

No. 760,703.

PATENTED MAY 24, 1904.

A. C. RUSH.  
HYDROCARBON BURNER.  
APPLICATION FILED APR. 27, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

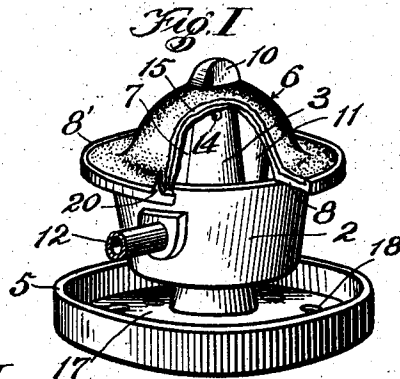


Fig. II

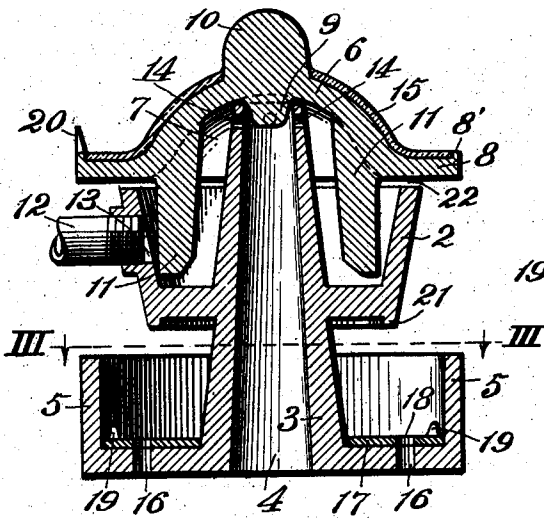


Fig. III

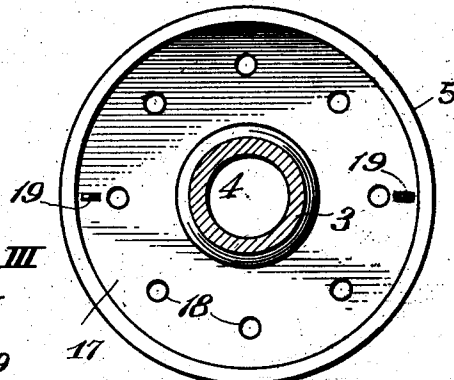
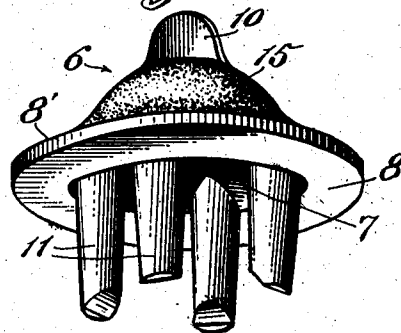
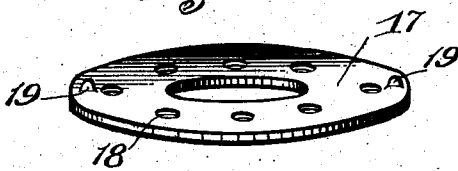


Fig. IV



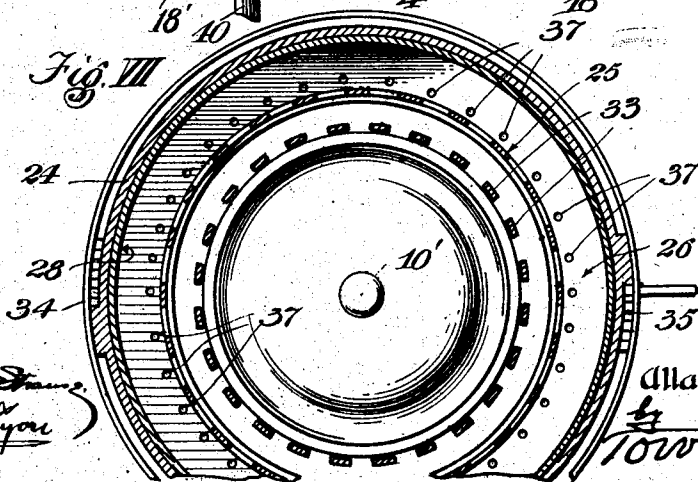
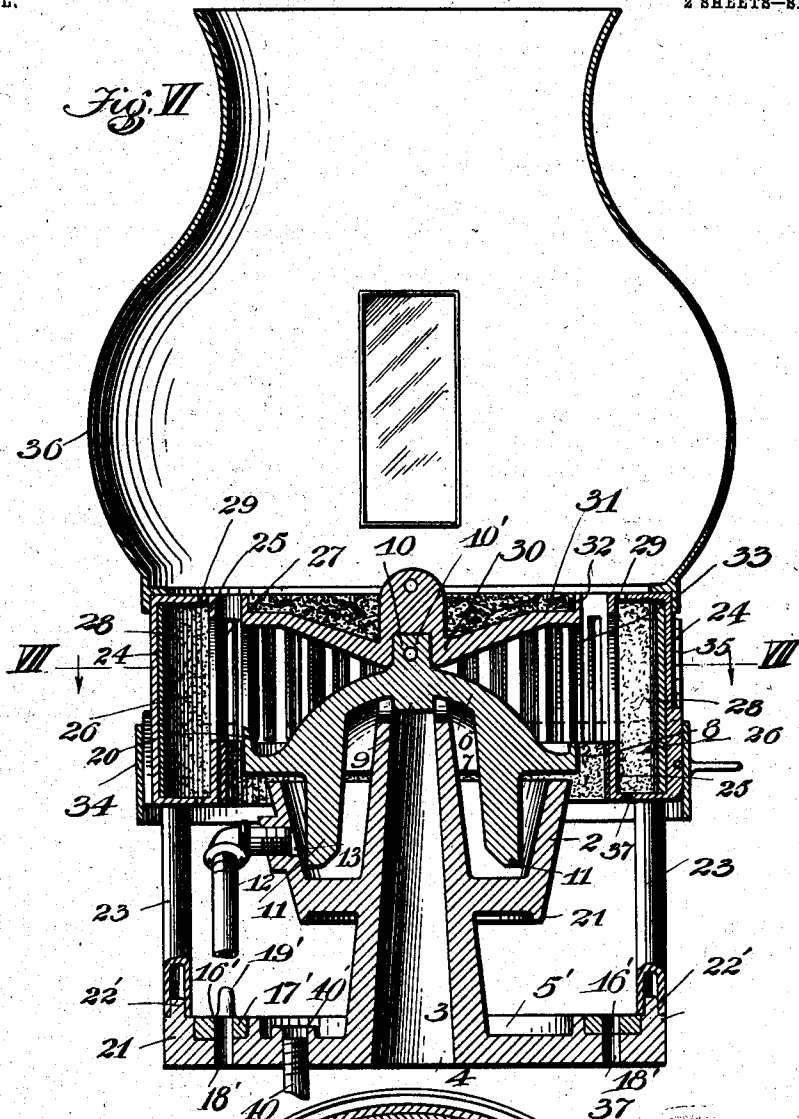
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NO MODEL.

2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

ALLAN C. RUSH, OF LOS ANGELES, CALIFORNIA.

## HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 760,703, dated May 24, 1904.

Application filed April 27, 1903. Serial No. 154,420. (No model.)

*To all-whom it may concern:*

Be it known that I, ALLAN C. RUSH, a citizen of the United States of America, residing in the city of Los Angeles, in the county of Los Angeles, State of California, have invented certain Improvements in Hydrocarbon-Burners, of which the following is a specification.

This invention relates to hydrocarbon-burners, and particularly to a burner adapted to volatilize crude or low-grade petroleum-oil and admix air to the volatilized oil as it is burned.

The general object of the invention is to provide a burner of this class which will be adapted to burn low-grade oil with high efficiency and without noise and to provide for great variation of flame, so that with the same burner a great range of heat may be secured, the burner being capable of being turned down very low and then at pleasure increased to full capacity or to any intermediate heat desired.

A further object is to provide a burner which may be readily cleaned and which shall be of simple, cheap, and durable construction.

A further object is to provide a burner which shall be noiseless, obviating a great objection to the majority of burners of this class heretofore constructed.

A further object is to provide means at the top of the burner for retaining the heat in that part of the burner for the purpose of volatilization, such means consisting in an outer layer or cap of asbestos placed over the outer surface of the cap of the burner.

A further object is to provide a burner of a construction which shall provide a smokeless noiseless blue-flame burner adapted for use in any stove or to be placed upon a table and operated in a room without the use of a stovepipe or a flue or may be used as a lamp for lighting purposes by the addition of a globe or large lamp-chimney, or if desired to use for heating a room a heating-drum may be placed over the flame.

A further object is to provide means for regulating the draft of air through and around the flame.

A further object is to provide suitable means for insuring the entire consumption of all smoke.

Other objects and ends in view will hereinafter appear from the detail description of construction and operation.

The invention consists in general in a hydrocarbon-burner comprising an open cup, means for supplying oil to the cup, a cover arranged over the cup and having a cavity in its under side and a laterally-extending flange which extends beyond the cavity of the cup, said cover suspended above said cup and having downwardly-projecting legs or ribs adapted to project into the oil in said cup, but terminating above the bottom thereof, whereby the said legs or ribs extend into the oil and heat the same, but do not touch any portion of said cup, and means for directing air into the cavity, a passage being provided between the cover and the rim of the cup for the escape of air and vapor.

The invention consists, further, in the provision, in connection with the vaporizer, of means for consuming all smoke and effectuating a complete combustion of the burning vapor, in novel means for regulating the draft of air through and around the flame, and in the provision of such smoke-consuming apparatus in form to conveniently and readily receive a lamp-chimney for lighting purposes or a heating-drum for heating purposes.

The invention consists, further, in the constructions and in general and subcombinations of parts, all as hereinafter described, and particularly pointed out in the claims, and will be more readily understood by reference to the accompanying drawings, forming a part of this specification, in which—

Figure I is a perspective view of a hydrocarbon-burner embodying my invention. Fig. II is a longitudinal section view thereof. Fig. III is a plan view thereof on the line III-III of Fig. II. Fig. IV is a view of the damper or air-regulator detached. Fig. V is a perspective view of the cap or cover detached. Fig. VI is a view of one of my burners equipped with smoke-consuming apparatus and a heating-drum, the burner proper and the heating apparatus being shown in longitudinal section. Fig. VII is a sectional plan view on the line VII-VII of Fig. VI.

As shown in the drawings, 2 designates a

cup or bowl with an open top. Preferably formed integral therewith is a central pipe 3, providing a duct 4, leading up through the cup, and preferably cast integral with the lower end of this pipe is a second cup or bowl 5, preferably of a greater diameter than that of the cup or bowl 2.

6 indicates a cover or cup above the cup or bowl 2, preferably having a concavity 7 in its under side and with an outwardly-flaring flange 8 extending laterally beyond the rim of the cup 2. This cap or cover 6 is provided with a lug or projection 9 at the center of its under side adapted to fit into the upper end of the duct 4, by which means the cap 6 is suspended in place over the cup 2. The cap or cover 6 is provided with a rib or projection 10 at its apex, such projection having a direction crosswise of the cap for the purpose of indicating the position of the cap or cover over the cup 2, as hereinafter more fully set forth. In the under side of the cap or cover 6 I provide a series of downwardly-projecting legs 11, preferably four in number and equidistantly spaced. These legs project down into the oil in the cup 2 and toward the bottom thereof, but do not touch the bottom. I have found that by thus arranging the legs so that they do not touch any of the metal of the cup the heat of the cover or cap 6 is communicated to the legs 11 and by them communicated to the oil in the cup 2, aiding in the heating thereof, and that by preventing their coming in contact with any portion of the cup all possibility of their being cooled by any portion of the cup is avoided. I have also found that by thus suspending these downwardly-projecting legs in the oil, but away from contact with the cup, all noise is eliminated from the use of the burner.

The cup 2 is provided with an inlet 13, into which the oil-supply pipe 12 is screwed, as shown.

In the upper end of the pipe 3 I provide a series of radial ports 14, opening from the duct 4 into the chamber formed between the concavity of the cover and the cup or bowl 2.

I provide the lower cup 5 with a series of air-inlets 16 and provide within the cup 5, in connection with said inlets 16, a slidable damper 17 provided with perforations 18, by sliding which damper the inlet 16 and perforations 18 may be caused to register to admit air or may be wholly or partially closed against the admission of air in the cup 5 from the bottom, as desirable.

19 represents means by which the damper 17 may be moved.

20 indicates a lug or indicator upon the outer flange 8' of the cap 6. As shown, this indicator is in line with one of the legs 11 and indicates the position such leg will occupy with respect to the inlet 13. By so positioning the cup that the leg 11 comes directly in front of the inlet the oil is deflected around the cup

and not permitted to come into contact with the pipe 3 until partially volatilized.

In Fig. VI the vertical wall 5' of the lower cup is not extended upward as high as in Figs. I and II, and beyond the vertical wall 5' is a flange 21, an annular way being formed between the inner surface of the flange 21 and the outer surface of the wall 5', and in this way is mounted a slidable damper 17', corresponding with the damper 17 of Figs. I to IV, and provided with perforations 16', adapted to be registered with perforations 18' communicating from said way down below said lower cup or pan. The rim of the flange 21 is provided with a series of projections or legs 22', of which there may be any desired number and upon which the hollow uprights or supports 23 are seated. The smoke-consuming apparatus is supported on these columns 23. This means consists of an outer wall 24 and an inner wall 25, suitably connected and forming between them the smoke-consuming chamber 26. The inner wall 25 is provided with a series of openings 27, leading into the chamber. Upon the inner surface of the outer wall 24 I provide a suitable lining 28 of asbestos. The chamber 26 is provided at its top with a series of comparatively small outlets or openings 29. This indicates an upper cap which is seated upon the cap 6, being preferably provided with a socket, into which the projection or nub 10' of the cap 6 is inserted. I prefer to provide upon the upper portion of the cap 30 a suitable coating of material, preferably asbestos and fire-clay mixed to a paste and forming a suitable covering adapted to accelerate the reflection of heat outward onto the cap or cover 6. As shown in Fig. VI, the upper cap 30 has a convex bottom, the curvature continuing until the edge of the convex portion is substantially in line with the outer edge or rim of the cup 2, from which point the bottom of the cap 30 extends out horizontally toward the wall 25 of the smoke-consuming chamber. However, this horizontal portion 31 terminates a distance from the said wall 25, such distance being substantially equal or a trifle less than the width of the chamber 26. The horizontal portion 31 at its outer edge is provided with an upwardly-extending flange 32, forming a rim for holding the coating 27 in place. The horizontal portion 31 is also provided at its edge with a series of downwardly-projecting bars 33, which, in effect, form a grate for the purpose hereinafter set forth. 34 represents a draft-regulator, preferably in the form of an annular band of sufficient width to provide the proper regulation of the draft to the burning vapor within the chamber formed between the rim of the cup 2 and between the caps 6 and 30. In practical use this regulator is made of much greater width in proportion to the height of the burner than is shown in the drawings, so that when in the lower position, as shown in Fig. VI, a large proportion of the open air-inlet between the

bottom of the smoke-consuming chamber and the lower pan or cup is closed. The inlet of air to the sides of the burner may be regulated by change of position of this regulator 34. This  
 5 may be effectuated by providing a series of steps 35 upon the periphery of the wall 24 and providing the regulator with projections adapted to be seated on any desired step, thereby supporting the regulator at any de-  
 10 sired height. 36 represents a suitable heater, or, if desired, a lamp-chimney may be used in place thereof. The chamber 26 is preferably provided with a series of air-inlets 37, adapted to draw air into the smoke-consuming  
 15 chamber.

In practical use the burner will be supported by a grate (not shown) or any other suitable means, leaving the air-stem 3 open at the bot-  
 20 tom for the free ingress of air therethrough. The detached cover 6 will be placed in position, as shown in Figs. I and II, and oil will be turned on through the pipe 12 and may be allowed to fill the cup and in a measure flow over the rim thereof and drip from the bead 21 to the  
 25 lower pan or cup 5, thus diffusing the oil with the atmospheric air, and the same will then be ignited, thereupon heating the extending flange 8' of the cover and also in a measure heating the upper cup. The cover 6 acts as  
 30 reflector and reflects the heat down upon the surface of the oil contained in the upper cup 2. The oil in the cup 2 reaches the boiling-point, and vapor rises from the heating and distilling oil, enters the cavity 7 of the cover or  
 35 reflector 6, where it becomes more highly heated, and then escapes downward and outward through the annular discharge 22 from between the rim of the cup 2 and the under side of the flange 8. Cold air rushes into the  
 40 cavity through the pipe or hollow stem 3 and becomes heated, forcing the vapor and hot air back down toward the surface of the oil in the cup 2. The concave form of the cavity shown facilitates this action. The vapors  
 45 which arise from the surface of the oil are thus mixed with hot air, and the vapor is thus forced down and the commingled product passes out through the open passage or discharge-slot 22, further heating the reflector  
 50 as it burns. The depending legs 11 apparently arrest for a time the downward flow of vapor and hot air, and there results a commotion of these elements and a thorough mixing of the same, and when said elements are  
 55 forced out by the draft of cold air from the pipe 3 and become ignited at the rim of the flange 8 there results a good flame without noise from the explosion of gases or otherwise. The dome-shaped cover or heat-  
 60 reflector 6 becomes highly heated and concentrates the inwardly-reflected rays of heat upon the vapors contained in the cavity and also reflects the heat down upon the surface of the oil in the cup. The covering 15, of as-  
 65 bestos and fire-clay or other confining mate-

rial, serves to prevent the radiation of heat outwardly from the reflector or cover 6, causing an increased reflection of the heat downward.

In practical operation as soon as the flame  
 70 is well started the operator will regulate the oil-supply, so that the oil will not flow over the rim of the upper cup, and as soon as the oil in the lower cup is consumed the flame is then supplied wholly from the vapors which  
 75 rise from the surface of the oil in the upper cup and said oil is heated only from above, so that there is no danger of boiling over, and as the supply of oil is decreased to lessen the fire the surface of the oil in the cup low-  
 80 ers to a greater distance from the cover and less heat is applied to the oil and the flame becomes reduced in correspondence with the amount of oil supplied.

To clean the burner, the cover may be read-  
 85 ily lifted off, thus giving access to the under side of the same and to the interior of the cup.

As the air-pipe 3 extends above the rim of the cup and opens into the concavity, the air  
 90 is thus inducted up into the body of vapors in the dome and must flow down again in order to pass out from above the cup. The ports 14 are preferably so positioned in the air-pipe 3 with respect to the inlet 13 that  
 95 when a leg 11 is brought opposite said inlet 13 the respective legs 11 are opposite the ports 14. The air entering through the ports 14 comes in contact with the legs 11, creating a greater commotion in the refractory heat-  
 100 ing-chamber formed between the cover 6 and the cup 2.

If desired, the ports 14, instead of being in the form of perforations through the pipe 3, may be in the form of vertical slots extend-  
 105 ing from the top of the pipe down any desired distance.

In Fig. VI, 40 represents an overflow-pipe, which I prefer to provide in connection with the lower cup or pan and by means of which  
 110 any overflow of oil may be carried off to a suitable receptacle. As shown, this pipe communicates into the chamber of the lower cup through a boss 40', which extends somewhat  
 115 above the bottom of the pan, permitting sufficient oil to accumulate in the pan for the purpose of generating. In case by accident too  
 120 much oil is permitted to flow into the cup 2 and drop into the lower cup or pan it is by this pipe 40 carried to a suitable receiving-tank provided in connection therewith.

In Figs. I and II I have shown the cap or  
 125 cover 6 provided with a coating 15, consisting, preferably, of asbestos and fire-clay mixed to a paste and forming a casing or jacket on the outside of the cap or cover, and have shown  
 130 the cap or cover 6 provided with a flange 8', adapted to retain this casing or jacket in place. This casing or jacket serves as a protection to the cap or cover, preventing rapid deterioration. It is obvious, if desired, the

burner may be used without this casing or jacket 15.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

5 1. A hydrocarbon-burner comprising an open cup, means for supplying oil to the cup, a cover arranged over the cup and having a cavity in its under side and a laterally-extending flange, which extends beyond the cavity  
10 of the cup, means for directing oil into said cavity, a passage being provided between the cover and the rim of the cup for the escape of air and vapor, and means over the outer surface of said cover for preserving said cover  
15 against the deteriorating action of the flame from the burner.

2. A hydrocarbon-burner comprising a cup, means for supplying oil to the cup, a cover arranged over the cup and having a cavity in  
20 its under side and a laterally-extending flange, which extends beyond the cavity of the cup, and an air-pipe extending up through the bottom of said cup above the bottom thereof and upon the upper end of which said cup is  
25 mounted, said pipe being provided with ports adapted to direct air into said cavity toward the top thereof, an open space being provided between the cover and the rim of the cup for the escape of the mingled air and vapor.

30 3. A hydrocarbon-burner comprising a cup, means for supplying oil to the cup, an air-pipe extending above the rim of the cup, a cover arranged over the cup and having a cavity in its under side and a flange extending out laterally beyond the cavity of the cup, said cover  
35 being mounted upon the upper end of said air-pipe, ports opening from said air-pipe into the cavity of said cover and an open space being provided between the cover and  
40 the rim of the cup for the escape of the mingled air and vapor.

4. A hydrocarbon-burner comprising a cup, means of supplying oil to the cup, a cover arranged over the cup and having a concavity  
45 in its under side and a laterally-extending flange, which extends beyond the cavity of the cup, means for directing air up into said cavity, an open space being provided between the cover and the rim of the cup and means  
50 above the outer surface of said cover preserving said cover against deterioration by the flame from the burner.

5. A hydrocarbon-burner comprising a cup, means for supplying oil to the cup, a cover arranged over and extending beyond the cavity  
55 of said cup and furnished with legs or projections, which extend down into the cavity of the cup, but free from contact with the walls or bottom thereof, and an air-pipe opening  
60 into said cavity between said legs, an open space being provided between the cover and the cup for the escape of air and vapor.

6. A hydrocarbon-burner comprising a cup, means for supplying oil to the cup, a cover arranged over and extending beyond the cavity

of said cup and furnished with depending legs extending down into the cavity of the cup free from contact with any portion of said cup, and an air-pipe opening into the cavity between said legs, said cover mounted upon  
70 the end of said air-pipe, an open space being provided between the cover and the cup for the escape of air and vapor.

7. A hydrocarbon-burner comprising a member, consisting in a hollow stem, an oil-cup surrounding said hollow stem, a drip-cup surrounding said hollow stem and arranged below said first-named cup, a cover over said first-named cup, said cover mounted upon the upper end of said hollow stem and means for supplying oil to said first-named cup, a space being provided between said cup and the cover for the escape of mingled air and vapor.

8. A hydrocarbon-burner comprising a member, consisting in a hollow stem, an oil-cup surrounding said hollow stem, a drip-cup surrounding said hollow stem and arranged below said first-named cup, a cover over said first-named cup, said cover provided with downwardly-extending legs projecting into  
90 the cavity of said oil-cup free from contact with any portion of said oil-cup and means for supplying oil to said first-named cup, a space being provided between said cup and the cover for the escape of mingled air and vapor.

9. A hydrocarbon-burner comprising a member consisting in a hollow stem, an oil-cup surrounding said hollow stem, a drip-cup surrounding said hollow stem and arranged below said first-named cup and provided with openings, damper means in connection with said openings, a cover over said first-named cup, said cover provided with downwardly-projecting legs extending into the cavity of said oil-cup free from contact with any portion of said cup, and means for supplying oil to said first-named cup, a space being provided between said cup and the cover for the escape of mingled air and vapor.

10. A hydrocarbon-burner comprising a hollow stem, an oil-cup surrounding said stem and terminating in a rim below the top thereof, a drip-cup below said oil-cup, means for supplying oil to said first-named cup, and a cover mounted upon the upper end of said hollow stem and furnished with a cavity into which said hollow stem communicates, said cover covering the cavity of said first-named cup, an open space being provided between the cover and the rim of the upper cup.

11. A hydrocarbon-burner comprising a hollow stem, an oil-cup surrounding said stem and terminating in a rim below the top thereof, a drip-cup below said oil-cup, means for supplying oil to said oil-cup, and a cover mounted upon the upper end of said hollow stem and furnished with a cavity into which said hollow stem communicates, said cover covering the cavity of said oil-cup and provided with downwardly-projecting legs ex-  
130

tending into the cavity of said oil-cup free from contact with any portion thereof, an open space being provided between the cover and the rim of the upper cup.

5 12. A hydrocarbon-burner comprising a hollow stem, a cup surrounding said stem and terminating below the upper end thereof and furnished at the bottom with a downwardly-projecting bead, a cup below said first-named  
10 cup, means for supplying oil to the upper cup and a cover which covers the cavity of the upper cup, said cover mounted upon the upper end of said hollow stem and provided with a cavity into which said hollow stem commu-  
15 nicates, an open space being provided between said cover and the rim of the cup for the escape of mingled air and vapor.

13. A hydrocarbon-burner comprising a cup having a downwardly-tapering chamber and  
20 an upwardly-tapering open-ended pipe, which opens laterally toward the top, means for supplying oil to the cup, and a cover mounted upon the upper end of said pipe and forming a refractory oil-heater above the cup, arranged  
25 with a space between it and the rim of the cup for the escape of air and vapor.

14. A hydrocarbon-burner comprising a cup having a downwardly-tapering chamber and an upwardly-tapering open-ended pipe, which  
30 opens upwardly at the top, means for supplying oil to the cup, and a cover mounted upon the upper end of said pipe and provided with a cavity into which said pipe communicates, said cover provided with downwardly-project-  
35 ing legs extending into the cavity of said cup free from contact with any portion thereof, said cover forming a refractory oil-heater above the cup arranged with a space between it and the rim of the cup for the escape of air  
40 and gas.

15. In a hydrocarbon-burner a hollow stem, an oil-cup surrounding said stem and terminating below the top thereof, means for supplying oil to said cup, a cover mounted upon  
45 the upper end of said hollow stem and having a cavity into which said stem communicates, said cover provided with downwardly-projecting legs extending into the cavity of said cup free from contact with any portion thereof,  
50 and an indicator upon said cup whereby the position of said legs with respect to said oil-supplying means is indicated.

16. A hydrocarbon-burner comprising an open cup, means for supplying oil to said cup, a cover arranged over said cup and having a  
55 cavity in its under side and a laterally-extending flange which extends beyond the cavity of the cup, means for directing air into said cavity, a passage being provided between the cover and the rim of the cup for the escape of air and vapor, and a smoke-consumer  
60 surrounding said cup and operatively positioned with respect to said passage.

17. A hydrocarbon-burner, comprising a  
65 cup, means for supplying oil to the cup, a

cover arranged over the cup and having a cavity in its under side and a laterally-extending flange which extends beyond the cavity of the cup, means for directing air up into said cavity, an open space being provided between  
70 the cover and the rim of the cup, an upper cover above said first cover, providing a chamber therebetween, and a smoke-consuming chamber about said cup and covers, into which the burning vapor is directed, an open space  
75 being provided between the peripheries of said cups and covers and the inner wall of said chamber.

18. A hydrocarbon-burner having a cup, means for supplying oil to the cup, a cover-forming dome-shaped refractory oil-heater arranged above said cup with an open space  
80 between it and the rim of the cup, a hollow pipe extending up through the cup and terminating in the dome, to discharge air into the cavity of the dome, and a smoke-consumer adapted to receive and consume the smoke from the burning vapor.

19. A hydrocarbon-burner comprising a member consisting in a hollow stem, an oil-  
90 cup surrounding said hollow stem, a drip-cup surrounding said hollow stem and arranged below said first-named cup, a cover over said first-named cup, means for supplying oil to said first-named cup, a space being provided  
95 between said cup and cover for the escape of mingled air and vapor, and a smoke-consuming chamber adapted to receive the smoke from the burning air and vapor from said escape-space and adapted to insure the combustion  
100 thereof.

20. A hydrocarbon-burner comprising a member consisting in a hollow stem, an oil-  
105 cup surrounding said hollow stem, a drip-cup surrounding said hollow stem and arranged below said first-named cup, a cover over said first-named cup, means for supplying oil to said first-named cup, a space being provided between said cup and cover for the escape of  
110 mingled air and vapor, a cap above said cover and forming a chamber therebetween, and a smoke-consuming chamber adapted to receive the smoke from the burning air and vapor from said escape-space and adapted to insure the combustion thereof.  
115

21. A hydrocarbon-burner comprising a cup having a downwardly-tapering chamber and an upwardly-tapering pipe which commu-  
120 nicates upwardly from its upper portion, means for supplying oil to the cup, a cover forming a refractory oil-heater above the cup, arranged with a space between it and the rim of the cup, and a smoke-consuming chamber surrounding said cup and into which the burning vapor is directed.  
125

22. In a hydrocarbon-burner, comprising a cup having a downwardly-tapering chamber and an upwardly-tapering pipe which commu-  
130 nicates outwardly toward its upper end, means for supplying oil to the cup, a cover forming

a refractory oil-heater above the cup with a space between said cover and the rim of said cup, said cover mounted upon said pipe, and a smoke-consuming chamber arranged opposite the open space between said cover and cup whereinto the burning vapor is directed.

23. A hydrocarbon - burner comprising a cup, means for supplying oil to the cup, a cover forming a refractory oil-heater above the cup and arranged with a space between it and the rim of said cup, means for supplying air to said refractory heater, a second cover arranged above said first-named cover and forming a chamber therebetween, and a smoke-consuming chamber arranged opposite said discharge-space and opposite said chamber between said covers, into which smoke-consuming chamber the burning vapor is directed.

24. A liquid-fuel burner comprising two cups one of which is inverted above the other and having their outer rims oppositely disposed and separated to form a vapor-outlet therebetween, the upper cup provided with a series of lugs or legs projecting from the upper cup into the cavity of the lower cup but free from contact with any portion thereof, an oil-supply pipe connected to and opening into said lower cup, an air-supply pipe commencing below said lower cup, extending centrally therethrough and communicating into the retort formed between said cups.

25. A liquid-fuel burner comprising two cups one of which is inverted above the other and having their outer rims oppositely disposed and separated to form a vapor-outlet therebetween, the rim of the upper cup being provided with a laterally-extending flange, extending beyond the rim of the lower cup, said upper cup provided with a series of lugs or legs extending into the cavity of the lower cup but free from contact with any portion thereof, an oil-supply pipe connected to and opening into said lower cup, an air-supply pipe commencing below said lower cup extending centrally therethrough and communicating into the chamber formed between said cups.

26. A liquid-fuel burner comprising a retort-chamber composed of two hollow hemispheres oppositely disposed and having their edges spaced apart to form a vapor-outlet therebetween, a series of lugs or legs extending from the upper hemisphere down into the cavity of the lower hemisphere but free from contact with any portion thereof, an air-supply pipe commencing below the lower cup and extending centrally therethrough and terminating within said upper cup, an oil-supply pipe adapted to supply oil into the lower cup, and a starting-pan surrounding said air-supply pipe below said lower cup.

27. A liquid-fuel burner comprising a retort-chamber composed of two hollow hemispheres oppositely disposed and having their

edges spaced apart to form a vapor-outlet therebetween, the upper hemisphere provided with a lateral flange extending beyond the rim of the lower hemisphere, a series of lugs or legs extending from the upper hemisphere down into the cavity of the lower hemisphere but free from contact with any portion thereof, an air-supply pipe commencing below the lower cup and extending centrally therethrough and terminating with said upper cup, an oil-supply pipe adapted to supply oil into the lower cup, and a starting-pan surrounding said air-supply pipe below said lower cup.

28. A liquid-fuel burner comprising a vaporizing-chamber provided with an annular vapor-outlet, said outlet surrounded by a smoke-consuming chamber formed of a perforated inner wall and an asbestos-lined outer wall, said smoke-consuming chamber provided with air-inlets at its bottom and air-outlets at its top, a deflector arranged above said vaporizing-chamber adapted to deflect the flame from said outlet toward said smoke-consuming-chamber, an annular passage provided between said deflector and the inner wall of said smoke-consuming chamber and means for supplying air and oil respectively to said vaporizing-chamber.

29. A liquid-fuel burner comprising two cups one of which is inverted above the other and having their outer rims oppositely disposed and separated to form a vapor-outlet therebetween, the upper cup provided with lugs or legs projecting down into the cavity of the lower cup but free from contact with any portion thereof, an oil-supply pipe communicating into the lower cup through the side thereof said upper cup being so mounted that its position may be adjusted to adjust the position of said lugs or legs with respect to the oil-inlet, an air-supply pipe communicating into the retort-chamber formed by said cups.

30. A liquid-fuel burner comprising two cups one of which is inverted above the other and having their outer rims oppositely disposed and separated to form a vapor-outlet therebetween; an oil-supply pipe connected to and opening into said lower cup; an air-supply pipe commencing below said lower cup, extending centrally therethrough and terminating above the top of said lower cup, and a smoke-consumer adapted to receive and consume the smoke from the burning vapor.

In testimony whereof I have hereunto set my hand, this 20th day of April, A. D. 1903, at Los Angeles, in the county of Los Angeles, State of California.

ALLAN C. RUSH.

In presence of—  
FREDERICK S. LYON,  
WARREN E. LLOYD.