E. E. FLORA.

HYDROCARBON OIL BURNER.

APPLICATION FILED OCT. 2, 1905.

908,084.

Patented Dec. 29, 1908.

4 SHEETS—SHEET 1.

Fig. 1.

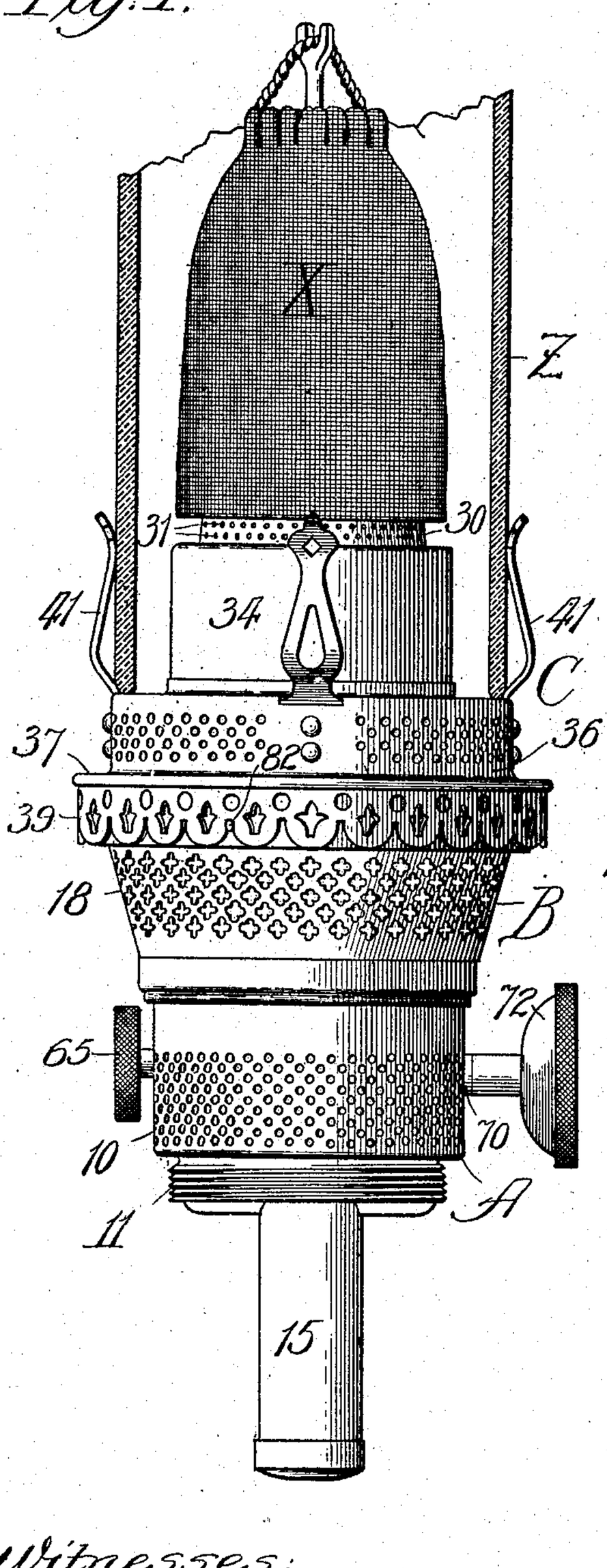
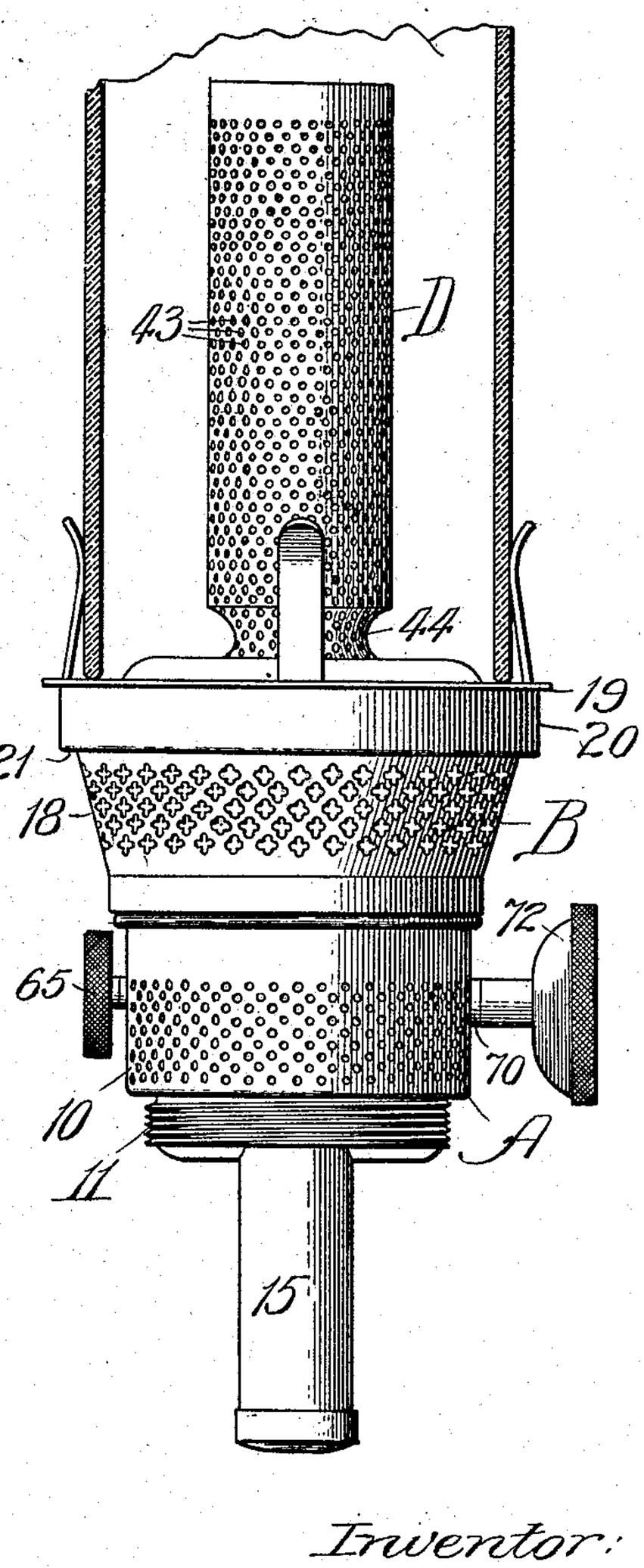


Fig. 2.



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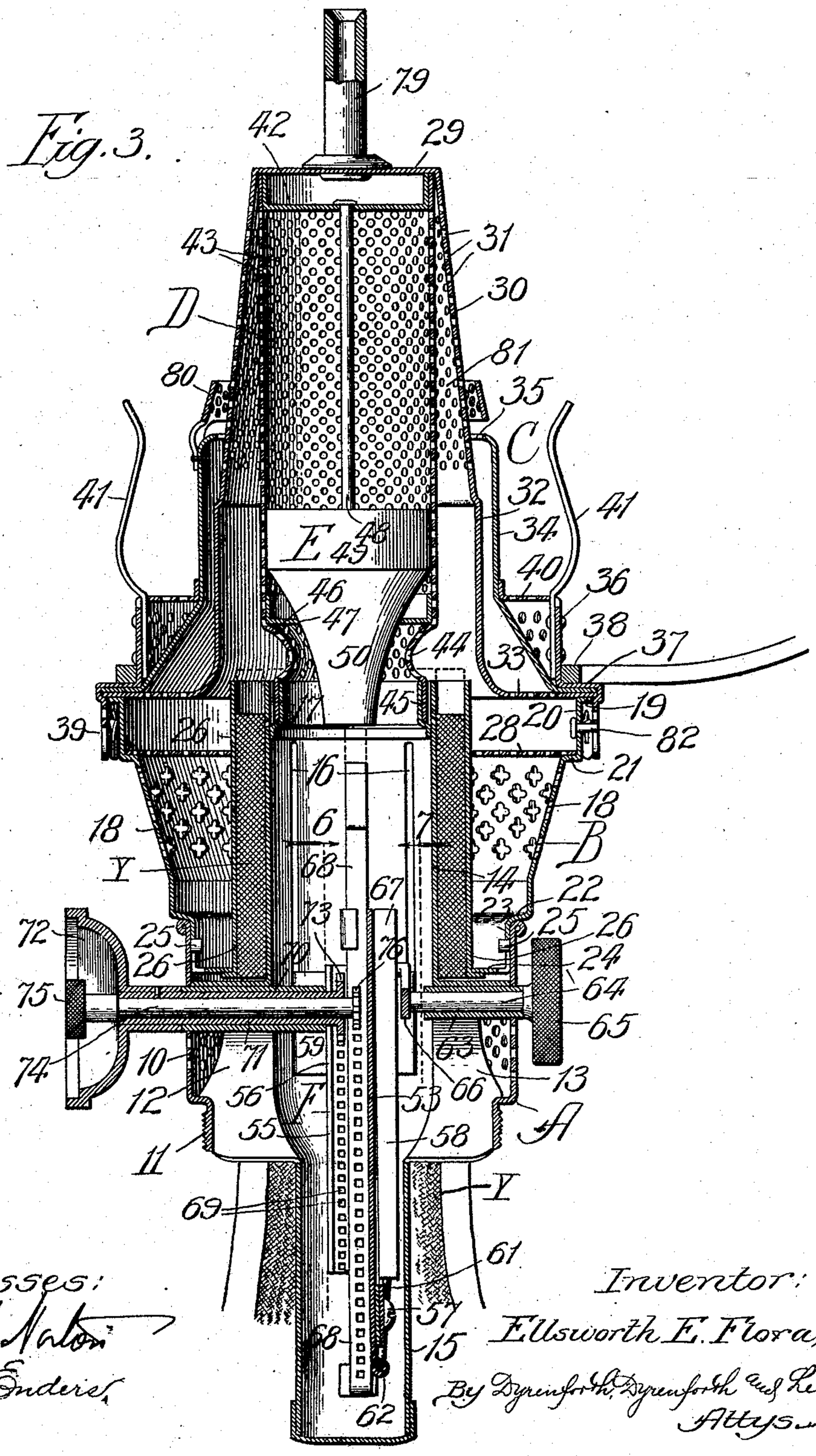
4 SHEETS—SHEET 2.

Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

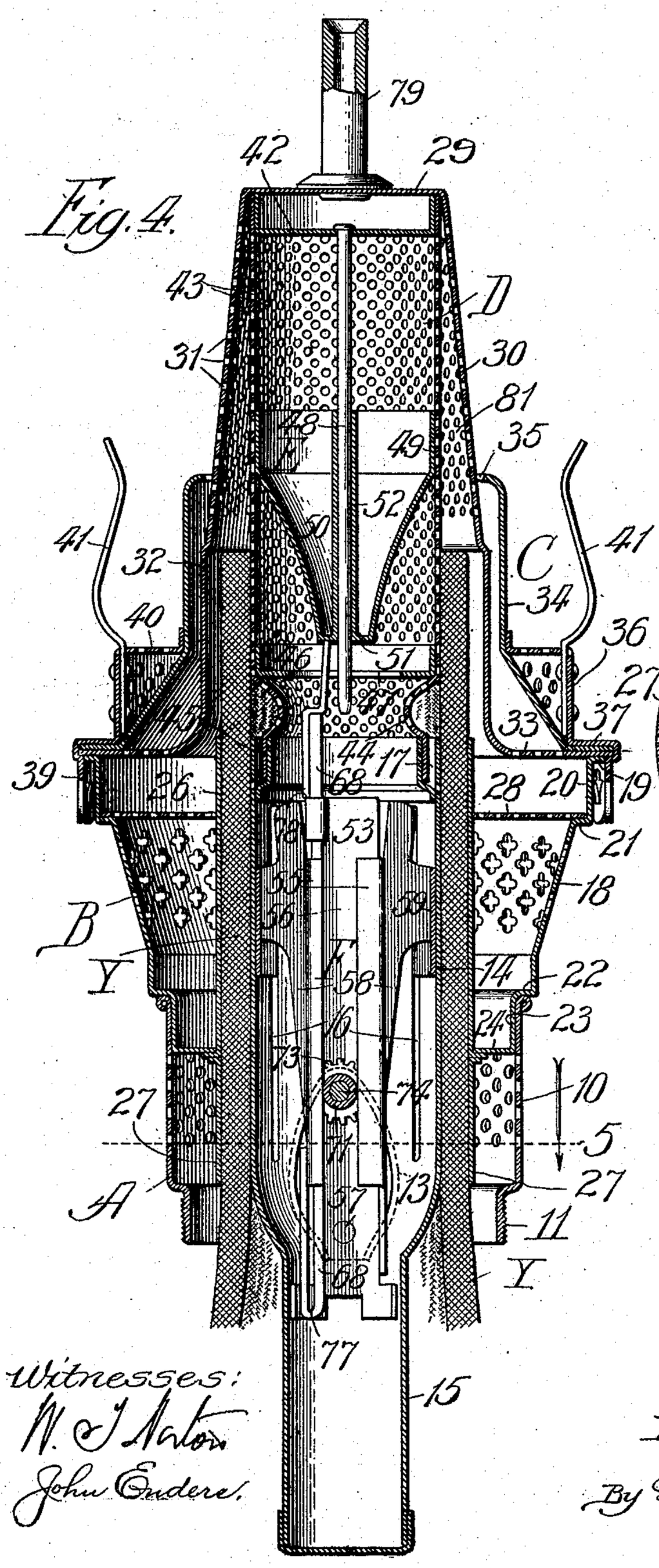
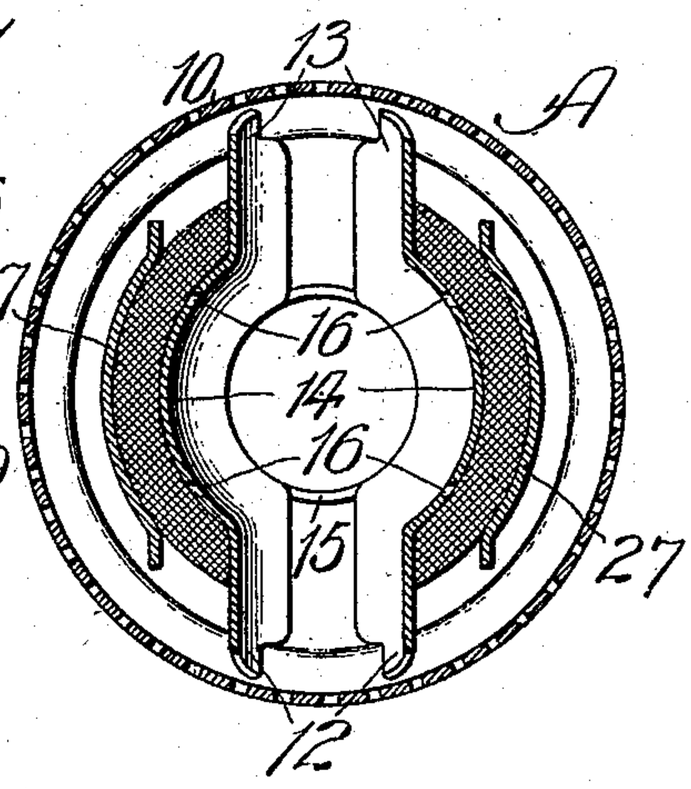


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

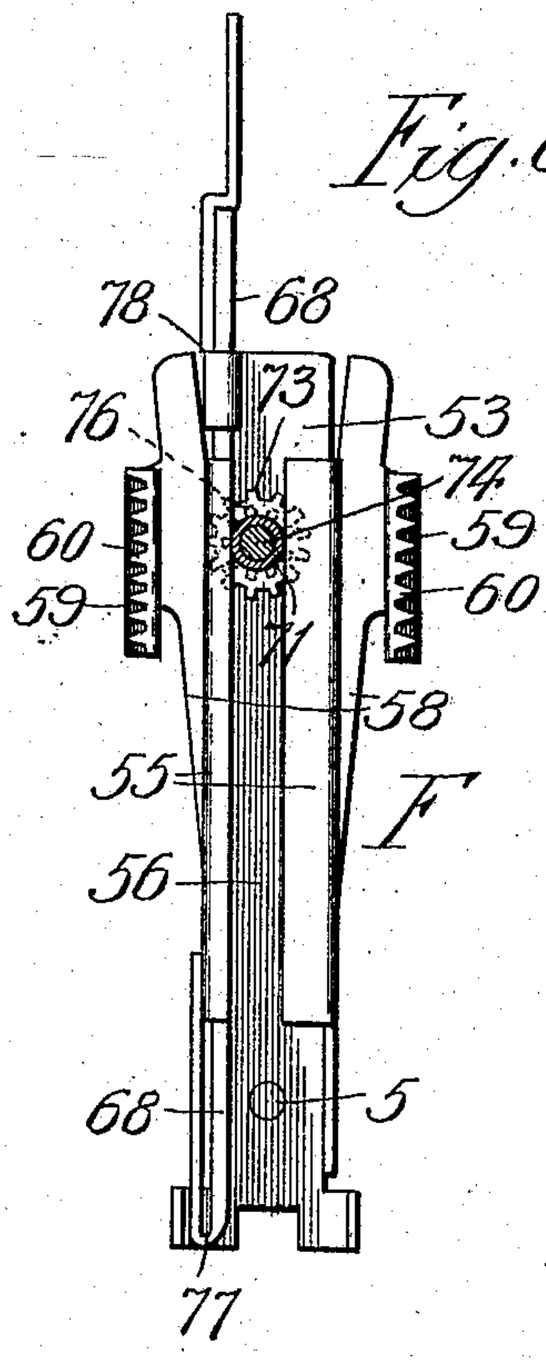


Fig. 7.

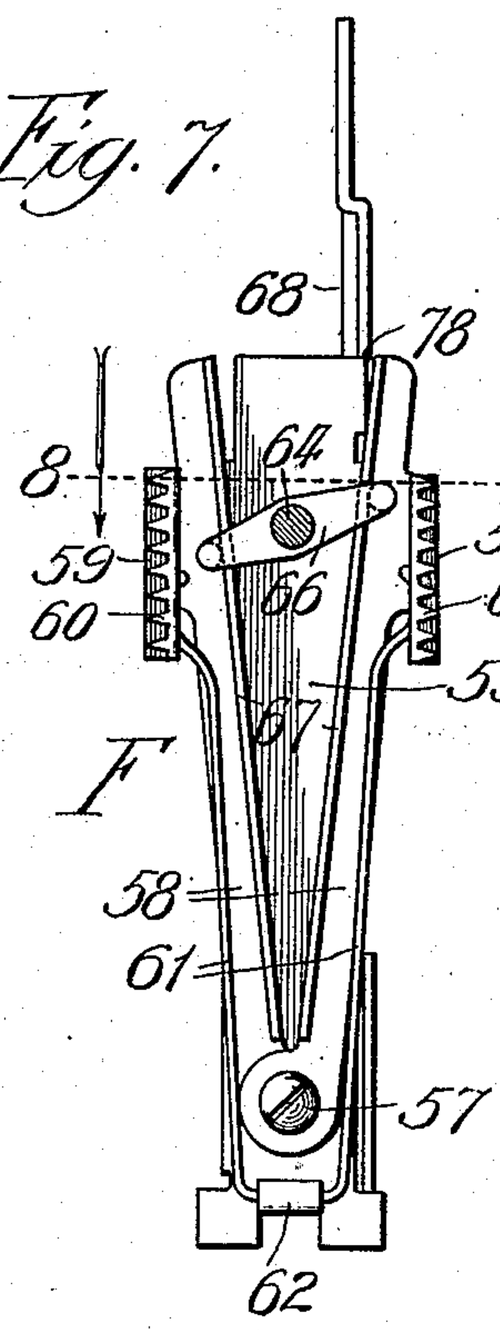
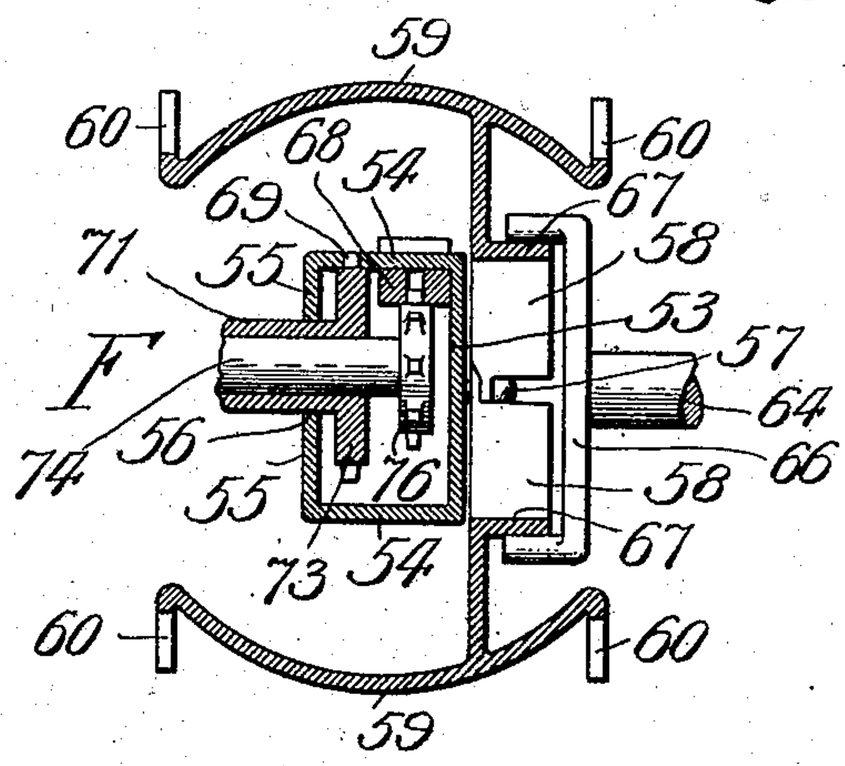


Fig. 8.



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UNITED STATES PATENT OFFICE.

ELLSWORTH E. FLORA, OF CHICAGO, ILLINOIS, ASSIGNOR TO FLORA BURNER & LAMP COMPANY, A CORPORATION OF ILLINOIS.

HYDROCARBON-OIL BURNER.

No. 908,084. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed October 2, 1905. Serial No. 280,951.

To all whom it may concern:

Be it known that I, ELLSWORTH E. FLORA, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Hydrocarbon-Oil Burners, of which the following is a specification.

This invention relates to improvement in liquid hydro-carbon burners of the class first shown and described in Letters Patent granted to me No. 711,153 and dated Oct. 14, 1902 for an incandescent oil lamp. In this burner a preferably round oil conducting wick is caused to contact at one side with the surface of a perforated, preferably tubular, heat conducting oil-gasifying wall, the area of such contact, which controls the quantity of oil-vapor generated, being regulated by sliding the wick longitudinally upon said surface. The said gasifying-wall forms the inner wall of an annular oil-vapor and air mixing-chamber into which the air is fed in suitable volume and in a manner to mix thoroughly with the vapor and form therewith a gas which in burning produces a blue flame indicating thorough combustion. The chamber has outlet perforations forming burner openings which are at all times more or less remote from the wick, and the heat there generated is conducted along the gasifying wall to vaporize the oil fed by the wick. The burner thus forms a wick-fed, kerosene burning, blue-flame heater, in which during operation there is no flame at the wick.

As a kerosene-burning heater, a burner constructed in accordance with my invention possesses many unique advantages. Having no valves it is free from danger of becoming clogged while in operation. It is peculiarly safe, because any breaking or separating of parts which would destroy the proper draft regulation, or permit a superabundance of air to enter the mixing chamber, or stop the necessary heat conduction, results in immediate, or approximately immediate, extinguishment of the flame. For the reason that the amount of gas generated during operation is controlled by the area of surface contact of the wick with the gasifying wall, there is no, at least material, variation in the heat produced while the wick remains undisturbed and the supply of oil is maintained. As a heater it may produce approximately uniform heat for an indefinite time, and, on account of the substantially perfect combustion which it effects, it gives off no material odor and there is no material deposit of free carbon to clog the burner or draft openings.

The features of novelty of the burner constructed as herein illustrated are, generally stated, the following: The inner wall of the mixing chamber, namely, the outer surface of the gasifying tube, is of a diameter not less than that of the inner wick-tube to insure close surface contact of the inner surface of the wick with the gasifying-tube. The lower end portion of the gasifying-tube is of spreader form, to facilitate, for one reason, the initial heating of the structure. A baffle, or draft-spreading plug, is provided in the gasifying-tube to direct the inner air current across the upper end of the wick and equally into all sides of the annular mixing chamber; the plug, in the present burner, operating to close the lower end of the tube when the wick is turned low, to aid in supporting combustion during initial heating; and the plug being provided with means for moving it in harmony with the wick, when the latter slides along the tube, to maintain the desired distribution and volume of center draft. A weep-channel, is provided upon and concentric with the inner wick-tube, which may also form the means for supporting the gasifying tube out of physical contact with the wick tube. An improved limited-movement wick-lift is provided with means for producing engagement and disengagement thereof with the wick, to facilitate adjustment, insertion and removal of the wick. An auxiliary chimney-holder or gallery is provided which may be employed when the upper removable part of the structure, carrying the outer wall of the mixing chamber, or burner head, is taken off and, in the absence of a mantle, the device is to form a wick-burner of the Argand type; said auxiliary holder being, in the present embodiment an adjunct applicable to the structure. Improvements generally in the construction of the burner are provided to facilitate initial heating, and proper heat-conduction, and to properly distribute and regulate the direction, mobility and volume of the incoming air-currents which produce the proper burning mixture and support combustion.

In the drawings—Figure 1 shows my improved mantle-incandescing burner in side elevation; Fig. 2 is a view of the lower part

of the structure with the gasifying tube therein and showing the auxiliary chimney-gallery in place, in which condition the parts of the structure shown may be employed as an Argand burner, the gasifying tube and its plug acting as a spreader for the wick-flame; Fig. 3, an enlarged section of the burner structure showing, by full lines, the wick and plug raiser in their lowest positions, and, by dotted lines, the same parts in approximately the positions they occupy when oil is ignited at the wick to preparatorily heat the gasifying tube and balance of the upper structure, this view showing also a broken section of a pronged shade-supporting ring; Fig. 4, a section through the structure, at a right angle to that shown by Fig. 3, with the wick and plug raised to their highest mantle incandescing positions; Fig. 5, a plan section taken on line 5 of Fig. 4; Figs. 6 and 7 sections on lines 6 and 7 in Fig. 3, viewed, respectively, as indicated by the arrows and showing the wick and plug operating mechanism; and Fig. 8 a plan section taken on line 8 in Fig. 7.

The lower half of the burner shell is formed of two separable and interlocking members A and B, and the upper half, or member C of the burner, rests in a readily removable manner upon the part B. The lowermost member A has an outer perforate wall 10 with a thread 11 at its lower end to engage the collar of an oil-font. Attached to the wall are tubes 12, 13 which open into and support rigidly the inner wick-tube 14 and a lower extension thereof, or well, 15. The inner wick-tube has four vertical slots 16 through it for the passage of the prongs of the wick-lift, hereinafter described; and attached to the inner side of the upper end portion of the inner wick-tube is a weep channel 17, which directs any oil overflowing from the top of the wick, when extinguished, back to the wick.

The intermediate member B has an outer perforate wall 18, formed with the top flange 19, imperforate ring portion 20, shoulders 21, 22, ring portion 23 and imperforate base or flange 24. The lower end of the part B fits into the upper end of the part A, as shown, the parts being fastened together by means of pins 25 (Fig. 3) on the wall 10, and bayonet slots in the ring portion 23. The flange 24 carries the outer wick-tube 26 and downward extensions thereof, 27, which straddle the tubes 12, 13. Surrounding the tube 26 and resting against the shoulder 21 is a perforate diaphragm 28.

The upper part or member C carries, as an integral portion thereof, a burner-head which may consist, as shown, of an imperforate top 29; an upper frusto-conical wall 30, provided with perforations 31, forming the burner openings; and an imperforate cylindrical lower portion 32 terminating in a perforate flange 33. Fastened around the edge of the flange, 33, beyond its perforations, is an imperforate hood or burner cap 34 turned inward at its upper end where it surrounds the lower part of the burner head 30 in a manner to leave a narrow annular draft-opening 35 between them. Also fastened to the edge of the flange 33 is a perforate ring 36 having a lower flange 37, which may form a shoulder to receive a shade support 38, the shoulder terminating in an ornamental skirt 39, fitting loosely over the upper end of the part B. At the upper edge of the ring 36 is a perforated flange 40 fitting at its edge around the hood 34. The flange 40 forms the chimney gallery, the chimney being held by the prongs 41.

D is a gasifying tube having an imperforate top 42, and perforated cylindrical wall 43. Near its lower end the tube is formed with a perforate concave portion 44, terminating in a straight cylindrical lower-end portion 45 of a size to fit snugly around the inner wall of the weep-channel 17. When the parts are in position, the upper end of the gasifying tube is in contact with the upper end of the burner head. In the tube D just above the concave part 44 is an imperforate annular flange or shoulder 46 with a central opening 47 through it; and extending centrally downward in the tube is a guide-rod 48 fastened to the top 42. Sliding on the guide-rod 48 is a baffle, or plug, E having an upper cylindrical ring portion 49, fitting slidably against the inner surface of the tube D, and having a tapering concave lower part 50 terminating in a base flange 51 from which extends a vertical center-tube portion 52 fitting slidably around the rod 48. When in its lowermost position the plug rests on the flange 46, closing the opening 47, and extends at its lower-end portion centrally into the inner wick-tube 14.

In the casing formed by the inner wick-tube 14 and well 15 is a wick-lift, F, forming part of which is a tubular frame or casing, rectangular in cross-section, consisting of the back 53, sides 54 and a front 55 provided from end to end with a vertical slot 56. Pivotally fastened at their lower ends by a screw or pin 57 to the back 53, is a pair of arms 58, each carrying at its upper-end portion a plate 59, segmental in cross-section to conform to the inner surface of the inner wick-tube 14, having serrated wick-engaging flanges, or prongs, 60 projecting through and sliding in the slots 16. A wire spring 61 fastened at 62 to the lower end of the back 53 extends upward, at opposite sides, and bears at its free ends against the plates 59 to press the prongs 60 through the slots 16 into the annular wick-space formed by the concentric tubes 14, 26. Fastened in the upper part of the horizontal tube 13, and ex-

tending through the same, is a bearing sleeve 63, in which is journaled a short rock-shaft 64 carrying at its outer end a thumb-wheel 65, and at its inner end a stirrup 66 which engages the outer surfaces of longitudinal flanges or ribs 67 on the arms 58. By turning the shaft 64, the stirrup 66 swings the arms toward each other, to retract them from their normally extended position against the resistance of the spring 61, and withdraws the wick engaging prongs out of the wick-space.

Sliding in guides against the inner surface of one of the walls 54 is a plug-raising rod or strip 68 forming a rack, and adjacent thereto is a vertical series of openings 69 in the said wall 54, forming a wick-raising and lowering rack. Fastened against the upper inner side of the tube 12, and extending through the same, is a bearing sleeve 70. A rotary sleeve 71, journaled in the sleeve 70, carries at its outer end a large cupped thumb-wheel 72, and at its inner end a large pinion 73 engaging the wick raising and lowering rack 69. Within the sleeve 71, and frictionally engaging the same, is a shaft 74 carrying at its outer end a small thumb-piece 75, partly housed by the thumb-wheel 72, and at its inner end a small pinion 76 engaging the rack, or plug-raising rod, 68. When the thumb-wheel 72 is turned it produces vertical movement of the casing of the wick-lift F and all the parts carried thereby, including the plug raiser 68 owing to the frictional engagement between the shaft 74 and sleeve 71; but when the thumb-piece 75 alone is turned it moves only the plug-raiser, because the resistance to movement of the wick-lift overbalances the resistance caused by friction between the shaft 74 and sleeve 71. The plug-raising rod 68, is formed with a stop 77 at its lower end which, by contacting with the lower end of the wall 54 limits its rise with relation to the wick-lift; and near the upper end of the plug-raising rod is a shoulder 78 which by contacting with the upper end of the wall 54 limits the relative descent of said rod. The mantle X may be supported upon a post inserted into a socket piece 79, or in any other suitable way to extend more or less concentrically downward around the burner head nearly, but not quite, to the top of the hood 34.

If desired the mantle may be caused to fit at its lower end against a spacing support, such for example as the stationary perforate ring 80, shown for illustration in Fig. 3, to steady the mantle and maintain it at all times in the annular field of greatest heat intensity, which is a short distance from the surface 30. If the support is provided to steady the mantle there should be but limited surface contact between them to reduce heat absorption by the support which would tend to lower or obliterate incandescence of the mantle at and adjacent to the place of contact.

In the burner, constructed as shown, I prefer to employ a comparatively thick wick Y, having an annular upper-end portion and split from the tubes 12, 13, downward to form tails.

To place the wick in the burner, the parts A and B are separated, the former carrying the inner wick-tube 14 and wick-lift mechanism, and the latter carrying the outer wick-tube 26. The legs of the wick are passed downward through the segmental spaces around the inner wick-tube, the wheel 65 is turned to withdraw the wick-engagers, and the tubular part of the wick is slid downward around the upper part of the inner wick-tube, to the position shown by full lines in Fig. 3. Release of the wheel 65 causes the wick-engaging prongs to spring into engagement with the wick. When the part B is placed upon the part A, and locked by the bayonet-joint connection described, the wick is confined slidably in the wick space between the inner and outer wick-tubes, as shown. To change the point of engagement between the wick and wick-lift, as after trimming the wick, the two may be released from each other by turning the wheel 65, after which the wheel 72 may be turned, more or less, to carry the engagers to another position relative to the top of the wick, and the wheel 65 be then released to effect the new engagement, which in the full turning of the wheel 72 will cause the wick to move between the desired highest point (as shown in Fig. 4) and lowest point (as shown by full lines in Fig. 3).

To start the burner, the wick should be raised to the position shown by dotted lines in Fig. 3, and the part C, with the mantle and chimney Z carried thereby, should be lifted off or raised, to permit a match to be applied to the wick which then burns with a comparatively small heating flame. The part C is then replaced, and if the flame gives off any smoke the wick may be turned lower. In a very short time the upper structure of the burner, and particularly the gasifying-tube and burner-head become heated to a sufficient extent, after which the flame at the wick should be blown out, or otherwise extinguished, and the wick quickly raised to, or nearly to, the position shown in Fig. 4. The extensive surface contact between the upper portion of the wick and the heated gasifying-tube, causes the oil raised by the wick to be vaporized quickly and in comparatively larger volume in the mixing-chamber 81 where it mixes with air in suitable proportions to produce a highly combustible fluid. This fluid escapes through the burner openings 31 and initially through the mantle to fill the chimney. A match applied at the top of the chimney sets fire to

the mixture, the flame descending quickly to the burner openings from which it plays against the mantle to render the same incandescent.

The time it takes to preliminarily heat the gasifying tube and burner head to the proper temperature, preparatory for suitably vaporizing the oil fed by the wick, depends largely upon the construction of the tube and head, the thickness and heat conducting properties of the metal employed in their construction, and the size of the preliminary flame. The perforations in the burner shell, both as to number and size, are in each instance provided to admit the proper amount of air necessary to produce the desired draft currents when the burner is in operation; and as it may be desirable to admit an increased volume of air to support combustion at the wick, during preliminary heating, and thereby produce a larger smokeless flame which will accelerate the heating of the tube and head, I show a means for this purpose in the form of, say, three pins 82 equidistant from each other, on the ring portion 20, on which lower scalloped edges of the skirt 39 may rest to raise the upper perforations of the skirt slightly above the top of the ring 20. This will permit a comparatively large volume of air to enter around the outer wick-tube 26. When the wick is extinguished the part C may be turned slightly to cause indentations in its skirt portion 39 to receive the pins, and thus cause the part C to descend to the position shown, wherein the flange 33 seats firmly upon the flange 19.

During operation combustion, at the burner openings 31, heats the burner head 30 and, by conduction and radiation, the latter heats the gasifying tube D. The heat conducted down the tube D vaporizes the oil raised by capillary attraction into the upper end-portion of the wick, the volume of vapor produced depending upon the temperature of the tube and extent of surface contact therewith of the inner annular face of the wick, which extent of surface contact is regulated by raising and lowering the wick. Air entering the perforations in the wall 10 passes through the tubes 12, 13 to the inner wick-tube, thus forming the center-draft which is spread by the plug E and deflected outward through the perforations in the tube D over the top of the wick into the mixing chamber, also carrying into the chamber the vapor from the wick entering its path. Air entering the perforations in the wall 18 passes upward through the perforated disk 28, where the current is divided, part passing up between the inner surface of the burner head and the wick to the mixing chamber, and part passing through the perforations in the flange 33 and thence through the chamber formed by the hood 34 into the mantle X. Air entering through the perforations in the ring 36 passes directly upward into the chimney around the hood.

In the construction of the burner head its perforations are provided of a suitable size to prevent the flame flashing back to the wick and at the same time in number sufficient to give the best heating results. The gasifying tube is of a thickness and character of metal which when suitably perforated, to admit of the passage of a center-draft of desired volume, still conducts heat, in spite of the cooling effect of the air currents, with sufficient rapidity to vaporize the oil at the wick in a manner to produce with the air the desired volume of burning mixture.

The burner as constructed is devised to cause the air to pass, in suitable volume and direction under a created draft governing the mobility of the air currents, into intimate contact with the created oil vapor and produce a mixture insuring substantially complete combustion which will render a mantle of good quality highly incandescent.

In the movement of the wick along the gasifying tube the plug moves in harmony therewith as stated, so that the proper balance between center and outer drafts is not disturbed by raising and lowering of the wick. Whenever for any reason this balance is disturbed, it may be adjusted by raising or lowering the plug E, independently of and with relation to the wick, in the manner before explained.

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

1. In a central-draft hydro-carbon burner of the character described, the combination with the air and gas mixing-chamber having a perforated external wall forming the heat-generating portion of the burner, a central, perforated gasifying-tube, annular concentric wick-tubes terminating in the lower part of said chamber and forming between them an annular wick-space, a round wick in said wick-space and wick-lift mechanism for sliding the wick longitudinally of the gasifying-tube, of a vertically-sliding plug in the gasifying-tube adjustable to regulate the central draft to the mixing-chamber in the different positions of the wick, substantially as and for the purpose set forth.

2. In a central-draft hydro-carbon burner of the character described, the combination with the air and gas mixing chamber having a perforated external wall forming the heat-generating portion of the burner and a central, perforated gasifying-tube, annular concentric wick-tubes terminating in the lower part of said chamber and forming between them an annular wick-space, a round wick in said wick-space, and wick-lift mechanism for sliding the wick longitudinally of the gasifying-tube, of a vertically-sliding downwardly-tapering plug in the gasifying-tube adjustable to regulate the central draft to the mix-

ing-chamber in the different positions of the wick and operate as a flame spreader when the wick is ignited, substantially as and for the purpose set forth.

3. In a central-draft hydro-carbon burner of the character described the combination with the air and gas mixing chamber having a perforated external wall forming the heat-generating portion of the burner, a central, perforated gasifuing-tube, annular concentric wick-tubes terminating in the lower part of said chamber and forming between them an annular wick-space, a round wick in said wick-space, and wick-lift mechanism for sliding the wick longitudinally of the gasifying-tube, of a vertically sliding plug in the gasifying-tube actuated by the wick-lift mechanism and movable thereby along the perforated gasifying tube to regulate the central draft to the mixing-chamber, substantially as and for the purpose set forth.

4. In a central draft hydro-carbon burner of the character described the combination with the air and gas mixing chamber having a perforated external wall forming the heat generating portion of the burner, a central gasifying-tube, annular concentric wick-tubes terminating in the lower part of said chamber and forming between them an annular wick-space, a round wick in said wick-space and wick-lift mechanism for sliding the wick longitudinally of the gasifying-tube, of a vertically sliding plug in the gasifying-tube adjustable to regulate the central draft to the mixing-chamber and a guide-rod in the gasifying-tube on which the said plug slides, substantially as and for the purpose set forth.

5. In a central-draft hydro-carbon burner of the character described, the combination with the air and gas mixing chamber having a perforated external wall forming the heat-generating portion of the burner and a central perforated tube, annular concentric wick-tubes terminating in the lower part of said chamber and forming between them an annular wick-space, a round wick in said wick-space and wick-lift mechanism for sliding the wick longitudinally of the gasifying-tube, of a vertically sliding plug in the gasifying-tube with which the wick is relatively adjustable and which is actuated by the wick-lift mechanism to regulate the central draft to the mixing-chamber, substantially as and for the purpose set forth.

6. In a central-draft, wick-fed, hydro-carbon burner, the combination with the concentric wick-tubes of a wick-lift frame with means for sliding it in the inner wick-tube, normally extended wick-engagers on the said frame and means for releasing the wick-engagers from the wick comprising a rock-shaft extending to the outer side of the burner-casing operatively connected with said engagers.

7. In a central-draft, wick-fed, hydro-carbon burner, the combination with the concentric wick-tubes, of a wick-lift frame with means for sliding it in the inner wick-tube, prong-carrying arms pivotally connected with the frame, a spring operating to press the said arms normally into extended, wick engaging, position, and means for retracting said arms to release the wick, comprising a rock-shaft extending to the outer side of the burner casing and an arm-engaging yoke on said shaft.

ELLSWORTH E. FLORA.

In presence of—
W. B. DAVIES,
L. HEISLAR.