

No. 774,747.

PATENTED NOV. 15, 1904.

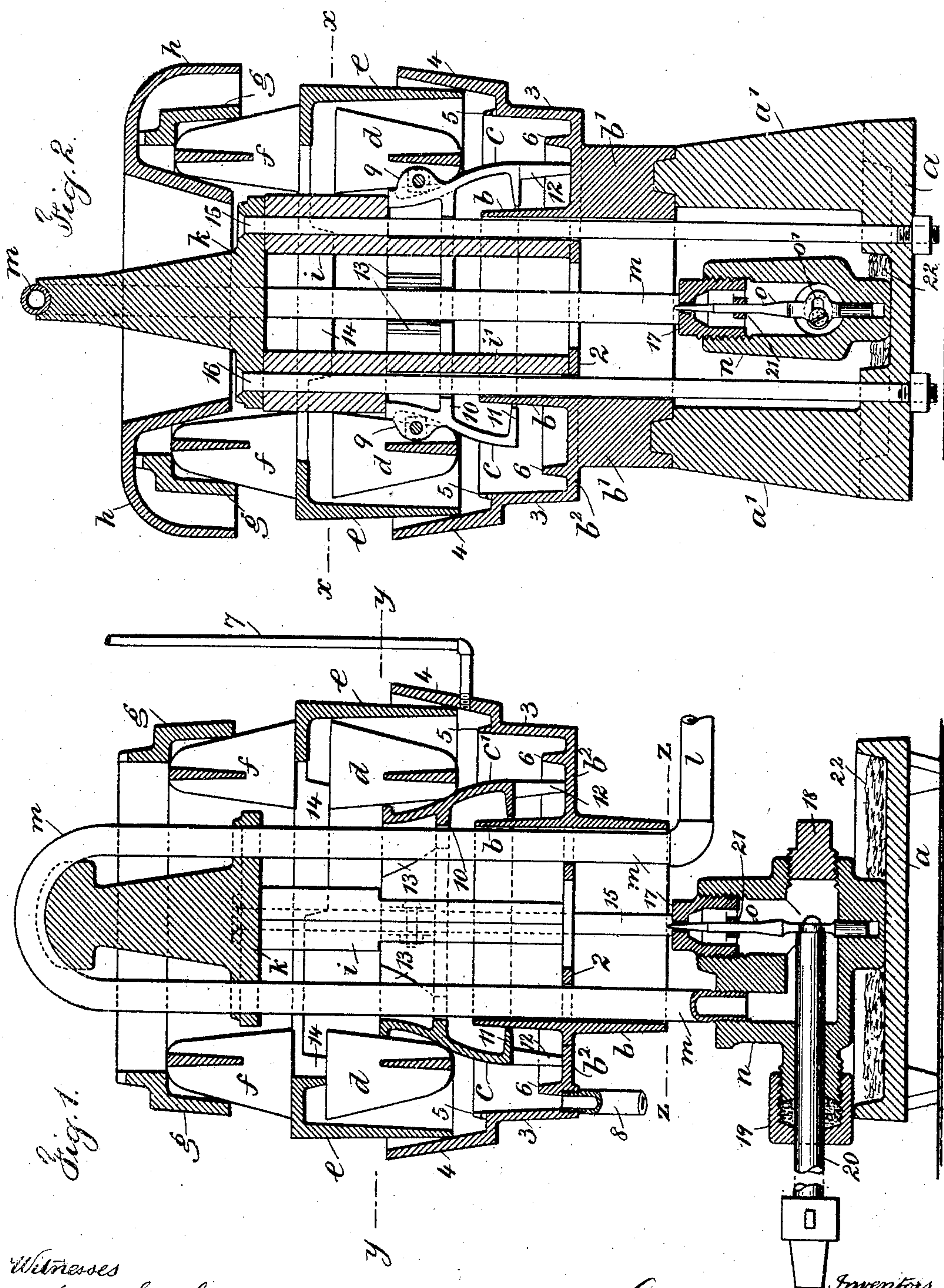
T. B. FERGUSON, JR. & E. R. BRUSH.

PETROLEUM BURNER.

APPLICATION FILED JUNE 24, 1902. RENEWED JUNE 30, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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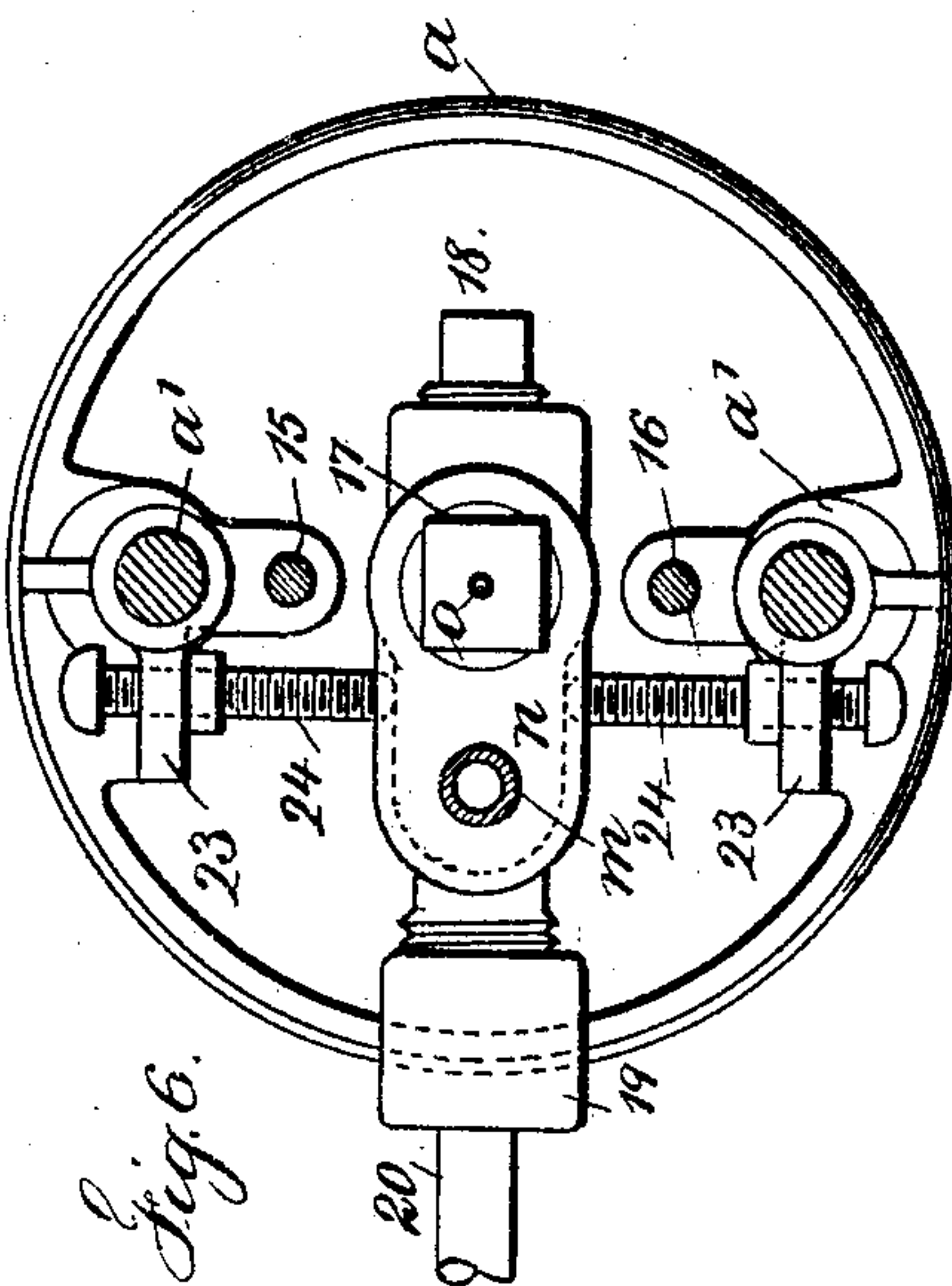
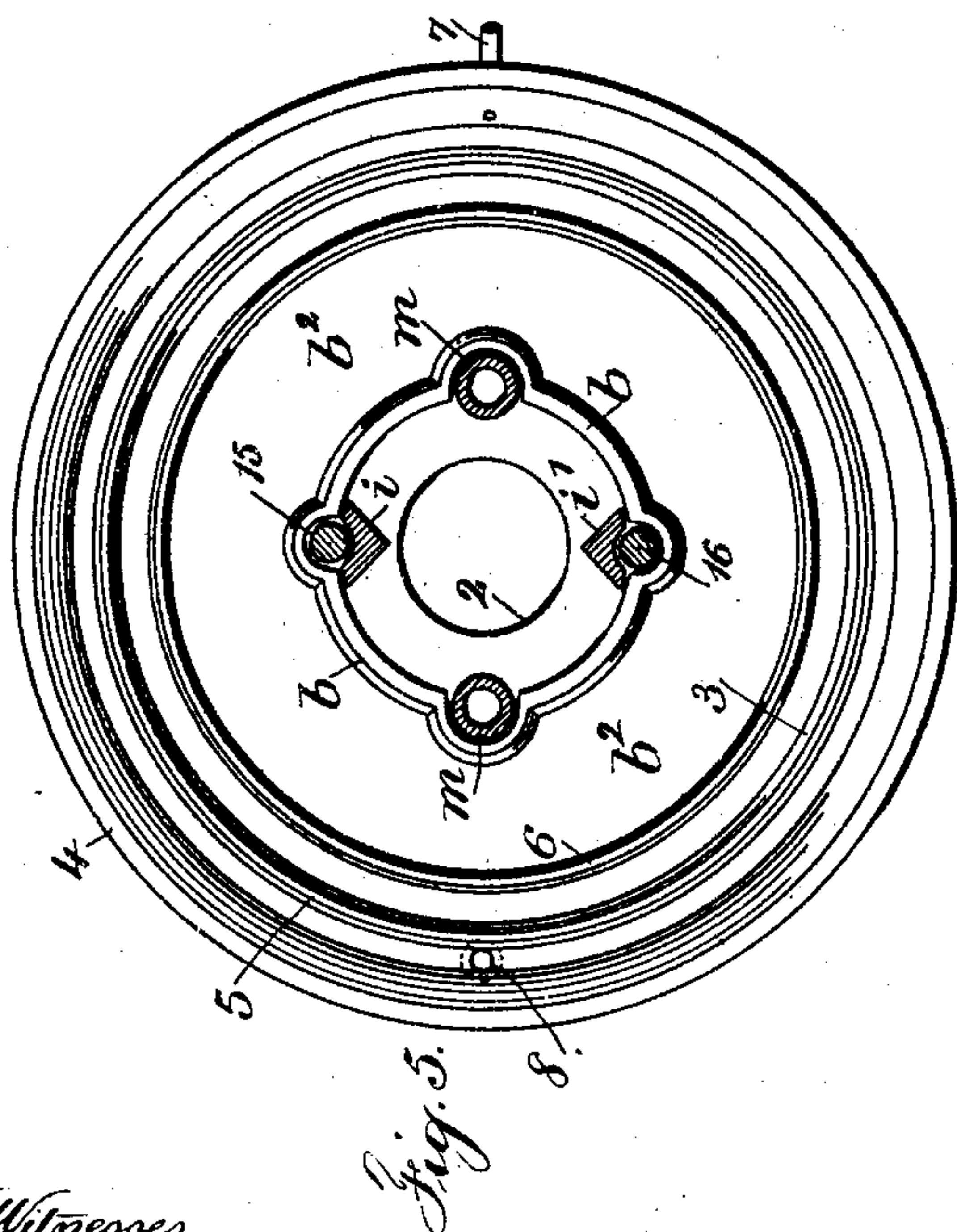
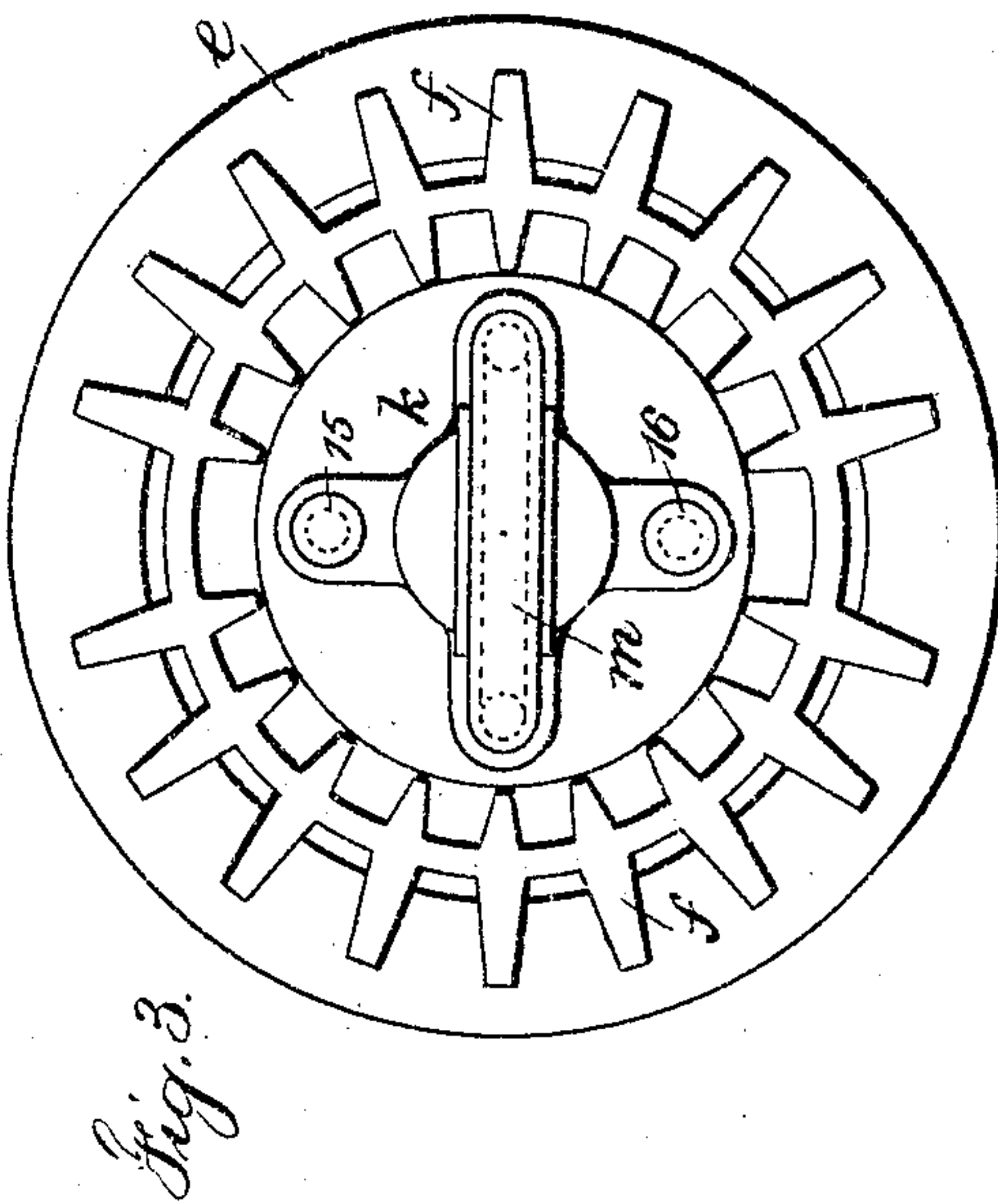
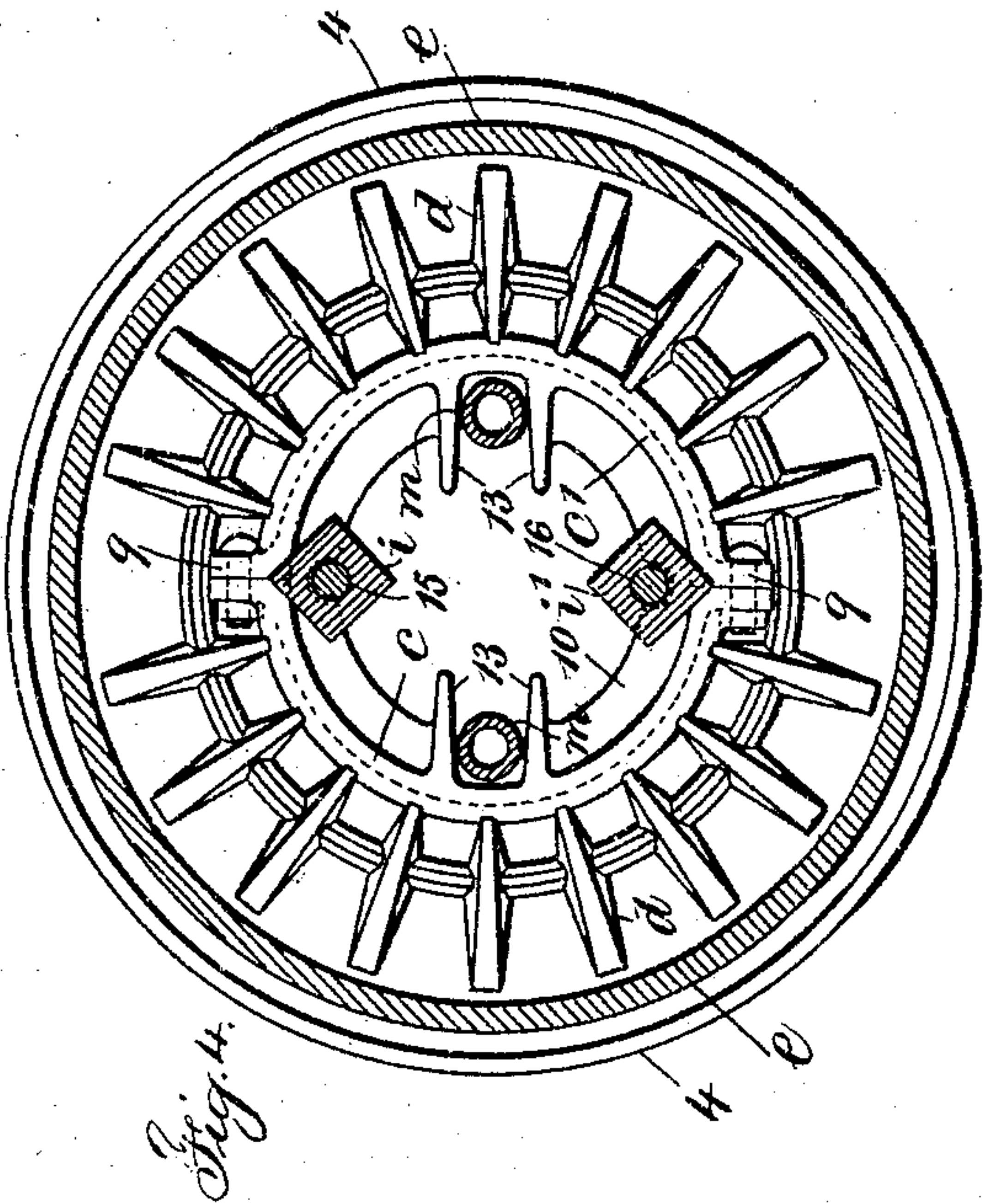
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2 SHEETS—SHEET 2.



Witnesses

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UNITED STATES PATENT OFFICE.

THOMAS B. FERGUSON, JR., OF BROOKLYN, AND EDGAR R. BRUSH, OF
NEW YORK, N. Y.; SAID BRUSH ASSIGNOR TO SAID FERGUSON, JR.

PETROLEUM-BURNER.

SPECIFICATION forming part of Letters Patent No. 774,747, dated November 15, 1904.

Application filed June 24, 1902. Renewed June 30, 1903. Serial No. 163,818. (No model.)

To all whom it may concern:

Be it known that we, THOMAS B. FERGUSON, Jr., residing in the borough of Brooklyn, in the county of Kings, and EDGAR R. BRUSH, residing in the borough of Manhattan, in the county of New York, city and State of New York, both citizens of the United States, have invented an Improvement in Petroleum-Burners, of which the following is a specification.

Our invention relates to an improved petroleum or hydrocarbon burner or heater adapted for use in stoves, furnaces, or ranges, and the same is an improvement upon the device shown and described in the application of said Thomas B. Ferguson, filed May 25, 1901, Serial No. 61,845, and duly allowed March 28, 1902.

The object of our invention is to confine and increase the heating of the hydrocarbon vapor and commingled air and to be able to introduce and commingle therewith water to be vaporized.

In carrying out our invention the hydrocarbon fluid is vaporized by the heat of the apparatus in transit, and said vapor is delivered to be burned by means of a regulatable needle-valve, and the several parts of the apparatus going to make up the burner provide increased spaces and channels or passage-ways for the vapor for the ingress of air and in which the same is momentarily held and raised to a high heat before passing to the part of the apparatus to be burned, and the associated parts and the proportions thereof are so regulated as to produce a great degree of efficiency and consequent heat of the burning vapor.

The device is of comparatively simple construction, it is easily started and kept going, and the supply of vapor and commingled air as well as the supply of water to be vaporized are readily regulated and controlled in their proportionate relations to one another so as to produce the desired result.

In the drawings, Figure 1 represents by a vertical section and partial elevation the simpler form of our invention. Fig. 2 represents by a vertical section and partial elevation the complete or preferred form of our invention. Fig. 3 is a plan of the parts of the burner

with the parts hereinafter called the "upper annulus" and "annulus-cap" removed. Fig. 4 is a sectional plan at the line xx of Fig. 2. Fig. 5 is a plan and partial section substantially below the line yy —that is, with the separable portions removed; and Fig. 6 is a sectional plan below the line zz of Fig. 1.

The metal base a is preferably recessed, is provided with supporting-feet, and at opposite points is constructed with integral standards a' , the upper ends of which are preferably of reduced diameter. An integral casting sits upon these standards a' . This casting is of circular form and comprises a mixing tube-section b at the central portion, an interior flange 2, projecting from the tube-section, lugs b' at opposite points formed as projections of the tube-section and recessed on the under side to sit upon the upper ends of the standards a' . This integral casting is provided with a bottom portion b^2 and with staggered offset flanges 3 4 or edges and internally with rims 5 6, the rim 5 being a substantial prolongation upon the inner surface of the flange 3 and the rim 6 raised from the bottom of the casting. These rims create within the casting annular channels, the one between the flange 4 and the rim 5 and the other between the flange 3 and the rim 6. An inlet water-pipe 7 passes through the flange 4 and an exit water-pipe 8, preferably of slightly larger area, enters the bottom b^2 of the casting in the channel between the flange 3 and the rim 6, and the flange 5 is preferably perforated at one or more places in proximity to the exit water-pipe 8.

We provide a tapering annular body in two parts $c c'$. Each of these parts is an integral casting provided with flanges 9, by which these two parts $c c'$ are secured together by bolts. These parts surround the tube-section b . They are provided with interior horizontal ring flanges 10 11, and the structure is provided with supporting-feet 12, resting upon the bottom b^2 of the previously-described structure. This two-part tapering body $c c'$ is provided with vertical ribs 13 in pairs at opposite points, and the ring flanges 10 are notched for tie-rods hereinafter described.

We employ a grid *d*, composed of bars or plates connected by a ring, the same being an integral casting fitting around and resting upon the outer surface of the tapering annular body *c c'*, and outside of this grid, partially covering the same and resting thereon and also within the flange 4, is an annulus *e*, having short interior flanges 14 at intervals, said flanges bearing upon the upper surface of the grid-bars and the lower edge of its flange bearing upon and within the flange 4. Another grid, *f*, closely resembling the grid *d*, but inverted in position with reference to the grid *d*, sits over and rests upon the annulus *e*, and an annulus *g* of offset cross-section surrounds the upper portion of and rests upon the grid *f*. There is therefore a circular and unbroken edge and surface to the annulus *e* and to the under portion of the annulus *g*, and said parts are preferably separated, and between the same and the bars of the grid *f* there is formed an exit from within the parts hereinbefore described, through which the hydrocarbon vapors and commingled air pass to be burned.

The annulus-cap *h* of concavo-convex form is shown in Fig. 2 in the complete form of our invention, for the reason that it is possible under certain circumstances and conditions to dispense with the annulus-cap *h* and to use only the structure shown in Fig. 1. With the structure shown in Fig. 1 the vaporized carbon and commingled air burn between the annulus *e* and the under edge of the annulus *g*, as well as up through the center of the grid *f* and annulus *g*, while in the structure Fig. 2 there is no flame at the central portion within the annulus-cap *h*; but all of the flame is between the annulus *e* and the under edge of the annulus *g*, as will be hereinafter more particularly described.

We employ auxiliary standards *i i'*, which are shown especially in Figs. 1, 2, 4, and 5. The lower ends of these standards rest upon the interior flange 2 of the tube-section *b* and they extend up to the under surface of the head *k*, and tie-bolts 15 16 pass through the lower portions of the head *k* at opposite sides, through the upper portions of these standards *i i'*, between the lower portions of these standards and the inner surface of the tube-section *b*, and extend down through the metal base *a*, the nuts of said tie-bolts bearing against the under surface of the base *a*. These tie-bolts hold firmly together as a rigid structure the base *a*, standards *a'*, the integral casting having as a part thereof the tube-section *b* and lugs *b'*, the auxiliary standards *i i'*, and the head *k*, and the parts *c, c', d, e, f, g*, and *h* are all independent of said connected parts and fit upon and around said parts in their respective relations and positions.

The pipe *l* comes from a source of supply of hydrocarbon to be vaporized and connects with the pipe *m*. This pipe *m* extends up-

ward through the head *k* at one side, over and around the curved upper end of the head, and down through the opposite side of the lower portion of the head *k* and connects with the case *n*, forming the vapor-chamber, so that the bent pipe *m* is within the tube-section *b*, the parts *c c'*, and also within the grids *d f*, and the annulus *e, g*, and *h*. This case or vapor-chamber *n* is provided with a removable nipple 17, needle-valve and stem *o*, screw-plug 18, a packing-gland 19, and a rod 20 for actuating the needle-valve and stem. This vapor-chamber and the parts connected therewith closely resemble similar parts shown in the application hereinbefore referred to, except that in the present case the needle-valve and stem *o* are of peculiar form—that is, the upper end where it passes through the removable nipple 17 is tapering. The lower end is cylindrical and parallel-sided and is received and guided in a channel formed in the base of the case or vapor-chamber *n*, and there is a guide 21 in the lower portion of the removable nipple 17, receiving a parallel-sided portion of the needle-valve and stem and guiding the same therein.

Where the rod 20 engages the needle-valve and stem the same is provided with a slotted portion *o'*, and a screw passes through this slotted portion into the end of the rod *o* at one side of the center of said rod, so that when the rod is turned the screw acts to raise and lower the needle-valve, so as to close or open the aperture in the removable nipple 17.

The central portion of the burner is open for the vapor and commingled air, and the lower portion of the burner below the lower edge of the tube-section *b* is also open for the circulation and free admission into the burner of air to commingle with the vapor that escapes up into the burner through the aperture in the nipple 17.

The outer surfaces of the parts *e, 4*, and *3* are cooler than the inner portion of the burner. Consequently there is a circulation of air over the upper surfaces of the annulus *e* down within and between the same and the grid *d*, the air passing through the bars of the grid and passing down within the inner surface of the flanges 3 4, beneath the tapering annular body *c c'*, and up within and between the same and the tube-section *b* into the center of the burner, where said air also commingles with the vapor and passes up, and in the form shown in Fig. 1 this combined vapor and air pass out between the bars of the grid and beneath the edges of the annulus *e* and *g* and up through the center of the grid *f* and annulus *g*, burning with a bright blue flame at both places, the central flame being in the form of a body of fire and the flame between *e* and *g* in the form of a ring of fire. The heat and presence of these flames keep the pipe *m* hot, so that the hydrocarbon fluid coming through the pipe *l* from a source of supply is vaporized

readily and passes down into the case or vapor-chamber *n*.

In starting the burner it is advantageous and substantially necessary to saturate the asbestos 22 on the surface of the recessed metal base *a* with some hydrocarbon fluid and to set fire thereto, so as to heat up the lower portion of the burner, including the case or vapor-chamber and the pipe *m*, to start the vaporization of the hydrocarbon fluid. The heat of the burner is increased and the character of the flame thereof altered by the addition to the burner of water supplied by the inlet water-pipe 7 into the center of the integral casting supporting upon the standards *a'*. This water enters through the flange 4, is deposited in the channel formed between the said flange and the ring 5, where the heat of the parts converts the water into vapor. This water is supplied in regulatable quantities, and should it be supplied faster than it can be vaporized it fills the channel between the flange 4 and the rim 5 sufficiently to escape through the perforations in the rim 5 down into the channel formed between the flange 3 and the rim 6, where, if not vaporized, it escapes, and, in fact, all the surplus water escapes by the exit water-pipe 8. The vaporized water commingles with the downflowing currents of air hereinbefore described and which are contained in the inclosed and heated portions *b*, *b'*, 3, 4, *e*, *d*, and *c c'*, commingling with the heated hydrocarbon vapor and air, all burning together in the simpler form of the invention, Fig. 1, in the central portion of the grid *f* and around the grid *f*, between the annulus *e* and the lower edge of the annulus *g*, or, in the complete and preferred form of the invention, between the upper edge of the annulus *e* and the under edge of the annulus *g* in the form of a ring of flame. The addition of the water-vapor changes the color of the flame from a blue or Bunsen flame of commingled hydrocarbon and air to a bright orange-red flame, either of the flames being substantially perfect combustion and not leaving upon any adjacent surfaces contacted therewith any soot or deposit whatsoever. The water-vapor produced within the closed part of the burner increases the movement and circulation of the commingled vapors and air, and consequently the force and extent of the flame, and in a sense augments the efficient draft of the burner, causing a hotter fire. The presence of the water and the evaporation thereof into water-vapor also have a tendency to keep the outer portions of the closed part or chamber cooler than would otherwise be the case.

The office performed by the annulus-cap of concavo-convex form sitting over and upon the annulus *g* is believed to be peculiar in itself. The upper edge of this annulus *g* is provided with notches. Consequently when the cap *h* sits thereon these notches form a series of passage-ways communicating within

the cap from one side of the annulus *g* to the other, and the effect or operation of this structure is to cause currents of air to rise within the said cap *h*, beneath the outer edge or rim thereof, which pass through the passage-ways, between said cap and the upper edge of the annulus *g*, and down between the inner portion of the cap *h* and the grid *f* and through the bars of the grid to commingle with the outflowing vapor to be burned between the edges of the annulus *e* and the lower edge of the annulus *g*, and at the same time air passes down through the central opening or aperture of the annulus-cap *h* to commingle with the same vapor and not only perfecting combustion, but increasing the size and capacity of the flame.

The case or vapor-chamber *n* is supported in part by its central portion resting upon the metal base *a* and the packing-gland 19 resting upon the rim of said metal base and by the support furnished through the pipe *m* as the same passes through the devices going to make up the burner and through the head *k*; but we have shown in Fig. 6 and prefer to employ lugs 23, formed as parts of the standards *a'*, and screws 24, passing through these lugs and bearing against opposite sides of the case or vapor-chamber *n*. These screws serve largely to prevent any lateral motion of the case or vapor-chamber, as well as assisting in supporting the same in position.

We claim as our invention—

1. In a petroleum-burner, the combination with a base and integral standards formed therewith and a case or vapor-chamber and pipes for hydrocarbon vapor, of an integral casting having an open center adapted to fit upon and be supported by the standards of the base, an auxiliary standard adapted to rest upon the integral casting, a head carried thereby and over which the pipe for hydrocarbon fluid extends, and tie-bolts passing through the head, through the auxiliary standard and within the center of the integral casting and connecting with the metal base, substantially as set forth.

2. In a petroleum-burner, the combination with a base and integral standards formed therewith, and a case or vapor-chamber and pipes for hydrocarbon vapor, of an integral casting having an open center adapted to fit upon and be supported by the standards of the base, an auxiliary standard adapted to rest upon the integral casting, a head carried thereby and over which the pipe for hydrocarbon fluid extends, tie-bolts passing through the head, through the auxiliary standard and within the center of the integral casting and connecting with the metal base, and devices surrounding the head and auxiliary standards and the hydrocarbon-fluid pipe and setting into and supported by the integral casting and together forming passage-ways for hydrocarbon vapor and commingled air, and a place at

which the same may burn, substantially as set forth.

3. In a petroleum-burner, the combination with a base and integral standards with reduced upper ends, a case or vapor-chamber and pipe for hydrocarbon fluid and vapor of an integral casting adapted to sit upon and be supported by the standards of the base and which casting comprises an open-center tube-section and interior flange, a bottom portion and lugs with recessed under surfaces, staggered offset flanges forming the periphery of the integral casting and rims within the same at different levels, substantially as set forth.

4. In a petroleum-burner, the combination with a base and integral standards with reduced upper ends, a case or vapor-chamber and pipe for hydrocarbon fluid and vapor, of an integral casting adapted to sit upon and be supported by the standards of the base and which casting comprises an open-center tube-section and interior flange, a bottom portion and lugs with recessed under surfaces, staggered offset flanges forming the periphery of the integral casting and rims within the same at different levels, and an inlet water-pipe extending through the uppermost offset flange and an exit water-pipe entering the bottom of the case between the lowermost flange and the inner rim and the uppermost rim perforated adjacent to the exit water-pipe whereby between said flanges and rims receptacles or channels are formed for water admitted into said casting and for the overflow thereof, substantially as set forth.

5. In a petroleum-burner, the combination with a base and integral standards with reduced upper ends, a case or vapor-chamber and pipe for hydrocarbon fluid and vapor, of an integral casting adapted to sit upon and be supported by the standards of the base and which casting comprises an open-center tube-section and interior flange, a bottom portion and lugs with recessed under surfaces, staggered offset flanges forming the periphery of the integral casting and rims within the same at different levels, and auxiliary standards at opposite points in the center of the burner with their lower ends resting upon the interior flange of said integral casting, a head supported by said standards and over the upper end of which the hydrocarbon-vapor pipe extends, and tie-bolts passing through said head, through the upper portions of said auxiliary standards and down through the base for connecting the parts together, substantially as set forth.

6. In a petroleum-burner, the combination with a base and integral standards with reduced upper ends, a case or vapor-chamber and pipe for hydrocarbon fluid and vapor, of an integral casting adapted to sit upon and be supported by the standards of the base and which casting comprises an open-center tube-section and interior flange, a bottom portion and lugs with recessed under surfaces, staggered offset

flanges forming the periphery of the integral casting and rims within the same at different levels, and a tapering annular body in two connected parts received within and resting upon said integral casting and surrounding the tube-section thereof, a grid surrounding said tapering annular body and resting thereon, an annulus surrounding said grid and received within the uppermost flange of said integral casting and supported by said parts, whereby an open-center structure or chamber is formed, exteriorly closed or shut off and in which the hydrocarbon vapor and entering air may commingle and become heated before being burned.

7. In a petroleum-burner, the combination with a base and integral standards with reduced upper ends, a case or vapor-chamber and pipe for hydrocarbon fluid and vapor, of an integral casting adapted to sit upon and be supported by the standards of the base and which casting comprises an open-center tube-section and interior flange, a bottom portion and lugs with recessed under surfaces, staggered offset flanges forming the periphery of the integral casting and rims within the same at different levels, and a tapering annular body in two connected parts received within and resting upon said integral casting and surrounding the tube-section thereof, a grid surrounding said tapering annular body and resting thereon, an annulus surrounding said grid and received within the uppermost flange of said integral casting and supported by said parts, whereby an open-center structure or chamber is formed, exteriorly closed or shut off and in which the hydrocarbon vapor and entering air may commingle and become heated before being burned, a grid *f* of bars or plates and a connecting-ring resting upon and supported by said annulus and an annulus *g* surrounding and resting upon said grid *f*, the openings between the bars or plates of the grid *f* forming passage-ways for the hydrocarbon vapor and commingled air to pass to be burned between the lower edge of the annulus *g* and the upper surface of the annulus beneath the same and in the center of the grid *f* and annulus *g*, substantially as set forth.

8. In a petroleum-burner, the combination with a base and integral standards with reduced upper ends, a case or vapor-chamber and pipe for hydrocarbon fluid and vapor, of an integral casting adapted to sit upon and be supported by the standards of the base and which casting comprises an open-center tube-section and interior flange, a bottom portion and lugs with recessed under surfaces, staggered offset flanges forming the periphery of the integral casting and rims within the same at different levels, a tapering annular body in two connected parts received within and resting upon said integral casting and surrounding the tube-section thereof, a grid surrounding said tapering annular body and resting there-

on, an annulus surrounding said grid and received within the uppermost flange of said integral casting and supported by said parts, whereby an open-center structure or chamber is formed, exteriorly closed or shut off and in which the hydrocarbon vapor and entering air may commingle and become heated before being burned, a grid *f* of bars or plates and a connecting-ring resting upon and supported by the upper annulus, an annulus *g* surrounding and resting upon the grid *f* and having in its upper edge a series of notches, and an annulus-cap *h* of concavo-convex form setting over the annulus *g* and the grid *f*, substantially as and for the purposes set forth.

9. In a petroleum-burner, the combination with a base and integral standards with reduced upper ends, a case or vapor-chamber and pipe for hydrocarbon fluid and vapor, of an integral casting adapted to sit upon and be supported by the standards of the base and which casting comprises an open-center tube-section and interior flange, a bottom portion and lugs with recessed under surfaces, staggered offset flanges forming the periphery of the integral casting and rims within the same at different levels, auxiliary standards at opposite points in the center of the burner with their lower ends resting upon the interior flange of said integral casting, a head supported by said standards and over the upper end of which the hydrocarbon-vapor pipe extends, tie-bolts passing through said head, through the upper portions of said auxiliary standards and down through the base for connecting the parts together, and devices surrounding the auxiliary standards and hydrocarbon-vapor pipe, setting into and supported by the integral casting structure and therewith forming a substantially closed chamber with tortuous passage-ways in which the hydrocarbon vapor and entering air are thoroughly commingled, heated and momentarily arrested before passing out to be consumed, substantially as set forth.

10. In a petroleum-burner, the combination with a base and integral standards with reduced upper ends, a case or vapor-chamber and pipe for hydrocarbon fluid and vapor, of an integral casting adapted to sit upon and be supported by the standards of the base and which casting comprises an open-center tube-section and interior flange, a bottom portion and lugs with recessed under surfaces, staggered offset flanges forming the periphery of the integral casting and rims within the same at different levels, auxiliary standards at opposite points in the center of the burner with their lower ends resting upon the interior flange of said integral casting, a head supported by said standards and over the upper end of which the hydrocarbon-vapor pipe extends, tie-bolts passing through said head through the upper portions of said auxiliary standards and down through the base for con-

necting the parts together, devices supported by said associated parts and also surrounding the standards, the head and the hydrocarbon-vapor pipe and forming both central and lateral discharge passage-ways for the commingled hydrocarbon vapor and oil to be burned, substantially as set forth.

11. In a petroleum-burner, the combination with a base and integral standards with reduced upper ends, a case or vapor-chamber and pipe for hydrocarbon fluid and vapor, of an integral casting adapted to sit upon and be supported by the standards of the base and which casting comprises an open-center tube-section and interior flange, a bottom portion and lugs with recessed under surfaces, staggered offset flanges forming the periphery of the integral casting and rims within the same at different levels, auxiliary standards at opposite points in the center of the burner with their lower ends resting upon the interior flange of said integral casting, a head supported by said standards and over the upper end of which the hydrocarbon-vapor pipe extends, tie-bolts passing through said head, through the upper portions of said auxiliary standards and down through the base for connecting the parts together, and devices surrounding the auxiliary standards and hydrocarbon-vapor pipe, setting into and supported by the integral casting structure and therewith forming a substantially closed chamber with tortuous passage-ways in which the hydrocarbon vapor and entering air are thoroughly commingled, heated and momentarily arrested before passing out to be consumed, and devices supported by said combined structure and also surrounding the auxiliary standards, head and hydrocarbon-vapor pipe and providing lateral discharge-apertures for the commingled hydrocarbon vapor and air to be burned, and also passages for air through the center and internally to commingle with said materials to be burned to insure the most perfect combustion, substantially as set forth.

12. In a petroleum-burner, the combination with a base, a case or vapor-chamber therein, a pipe for vaporizing hydrocarbon fluid and delivering the same to said chamber, and means for regulating and controlling the discharge of said vapor, of devices entering into the burner structure and arranged to provide a mixing tube-section to receive the hydrocarbon vapor and entrained air, also to provide an annular water-chamber and tortuous passages in which the vapor from said water is mixed with air and delivered to the mixture from the mixing tube-section, substantially as set forth.

13. In a petroleum-burner, the combination of devices for vaporizing hydrocarbon fluid, means for regulating and controlling the discharge thereof, devices of annular form providing a circumferential opening for the entrance of air and tortuous passages for the

progressive circulation and heating thereof to be commingled with the hydrocarbon vapor, and means providing for the entrance of water to be vaporized and commingled with the air and hydrocarbon vapor, substantially as specified.

14. In an apparatus for vaporizing hydrocarbon preparatory to burning the same with an admixture of air, and in combination, a closed chamber for the hydrocarbon and in which the same is vaporized, parts forming a heat zone for the combustion of the vapor obtained from said hydrocarbon with air, parts forming a cooler zone above said heat zone, and a part forming a division between the same, parts forming a cooler zone below the

heat zone and through which zone the air and vapor pass and are mixed, said closed chamber passing up over and returning down through the respective zones within and between said parts for tempering the heat of said chamber so as to prevent carbonization of the hydrocarbon, and a delivery-burner below the lowermost cooler zone and with which said closed chamber is connected.

Signed by us this 16th day of June, 1902.

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Witnesses:

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S. T. HAVILAND.