of a cooking stove, having the usual circular hole for cooking utensils. Q is the bottom plate of the burner, which fits at its outer margin within the hole in the stove-top, and is provided with a central opening *q* through which the flames make their exit from the burner downwardly into the stove. R is the outer shell of the burner which rests at its lower margin upon the outer margin of the bottom plate Q, and S is an inner shell, smaller in diameter than the outer shell, and resting upon the said

bottom plate. The inner shell S is provided with an upwardly extending central flange which passes through a central opening in the outer shell R, and is covered by a cap R′, this construction being used merely for the purpose of enabling these parts to be employed in a burner in which the flames escape from the top of the burner. The said inner shell is provided around its outer wall with air inlet slots or openings *s s s*, and around the outside of the same is a damper ring S′ provided with slots or openings *s′ s′ s′* corresponding with the slots *s s s*. Attached to the damper ring S′ is a rigid actuating arm $S^2$ which extends outwardly through a horizontal slot in the outer shell R, said opening being preferably covered by a slide *r* held in horizontal guide-grooves *r′ r′* upon the said shell, the arm passing closely through a hole in the said slide, so that the slide is moved with the arm. Said air inlet slots or openings *s s s* and the corresponding slots *s′ s′ s′* have inclined or beveled side walls, so that the air currents entering through the same are given an oblique direction, with the result of producing a rotary motion in the flames within the burner, in the same manner as hereinbefore described. That part of the bottom plate within the inner shell forms the lower burner plate, and upon the same rests a top burner plate T of annular form. The bottom plate Q is provided with an annular depression or channel Q′ in which is inserted a flange *t* upon the bottom surface of the top burner-plate T, an annular space being afforded at the bottom of said channel, beneath the said flange *t*, with which communicates an oil supply pipe U. These burner plates, with a trough V for lighting or starting the fire, are arranged in the same manner as hereinbefore described in connection with the burner shown in Figs. 8 and 9, said trough terminating at its lower end opposite a door P′ in the front wall of the stove. In this instance the bottom plate Q forms a close bottom to the air-space between the outer shell R and the inner shell S, and air is admitted to the said space by means of an air inlet tube W connected with the outer shell and extending past the edge of the stove-top and then downwardly to a point considerably below the level of the bottom of the burner. The pipe is thus disposed in order to prevent possibility of the flames from the burner passing from the air inlet opening, as might sometimes occur in case the tube W were not present at the time of starting. the burner, before the draft through the smoke pipe of the stove is established. When the said tube is present the flames will obviously be compelled to pass downwardly through the exit opening *q* of the burner and thence to the smoke pipe of the stove, owing to the fact that the flames and heated gases will not descend as far as the bottom of the said tube, when the easier path through the smoke pipe is open for them.

An oil burner of the kind shown in Figs. 8 and 9 is of great advantage inasmuch as it may be placed upon an ordinary cooking stove, to allow the use of a liquid fuel without any change being required in such stove.

I claim as my invention—

1. An oil-burner comprising a circular closed casing having an oil-burning device in its bottom and provided with a central exit opening and with peripheral air inlet slots or openings located above the oil burning device, and an exterior shell extending around and over the sides and top of the casing and forming an air-heating chamber adjacent to the said air inlet slots or openings, said shell being open at its bottom for the admission of air to said chamber, substantially as described.

2. An oil-burner comprising a circular closed casing having an oil-burning device in its bottom, and provided with an exit opening and with air-inlet slots or openings located above the oil-burning device; the sides of said air inlet slots or openings being oblique or inclined to give rotary motion to the flames within the casing, substantially as described.

3. An oil burner comprising two burner-plates the adjacent surfaces of which are in contact with each other, a supply pipe delivering oil between the said plates, and a shell or casing forming a combustion chamber over or adjacent to the plates, and provided with air-inlet openings or slots the sides of which are made oblique or inclined to give a rotary motion to the flames within the combustion chamber, substantially as described.

4. An oil-burner comprising two burner plates, the adjacent surfaces of which are in contact with each other, a supply pipe delivering oil between the said plates, a shell or casing forming a combustion chamber over or adjacent to the plates, said shell or casing being provided with air-inlet openings or slots, the sides of which are inclined or oblique, and a movable plate or damper provided with slots or openings corresponding with those of the shell, and also having their sides made inclined or oblique, substantially as described.

5. An oil-burner comprising two burner-plates the adjacent surfaces of which are in contact with each other, a supply pipe delivering oil to the space between said plates, an inner shell or casing forming a combustion chamber over or adjacent to the said burner-plates and provided with air inlet slots or openings having inclined or oblique side walls, and an outer shell forming an air-chamber around the inner shell and provided with an air-inlet opening or openings, substantially as described.

6. An oil-burner comprising two burner plates, the adjacent surfaces of which are in contact with each other, a supply pipe delivering oil to the space between the said plates, an inner shell or casing forming a combustion chamber over or adjacent to the said burner-plates, and provided with air-inlet slots or openings having inclined or oblique side-walls, and an outer shell forming an air chamber around the inner shell and provided with an

air inlet opening or openings, and inclined wings or deflecting plates located in said air-chamber, substantially as described.

7. An oil burner comprising a lower burner plate, an upper burner plate smaller in diameter than the lower plate and resting upon the latter, a supply pipe delivering oil to the space between the plates, and a shell or casing resting at its edges on the said lower burner-plate and forming with the latter a combustion chamber over the burner plates, said shell or casing being provided near its outer margin with a series of air inlet slots or openings the side walls of which are inclined or oblique, substantially as described.

8. an oil-burner for the top of a stove comprising a lower burner plate provided with a central opening, an upper burner plate resting upon the lower plate, a supply pipe delivering oil between the plates, an inner shell or casing forming a combustion chamber above the burner plates and provided with air-inlet slots or openings having inclined or oblique side walls, an outer casing forming an air-chamber around the inner casing, and a depending air inlet pipe connected with said outer casing, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

ALMON H. CALKINS.

Witnesses:

C. CLARENCE POOLE,

G. W. HIGGINS, Jr.