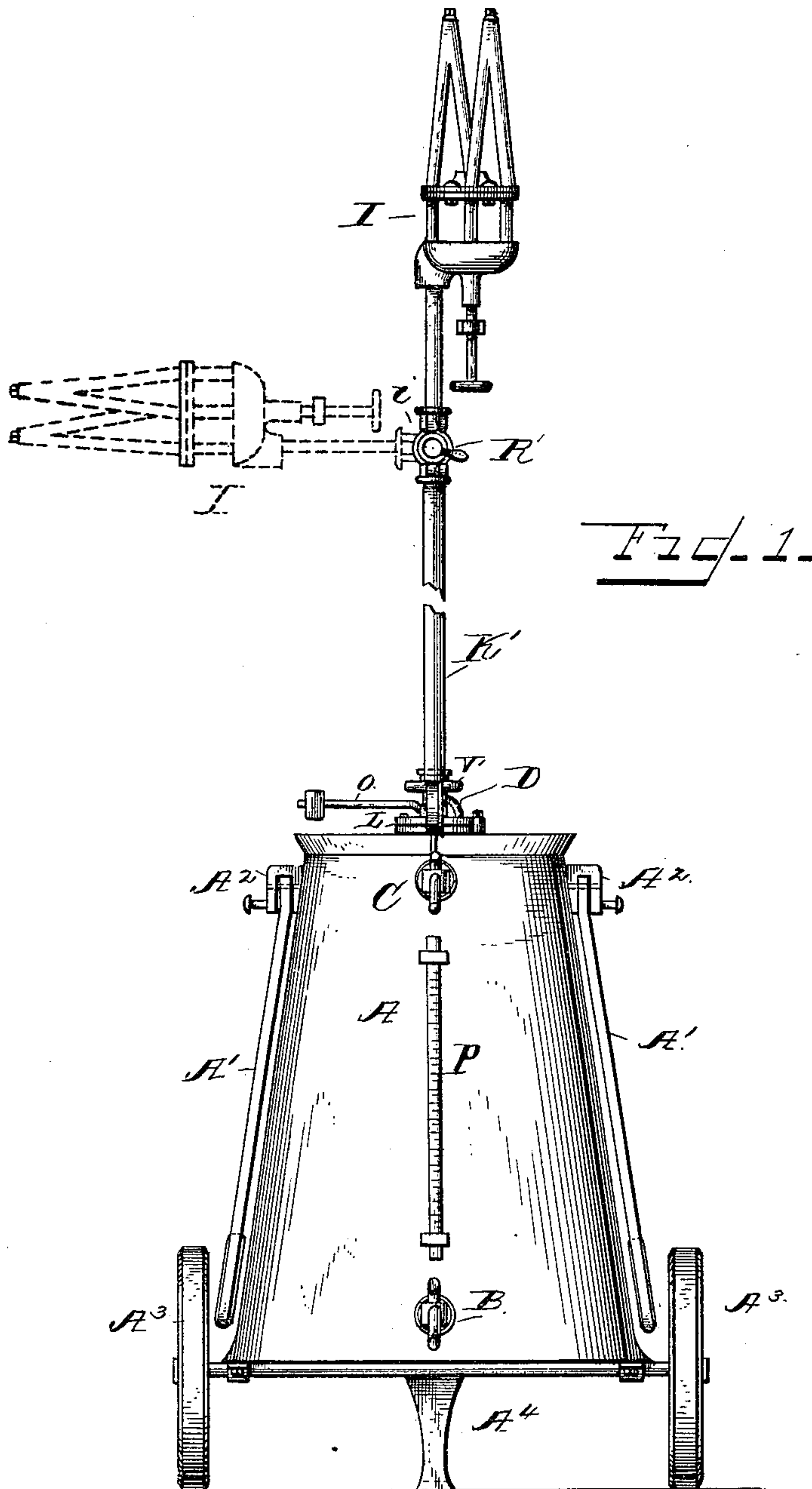


3 Sheets—Sheet 1.

APPARATUS FOR SUPPLYING COMBUSTIBLE LIQUIDS TO BURNERS.

Patented June 25, 1889.



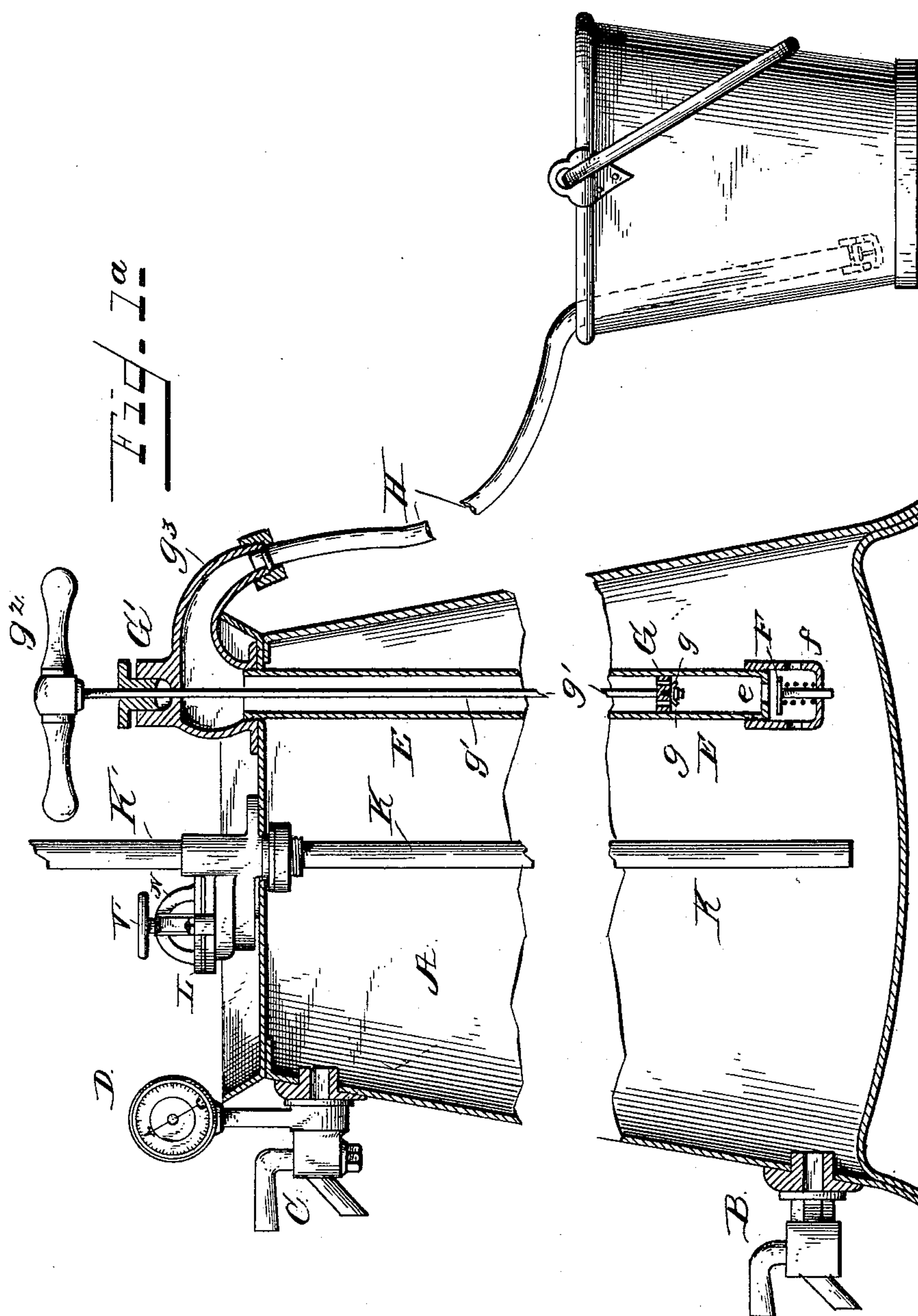
Witnesses:
J. Thomson Cross
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Inventor.
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per Henry Mth
Attorney.

(No Model.)

3 Sheets—Sheet 2.

R. WALLWORK & A. C. WELLS.
APPARATUS FOR SUPPLYING COMBUSTIBLE LIQUIDS TO BURNERS.
No. 405,860. Patented June 25, 1889.



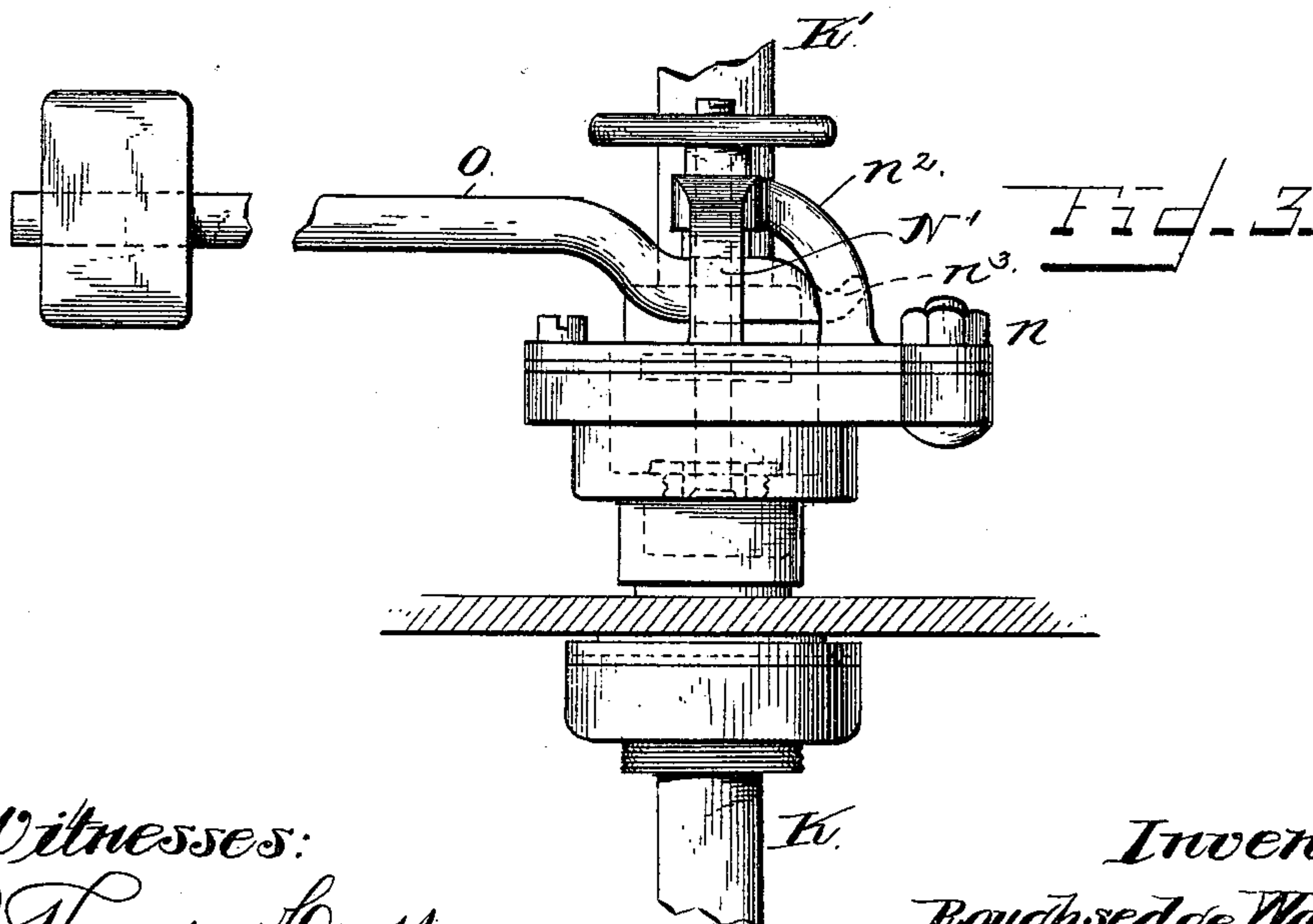
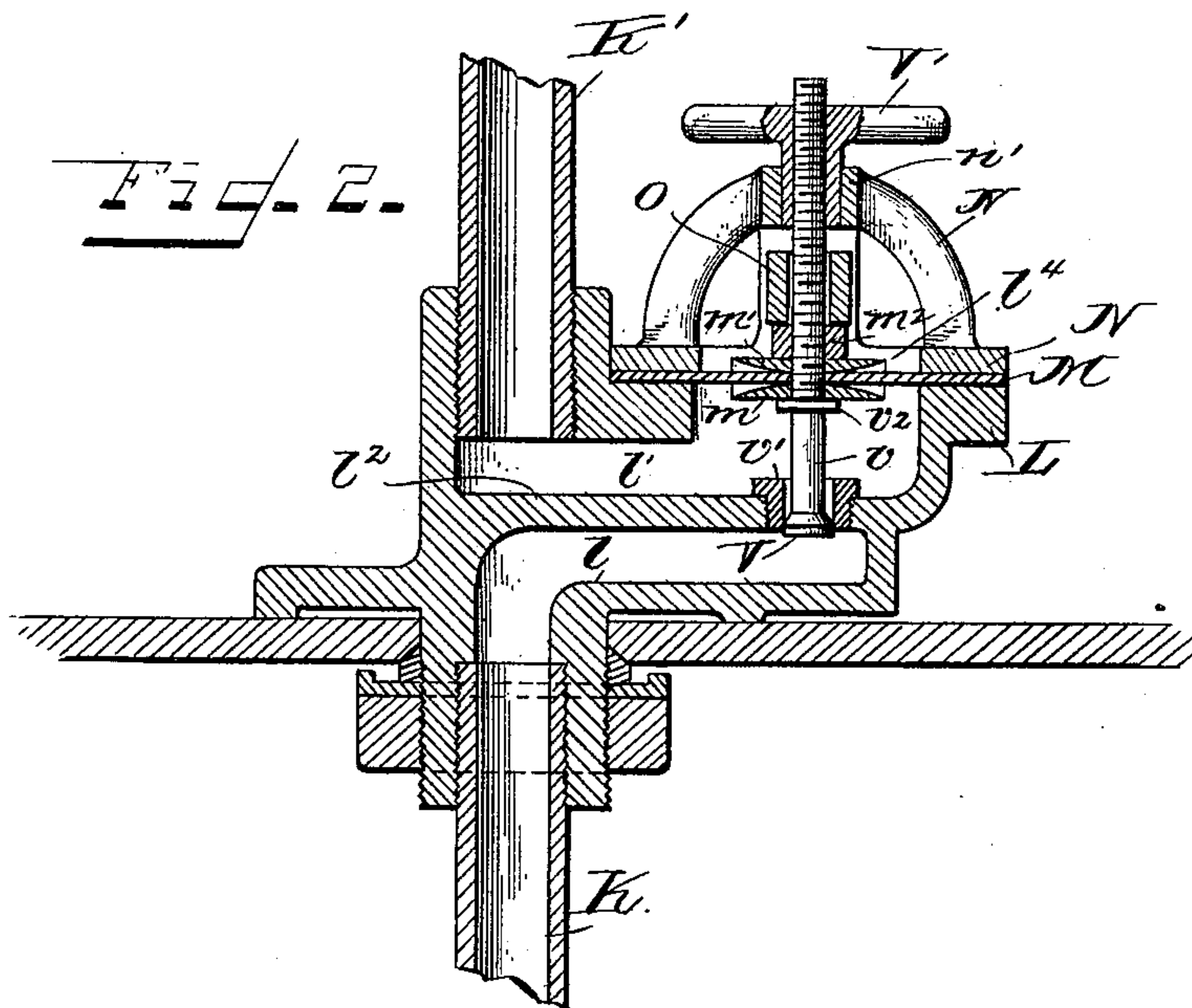
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per Henry M. M.
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(No Model.)

3 Sheets—Sheet 3.

R. WALLWORK & A. C. WELLS.
APPARATUS FOR SUPPLYING COMBUSTIBLE LIQUIDS TO BURNERS.
No. 405,860. Patented June 25, 1889.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

ROUGHSEGE WALLWORK AND ARTHUR C. WELLS, OF MANCHESTER,
COUNTY OF LANCASTER, ENGLAND.

APPARATUS FOR SUPPLYING COMBUSTIBLE LIQUIDS TO BURNERS.

SPECIFICATION forming part of Letters Patent No. 405,860, dated June 25, 1889.

Application filed September 14, 1888. Serial No. 285,381. (No model.) Patented in England March 8, 1887, No. 3,543, and in Belgium April 24, 1888, No. 81,537.

To all whom it may concern:

Be it known that we, ROUGHSEGE WALLWORK and ARTHUR C. WELLS, subjects of the Queen of England, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Apparatus for Supplying Combustible Liquid to Burners, (for which we have received Letters Patent in England March 8, 1887, No. 3,543, and in Belgium April 24, 1888, No. 81,537;) and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

In the drawings, Figure 1 is an elevation of our improved portable apparatus for supplying combustible liquids to and combined with a burner. Fig. 1^a is a vertical section of the reservoir for the illuminating agent and parts connected therewith, on a larger scale, the devices for transporting said reservoir being omitted. Fig. 2 is a section, and Fig. 3 an elevation, of the automatic pressure-regulating valve, also on an enlarged scale.

This invention relates to apparatus especially designed for forcing combustible liquids to burners for illuminating or heating purposes, and is an improvement upon the apparatus shown and described in British Patents No. 15,382, of November 22, 1884, and No. 15,328, of November 24, 1886, granted to Roughsedge Wallwork, and we do not desire herein to claim, broadly, a portable illuminating apparatus, or such an apparatus constructed as shown and described in said patents.

The invention consists in an air-tight reservoir for the liquid combustible, in combination with a force-pump for forcing an elastic fluid into the reservoir and compressing the same therein to force the liquid illuminant, and a service pipe or main connected with the reservoir and the burner or burners, substantially as hereinafter described and claimed.

The invention further consists in the combination, with the reservoir and service-pipe,

of an automatic pressure-regulating valve interposed between said service-pipe and reservoir, substantially as hereinafter fully described and claimed.

The invention further consists in structural features and combinations of parts, substantially as hereinafter fully described and claimed.

The object of our invention is to provide an apparatus of simple construction which may be located at any desired point below the burner or burners, and which shall serve the purposes of reservoir for the combustible liquid and of forcing apparatus for forcing the said liquid to the burner.

The apparatus may be made portable or stationary. In Fig. 1 we have shown the reservoir A mounted on wheels A³ and provided with handles A', that are pivoted to the reservoir A, so as to drop alongside thereof when not in use, their upward motion being limited by suitable bearings A². The reservoir is preferably made of sheet metal and of sufficient strength to withstand the required pressure. The reservoir is provided near its bottom with an exhaust stop-cock B and near its top with a pressure-regulating cock C, provided with a manometer D. In the reservoir is arranged a pump-barrel E, that has at its lower end a valve-seat *e* for a spring-actuating disk-valve F, arranged in and suitably guided by a cap *f*, whose walls are perforated.

G is the pump-plunger, which has ports closed by valves *g*, opening downwardly. *g'* is the plunger-rod, and *g*² the manipulating-handle, said rod passing through a suitable stuffing-box on the head G' of the pump-barrel on the outside of the reservoir. The head G' is provided with a branch *g*³, to which a hose H may be coupled, so that the pump answers the twofold purpose of a gas and liquid force-pump.

The supply-pipe K extends axially into the reservoir and terminates near the bottom thereof, and communicates with the burner-pipe K', a stop-cock R' being provided for regulating the flow of the illuminating agent.

I is the burner or regenerative burner, con-

connected to pipe K', which burner may be of any desired construction.

When the apparatus is used outdoors, we hinge the burner I to the supply-pipe K at *i*, so that said burner may be turned from a vertical into a horizontal position, as shown in dotted lines in Fig. 1, to bring the flame into the direction of the wind, and thus prevent its being blown about or extinguished.

For outdoor purposes we prefer to employ a regenerative burner of the class shown and described in the application of R. Wallwork, Serial No. 289,045, filed October 24, 1888, for the reason that a strong elongated flame is obtained.

A plurality of burners may in a similar manner be connected with a supply-pipe, as will be readily understood, the supply-pipe K being then connected with a horizontal branch, to which a plurality of vertical burner branches K' are secured, as will be readily understood.

In the supply-pipe is interposed an automatic pressure-regulating valve, the casing L whereof has two interposed parallel passages *l* and *l'*, the passage *l* being connected with the reservoir through the branch K of the supply-pipe and the passage *l'* with said supply-pipe K'. In the partition *l*² between passages *l* *l'* is formed a port, in which is screwed a tubular valve-seat *v'* for a cone-valve V, that opens downwardly. To the stem *v* of the valve is secured a flexible diaphragm M of any suitable material—such as sheet metal, leather, or other suitable material—that closes a cylindrical opening in the casing L, leading to the passage *l'*, the valve-stem being provided with a collar *v*², upon which the lower retaining-disk *m* of the diaphragm M is seated, and said diaphragm is securely connected with the valve-stem by a clamping-nut *m*², screwed on said stem and bearing upon the upper retaining-disk *m'* of diaphragm M. The edge of the diaphragm M is secured to the edge of the opening *l*⁴ by means of a ring N, secured to the casing by bolts or screws *n*.

On the ring N is formed a yoke N', provided with a boss *n'*, that serves as a bearing for the elongated hub of a hand-wheel V', screwed on the outer end of the valve-stem, and in which bearing said hub is free to slide. In a third arm *n*² of the yoke N' is formed a fulcrum-notch *n*³ (see Fig. 3) for the hook end of a lever O, that has a perforation through which the valve-stem *v* passes freely, said lever resting on the clamping-nut *m*², so as to exert pressure upon the diaphragm M, the lever being suitably weighted to hold the valve off its seat against a given pressure in the passage *l*, and consequently in the reservoir A.

By the described construction of automatic pressure-regulating valve said valve may also be used as a cut-off valve by the manipulation of the hand-wheel V' on valve-stem *v*, as will be readily understood.

Instead of weights for the lever O, a spring may be used for holding the valve off its seat and means provided for adjusting the tension of the springs.

The operation of the described devices is as follows: A liquid combustible may be first pumped into the reservoir by coupling the hose H to the pump branch *g*³, in the outer end of which hose is a valve opening inwardly to prevent the return of the liquid combustible, and a strainer to prevent entrance of any solid matter. The liquid may be pumped into the reservoir from a barrel or from a bucket, as shown, until said reservoir is nearly full, sufficient space being left for the elastic or compressible fluid. During the operation of filling the reservoir the pressure-regulating cock may be opened to allow the air in the reservoir to escape, the valve V being closed. After the proper supply of liquid combustible has been pumped into the reservoir the pressure-regulating cock is closed and the hose disconnected from the pump, which is now used to pump air into the reservoir until the manometer indicates that the proper or desired pressure has been reached. The valve V is now placed in condition to operate automatically by unscrewing the hand-wheel V' sufficiently to allow the valve V to move completely off its seat when the lever is weighted to force said valve more or less off its seat and hold it in this position against the pressure in the reservoir A, the combustible liquid being thus forced to the burner or burners at any desired pressure.

The operation of charging the reservoir may be varied. An elastic gas may be forced into the reservoir and compressed to a minimum pressure, and the combustible liquid may be forced into the reservoir afterward to compress the gas to a maximum pressure.

When the combustible liquid is exhausted and no air has been allowed to escape, a fresh supply of such liquid may be forced into the reservoir to again compress the air therein to its previous maximum.

When a combustible liquid of greater specific gravity than water is used, a certain quantity of water may first be pumped into the reservoir filled with air at a normal or atmospheric pressure to give the minimum pressure, the combustible liquid being then forced into the reservoir until the maximum pressure is reached, the liquid combustible subsiding below the water.

When, on the contrary, the combustible liquid employed is of less specific gravity than water and floats thereon, a given quantity of water may be forced into the reservoir, first, to compress the imprisoned air until the minimum pressure is reached. Then the combustible liquid is forced into the said reservoir to further compress the air until the maximum pressure is reached. In this case the supply-pipe will project into the reservoir to a point above the level of the water

therein. Finally, an elastic fluid and a combustible liquid may both be forced into the reservoir at the same time, the elastic fluid in quantity sufficient to produce the maximum
5 pressure.

When an elastic fluid—such as air—is used for forcing the combustible liquid, the larger the space left for the air at the maximum forcing pressure the more uniform will be the
10 pressure at which the combustible liquid will be supplied to the burner or burners.

Any other elastic or compressible gas may be used instead of air.

Practical demonstration has shown that
15 an apparatus the reservoir of which is about twenty-one inches deep and fifteen inches average internal diameter will give space for inclosed air at a maximum pressure of twenty-five to thirty-five pounds to the square
20 inch, (which air may be forced in by the pump shown in a few minutes,) and for combustible liquid sufficient to supply a burner equal to two thousand five hundred
25 of one thousand candle-power for seven or eight hours, without further addition of oil or air or further attention, except occasional regulation of the cock supplying the combustible liquid to the burner, and even this
30 may be dispensed with when the automatic pressure-regulating valve above described is employed.

The reservoir may, for convenience, be provided with a level-indicator P, Fig. 1, and
35 may be made portable by mounting the same on wheels, as shown in Fig. 1, a support A⁴ being provided in addition to the wheels to prevent the reservoir from tilting.

Having described our invention, what we
40 claim is—

1. In the art of illuminating with combustible liquids, a portable reservoir, a fluid-delivery pipe having its inlet near the bottom of said reservoir, a burner or burners connected with the supply-pipe, and a force-pump having
45 its suction or inlet open to the atmosphere and its discharge in proximity to the bottom of the reservoir, said parts constituting a portable illuminating apparatus, substantially as described.

2. In the art of illuminating with combustible liquids, a reservoir mounted on wheels, a fluid-delivery pipe having its inlet near the bottom of said reservoir, a burner or burners connected with the supply-pipe, and a force-
55 pump having its suction or inlet open to the atmosphere and its discharge in proximity to the bottom of the reservoir, said parts constituting a portable illuminating apparatus, substantially as described.

3. In the art of illuminating with combustible liquids, a portable reservoir, a fluid-supply pipe having its inlet near the bottom of the reservoir, a burner or burners connected with said pipe, a pressure-regulating valve
65 interposed in the supply-pipe between the burner and reservoir, and a pressure-indicator for said reservoir, in combination with a force-pump having its suction-port open to the atmosphere and its discharge-port in proximity
70 to the bottom of the reservoir, said parts constituting a portable illuminating apparatus, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

ROUGHSEGE WALLWORK.

ARTHUR C. WELLS.

Witnesses:

PETER J. LIVSEY,

WILLIAM FAULKNER.