

No. 705,459.

Patented July 22, 1902.

W. J. SMART.
VAPOR BURNER.

(Application filed Jan. 16, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1,

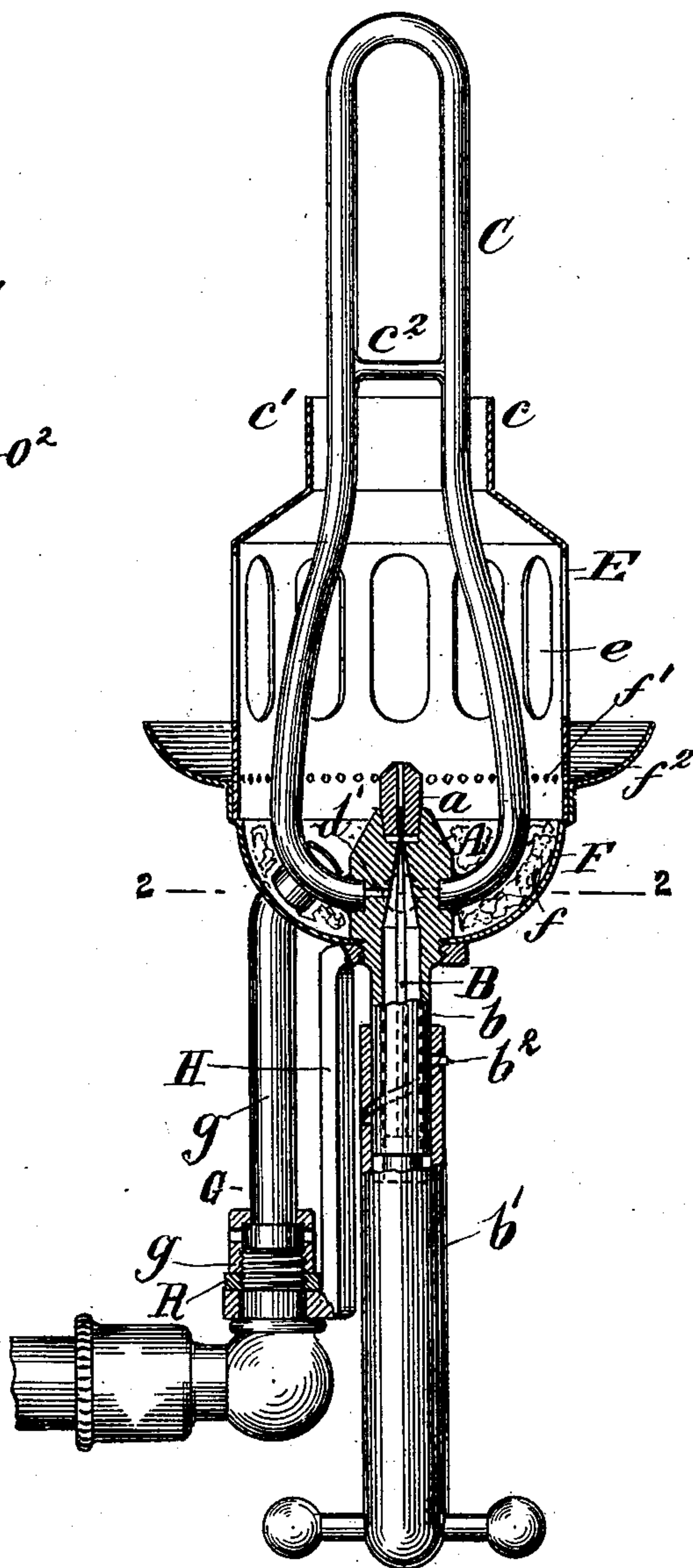


Fig. 3,

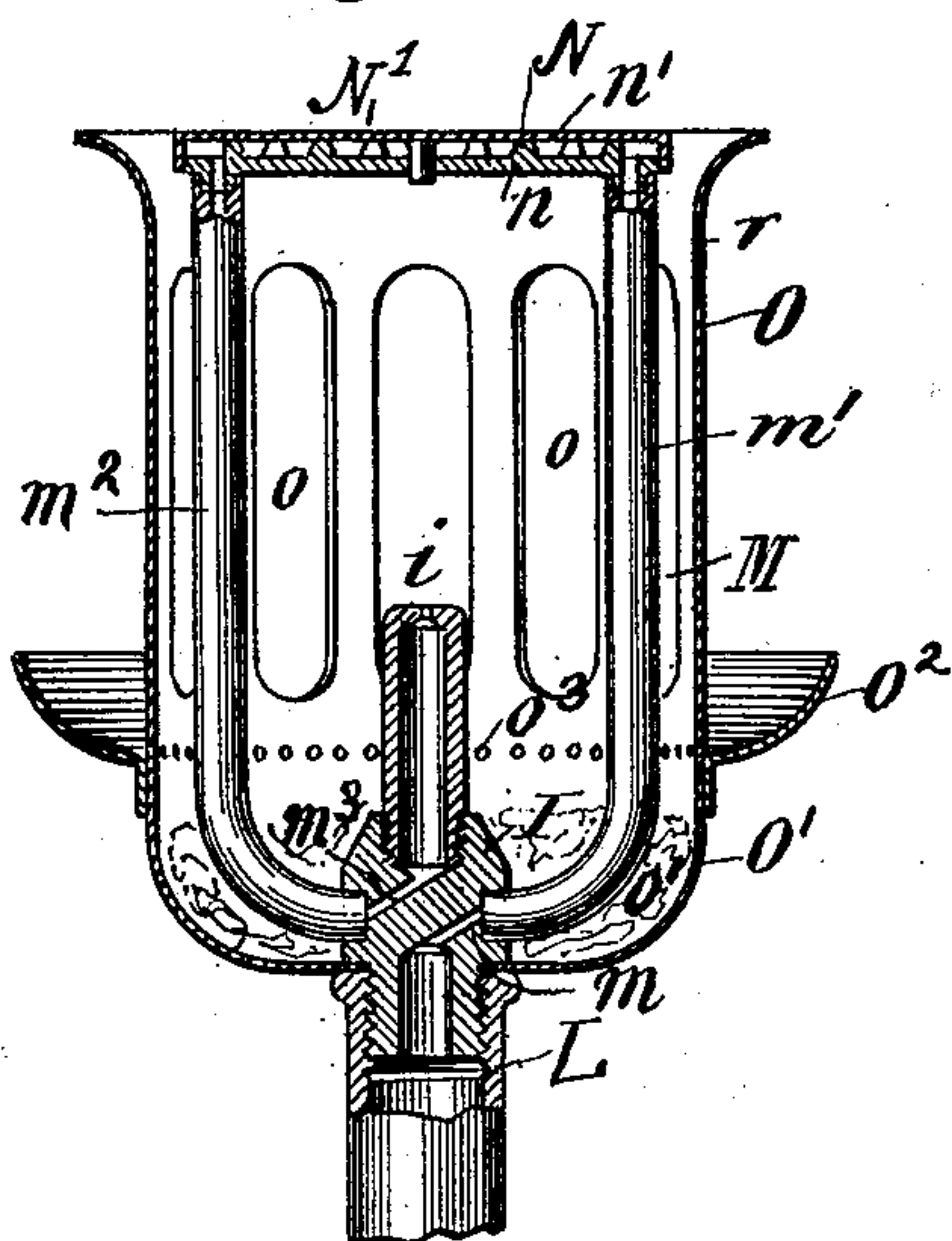


Fig. 4,

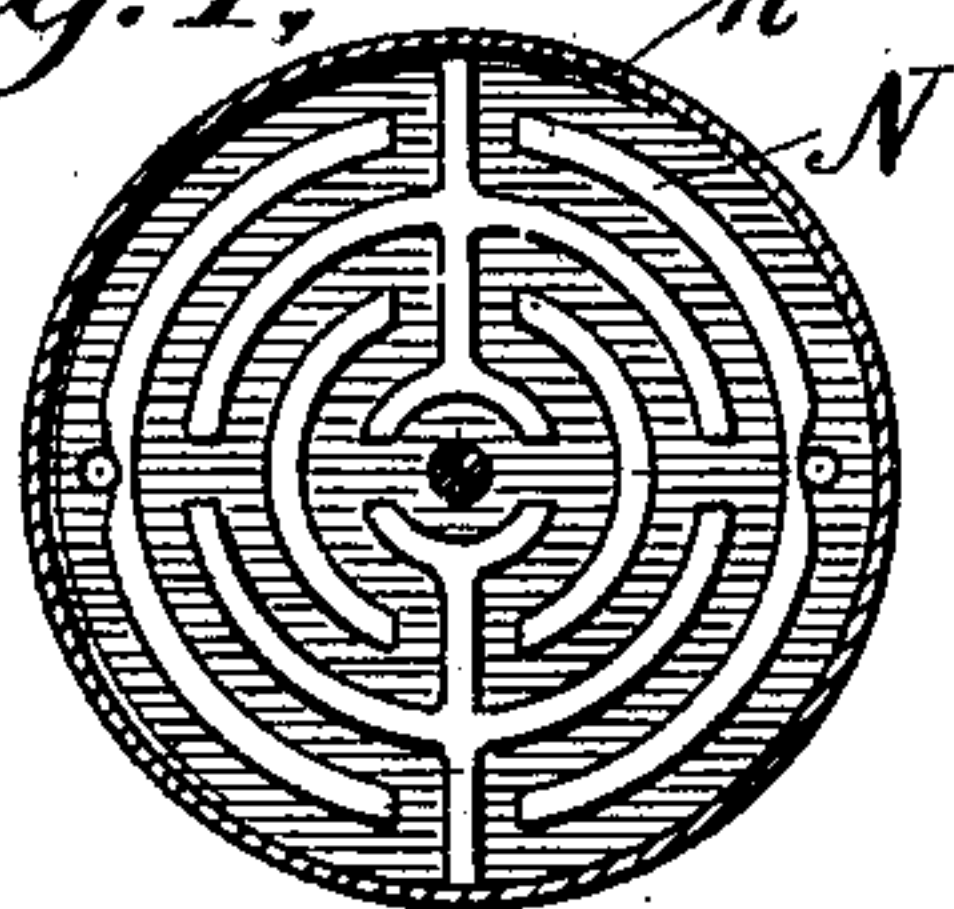
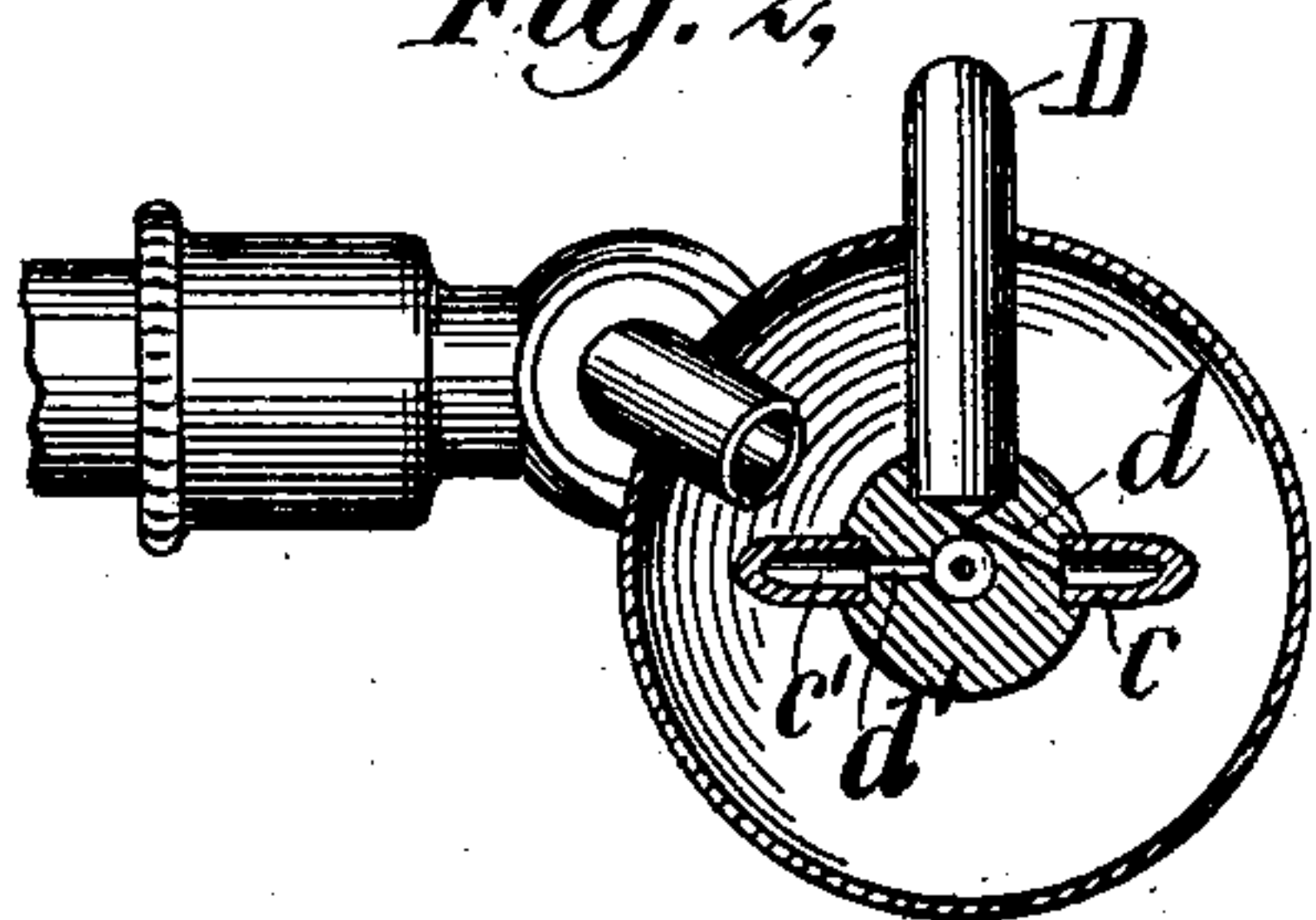


Fig. 2,



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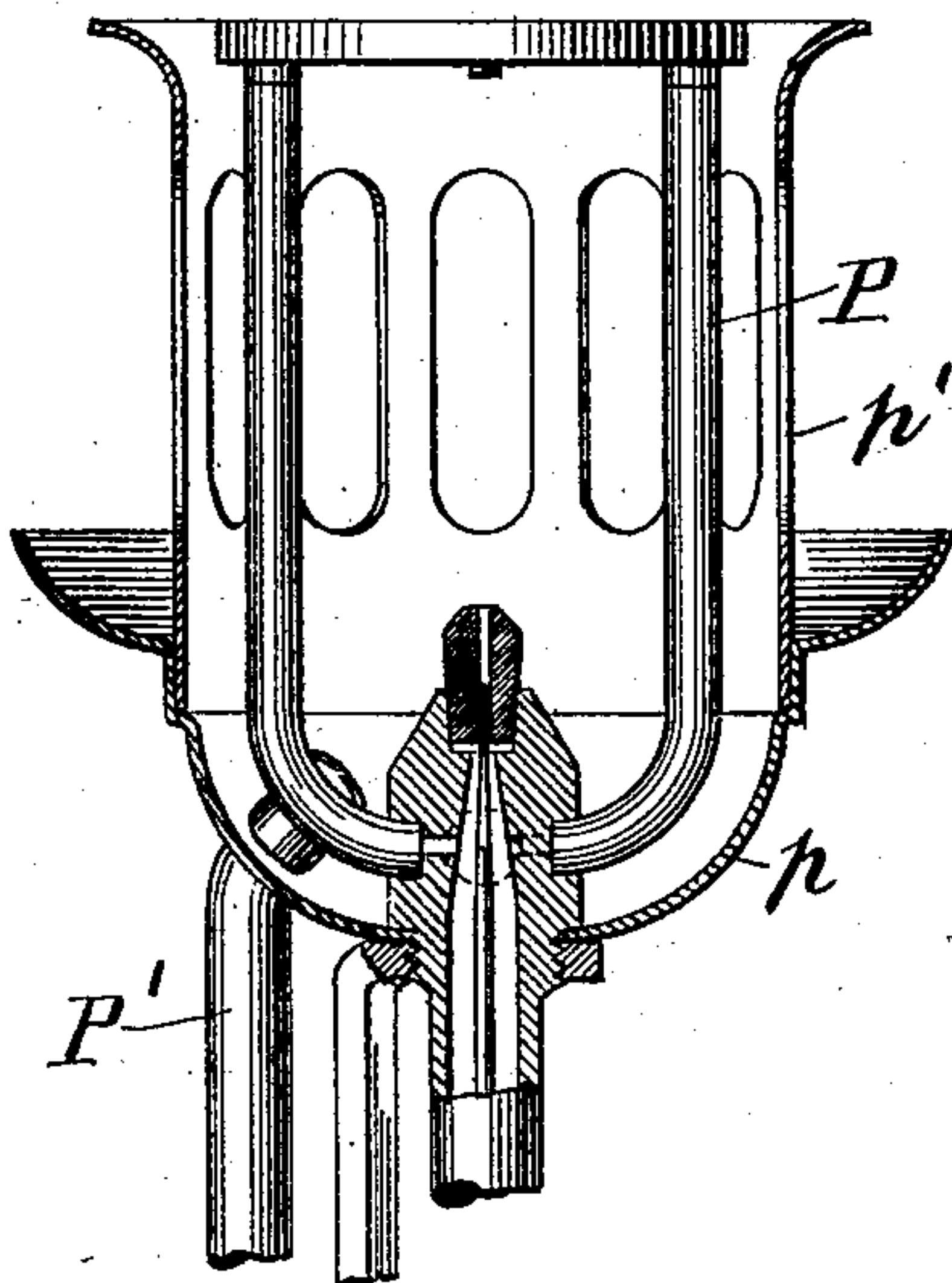
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2 Sheets—Sheet 2.

Fig. 5,



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UNITED STATES PATENT OFFICE.

WALTER J. SMART, OF ORANGE, NEW JERSEY.

VAPOR-BURNER.

SPECIFICATION forming part of Letters Patent No. 705,459, dated July 22, 1902.

Application filed January 16, 1899. Serial No. 702,276. (No model.)

To all whom it may concern:

Be it known that I, WALTER J. SMART, of Orange, New Jersey, have invented a certain new and useful Improvement in Vapor-Burners, of which the following is a specification.

This invention belongs to that class of vapor-burning devices which are designed to receive a liquid hydrocarbon and convert the same into vapor before intermixture with air and subsequent combustion, this process taking place continuously during the operation of the device.

The invention is especially designed to produce a vapor-burner of simple construction and one whose operation is efficient, accomplishing a thorough and complete vaporization of the combustible before its discharge through the escape-orifice. The burner of the invention is one, moreover, that may be used for heating or lighting and provides a construction whereby ordinary illuminating or other gas may be used for the initial warming of those parts more immediately concerned in the oil-vaporization.

A vapor-burner will be described wherein are embodied the features of my invention, the novelty of the same being subsequently defined in claims.

In the accompanying drawings, Figure 1 represents a central longitudinal section of a vapor-burner embodying my improvement, parts, however, being shown in elevation. Fig. 2 represents a cross-section on the line 2-2, Fig. 1. Fig. 3 represents a central longitudinal section of a modification especially adapted for heating purposes. Fig. 4 represents a plan view of the interior of the vaporizer of the form shown in Fig. 3, illustrating the paths taken by the oil and vapor therethrough. Fig. 5 shows a form of vapor-burner wherein are combined features set forth in Fig. 1 with the style of vaporizer shown in Figs. 3 and 4.

Similar letters of reference designate corresponding parts in all figures.

Referring at first to the form set forth in Figs. 1 and 2, A is a fitting with an internal passage opening upward into the vapor-discharge and conveniently serving for the attachment of the other burner parts. The vapor-discharge may be through a removable burner-tip *a*, the size of whose vent may be

regulated at will by a needle-valve B. The tapering upper end of this valve may be withdrawn from or protruded into the restricted opening of the burner-tip *a* by any suitable means. For instance, the fitting A may be carried downward as a tubular projection *b* and over it fitted a handpiece *b'*, to which the valve B is rigidly affixed, this latter passing through a gas-tight aperture at the end of the projection. A helical curve and engaging pin *b²* upon the parts *b* and *b'* will serve upon the rotation of the handpiece to advance or withdraw the valve.

C is the vaporizer, here shown to consist of a tube bent back upon itself to form a rising and descending limb *c* and *c'*, respectively, with their ends secured to the fitting A. A deflecting plate or piece *c²* may be provided, as shown.

D is a connection for the attachment of a conduit delivering oil to the burner. The passage therethrough is continued through the fitting A by a channel *d*, placing the oil-supply in communication with the rising limb of the vaporizer. The descending limb *c'* is open to the interior of the fitting A by way of the channel *d'*, as shown in Fig. 1.

E is a shell or casing surrounding the vaporizer C and forming a chamber in which intermixture with air takes place. Its internal diameter is reduced at its upper end, and at its lower end it rests upon the starting-cup F, designed to hold cotton or like absorbent material *f* for alcohol, &c., entering through openings *f'* from a receptacle *f²*, into which it may be poured. This means of providing an auxiliary flame may be used to effect the necessary preliminary heating of the vaporizer, or, if thought desirable, a gas-flame may be made use of. For this purpose there is provided a suitable attachment G for removable connection to a gas-bracket. Extending upwardly as a gas-inlet tube *g* it projects into the mixing-chamber formed by the apron E. If preferred, instead of using the impregnated cotton in the cup F to heat the vaporizer this Bunsen gas-flame may be used and then shut off when the vaporizer has reached a sufficient temperature. H is a support for the burner secured to the fitting A and so constructed as to be readily attached to and detached from the gas-bracket. It is here

shown as fitting over the end of the bracket and secured in position by a lock-nut R.

Referring now to the form set forth in Figs. 3 and 4, here, as in the former device, I is a fitting provided with a burner-tip i at the top, (not here shown as being provided with a regulating device to adjust the size of its opening, but means of adjustment may of course be supplied, if desired.) Below the fitting is secured to the pipe L communicating with the oil-supply, which enters the vaporizer M via the channel m . This vaporizer comprises, as before, rising and descending tubes m' and m'' , respectively, the latter discharging into the burner-tip i through a channel m^3 . At the top, however, connecting these two tubes, there is a flattened disk-like plate N' , from side to side of which there runs a series of channels, compelling the partially-vaporized hydrocarbon to follow tortuous and preferably intersecting paths in its passage from the inlet-tube of the vaporizer to the outlet-tube thereof. The lengthened time consumed in its transit, added to the mutual impingement of meeting streams, facilitates the comminution and vaporization of the oil, causing the vapor delivered at the vapor-discharge to be free from liquid particles. A convenient mode of forming and arranging these channels is attainable by constructing the vaporizer of two plates nn' , one of which, n , is provided with a number of arc-shaped ridges N of a height corresponding to the thickness of the plate and with the general relation, as shown in Fig. 4, where it is seen that the ends of the ridges are opposite unbroken parts of adjacent ridges. The two plates may then be secured together, preferably at their middle portions, to prevent separation. It will be noted that each of the two streams into which the entering stream is divided as a whole is deflected first in one direction and then in the opposite as they traverse the space from one side of the vaporizer to the other, intermingling during the passage. In other words, the entire body of fluid in its passage across the vaporizer from entrance to exit is compelled to take this tortuous passage. It will further be noted that all the intermediate channels and the channels through which the diverging streams pass from the entrance to the vaporizer onward, as well as those through which they flow as they converge to the outlet, are all substantially in the same plane.

From an inspection of Fig. 4 it will be seen that as the oil passes into the vaporizer it divides, going in opposite directions, only to return and meet before passing onward toward the center of the vaporizer. This action is continued until the diametrically opposite point is reached, when the descending limb is reached. This form of vaporizer and connecting parts is especially adapted to a heating device.

O is the encircling shell or casing, having air-openings o and resting upon the starting-

cup O' , holding the absorbent material o' and communicating with the basin o^2 by means of the openings o^3 . In actual use both this shell or casing and the one previously described act to confine the flame to the region immediately adjacent to the vaporizer, intermixture with the combustible occurring at the lower portion of the shell, while combustion takes place in the upper portion thereof. The vaporizer is thus bathed, as it were, in flame.

If the hydrocarbon vapor were allowed to expand freely into the atmosphere as it issues from the exit-orifice, by removing the shell or casing, for instance, it will be found impossible to ignite it. The vapor being under considerable pressure as it issues forth escapes with considerable velocity, rapidly expands into a divergent cloud of vapor or gas, runs down in temperature, and soon becomes so diluted with air as not to form a combustible mixture. Unless the velocity is checked before dilution has proceeded to this degree the vapor will not burn. Both forms of shell or casing represented effect this reduction in velocity in part, at least, of the vapor, the restricted outlet of Fig. 1 permitting the free escape of a part only of the moving vapor, while the flattened form of vaporizer of Fig. 3 has a throttling action upon the expanding and diverging jet. Thus the velocity of part of the vapor is diminished and this part confined temporarily to the upper region of the shell. Admixture with air results at this point in a flame which does not and cannot run back to the vapor-orifice as long as the vaporizer is in action.

Fig. 5 shows this style of vaporizer applied to the general type of burner set forth in Figs. 1 and 2. P is the vaporizer, similar in construction to the vaporizer of Figs. 3 and 4, and P' is the Bunsen-tube attachment for the gas-bracket. The starting-cup is designated by p and the shell constituting the surrounding chamber by p' .

Having described my invention, what I consider as new, and desire to secure by Letters Patent, is—

1. The combination of a vaporizer, a valve for regulating the discharge therefrom, a shell or casing disposed exteriorly of the vaporizer and provided with openings for the admission of air, means for delivering a liquid hydrocarbon to the vaporizer, a gas-inlet tube communicating with the interior space of the shell or casing, and an independent support for attaching the parts to a gas-outlet.

2. The combination of a vaporizer, a shell or casing surrounding the same and having openings for the admission of air, a cup for absorbent material open to the interior of the shell, and a receptacle exterior to the shell and communicating with the cup.

3. The combination of a vaporizer, a shell or casing surrounding the same and having openings for the admission of air, a cup for absorbent material open to the interior of the

shell, a receptacle exterior to the shell and communicating with the cup, and a support for attaching the parts in place.

5 4. A vaporizer flattened in form and provided with a succession of channels intermediate its inlet and outlet openings, each of said intermediate channels communicating at its ends with the adjacent channel on one side and at a point between its ends with the adjacent channel on the other side.

10 5. A vaporizer comprising an inlet and an outlet tube, in combination with a connecting part, flattened or disk-like in form, and provided with a succession of channels intermediate its inlet and outlet openings, each of said intermediate channels communicating at its ends with the adjacent channel on one side and at a point between its ends with the adjacent channel on the other side.

20 6. The combination of a vaporizer, a shell or casing within which the vaporizer is located and which is provided with openings

for the admission of air and has its outlet-passage restricted, means for delivering a liquid hydrocarbon to the vaporizer, a gas-in- 25 let tube communicating with the interior space of said apron or shell and an independent support for attaching the parts in place.

7. The combination with a vaporizer flattened in form and provided between the inlet and outlet openings with a succession of channels connected with each other alternately at their end and middle portions, of a shell or casing within which the vaporizer is located and which is provided with openings 30 for the admission of air and means for delivering a liquid hydrocarbon to the vaporizer.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

WALTER J. SMART.

Witnesses:

CHAS. S. BONNOR,
JOSEPH ROURKE.