(No Model.)

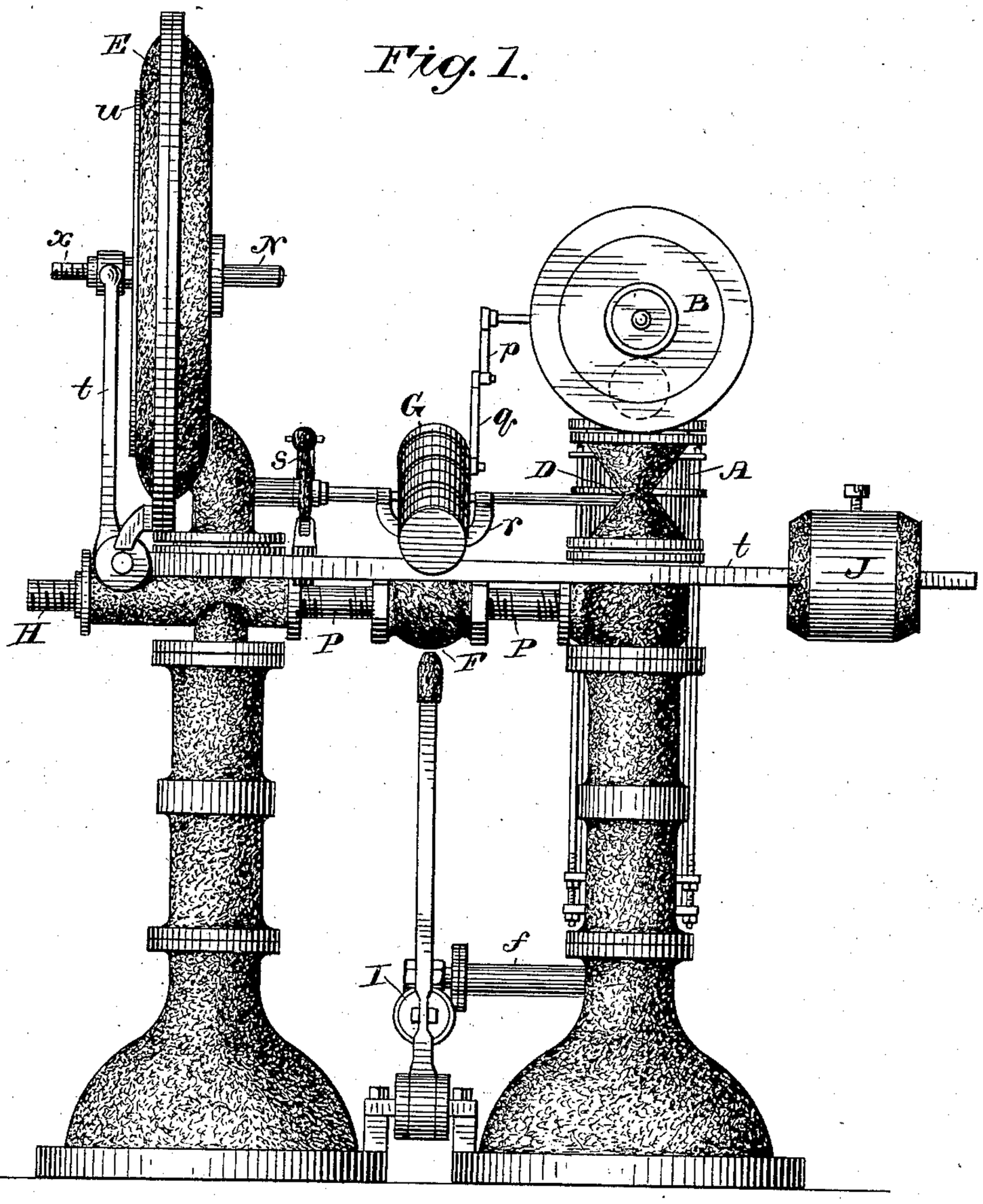
3 Sheets—Sheet 1.

H. COTTRELL.

PROCESS OF VAPORIZING OIL.

No. 406,504. Patented July 9, 1889.

Fig. 1.



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BY

Edward P. Thompson.

ATTORNEY

(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

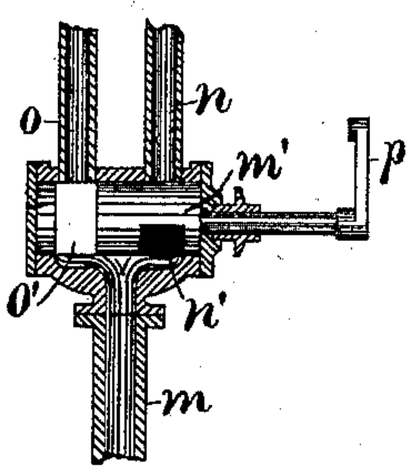
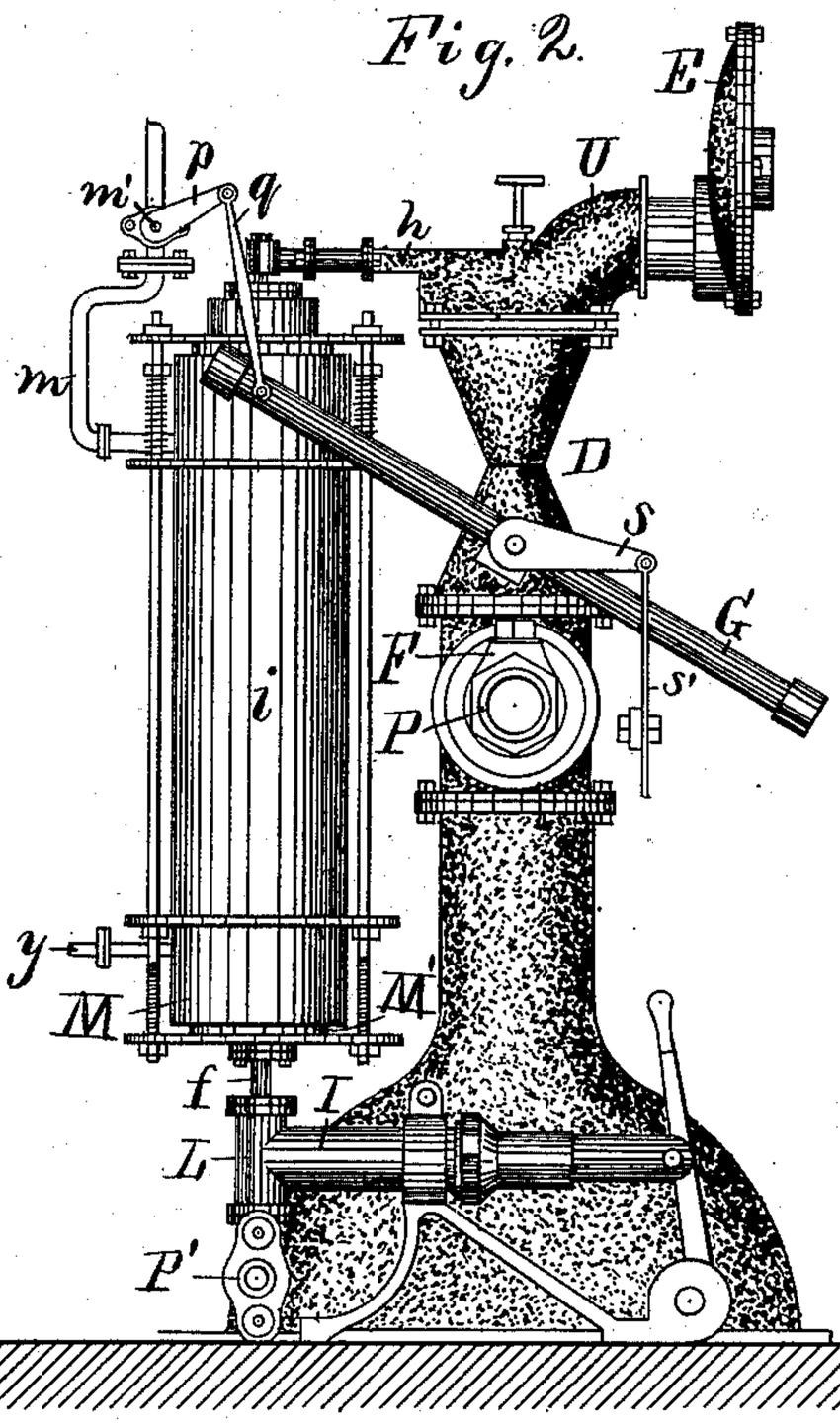


Fig. 2.



Attest:
L. Lee.
F. C. Fischer.

Inventor.
H. Cottrell, per
Crane & Miller, attys.

(No Model.) 3 Sheets—Sheet 3.

H. COTTRELL.

PROCESS OF VAPORIZING OIL.

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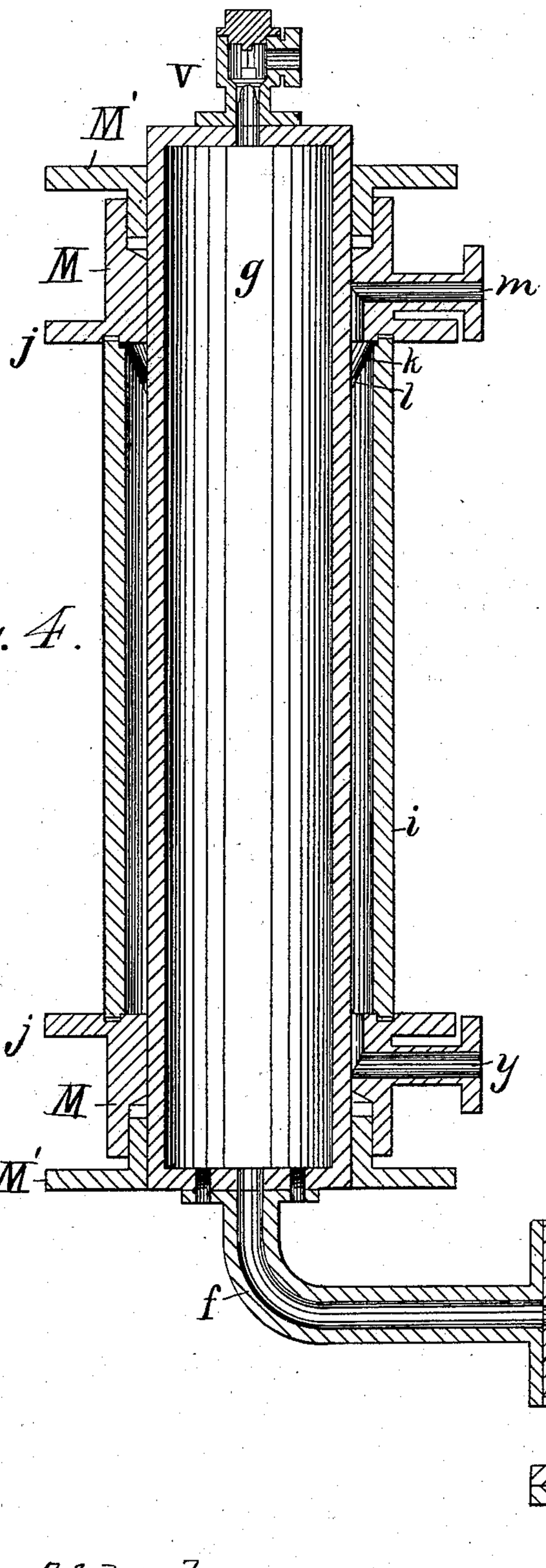

Fig. 4.

Attest:
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UNITED STATES PATENT OFFICE.

HERBERT COTTRELL, OF NEWARK, NEW JERSEY.

PROCESS OF VAPORIZING OIL.

SPECIFICATION forming part of Letters Patent No. 406,504, dated July 9, 1889.

Application filed December 22, 1887. Serial No. 258,664. (No model.)

To all whom it may concern:

Be it known that I, HERBERT COTTRELL, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in the Process of Vaporizing Oil, of which the following is a specification.

This invention is adapted to all processes in which hydrocarbon or equivalent fluid is vaporized in a generator by the application of heat; and the object of the invention is to furnish a method for automatically supplying the hydrocarbon fluid to the generator, and thus avoiding, upon the one hand, the use of feeding-pumps or similar devices to force the fluid therein, and upon the other hand the risk of overcharging the generator when the liquid is supplied by gravity.

The improvement consists, essentially, in cooling the generator at intervals to produce a partial vacuum therein, and thereby draw the liquid into the generator from a reservoir below its level. It also consists partly in discharging the vapor from the generator against a regulated pressure, and positively cooling the generator when such pressure rises too high, the cooling producing a partial vacuum, which operates to lift the fluid from its reservoir into the generator to renew the supply of liquid before the generation of vapor is resumed.

The apparatus shown herein is the same as that claimed in my application, Serial No. 253,951, filed November 1, 1887; but other forms of apparatus may be used to carry out my invention.

In the drawings, Figure 1 is an elevation of the machine, viewing the edge of the receiver and the face of the inspirator inlet-valve. Fig. 2 is an elevation of the same, taken in section on line *x x* in Fig. 1, the standard with the gas-receiver being removed by such section. Fig. 3 is a section of the generator-jacket supply-valve on line *x x* in Fig. 2, but on a larger scale. Fig. 4 is a central longitudinal section of the generator and the valve-box attached to its suction-pipe.

The drawings represent the apparatus constructed with two pedestals P^5, one of which sustains the receiver E and the other the inspirator D, while the generator A is sustained by pipe-connections *f* (at the bottom) to the valve-box L and the pipe-connection *h* at the top of the inspirator.

The generator shown in the drawings consists in a tube or shell *g*, provided with a jacket *i*, which is fitted to the opposite ends of the generator by stuffing-boxes M, having glands M′ adapted to hold a packing to make a tight joint with the shell of the generator. The inner sides of the stuffing-boxes are grooved to fit the ends of the jacket *i*, and the stuffing-boxes are pressed toward the ends of the jacket by rods R′, extended through flanges *j*, formed upon the stuffing-boxes and through the flanges of the glands M′. Nuts *n′* are applied to the ends of the rods to hold the casing and stuffing-boxes securely together, and provision is made for the longitudinal expansion of the jacket *i* by inserting springs S′ between the flanges *j* and nuts N′, applied upon the rods inside one of the glands. The jacket is provided with an inlet-pipe *m* and outlet-pipe *y*, the latter being preferably connected with an open waste-pipe and operating to continuously drain the jacket of its contents. The pipe *m* is provided with a supply-valve *m′*, the latter having two inlet pipes or passages *n* and *o*, and the valve is constructed with ports *n′* and *o′* to alternately connect such pipes or passages with the pipe *m*. A tilt-lever G, consisting in an iron tube closed at the ends, with a charge of mercury inside, is supported upon a rock-shaft *r* and connected by a link *q* with a crank *p* to operate the valve *m′*.

The hydrocarbon vapor formed in the generator passes from the top of the generator through a check-valve V, and thence into a pipe *h*, communicating with the nozzle R of the inspirator. The body of the inspirator is formed with chamber T in its upper portion and chamber W below the same, the latter connecting with a pipe P and a check-valve F, which delivers the mixed air and vapor to the receiver E. The chamber T communicates through a passage U in the head-piece with a casting B, having a flexible flap-valve Z fitted therein over a hole Y, to which the air has free access. The receiver is formed of a dish-shaped or concave casting, having a flexible diaphragm *v* attached to its periphery and clamped about its middle by two cir-

cular collars *u*. The collars are provided with arms and with hubs *z*, to which latter is attached a guide-rod *x*, the inner end of which slides in an axial socket N, while the outer end is pivoted to a bent lever *t* for actuating the tilt-lever G. A weight J is affixed to the free end of the bent lever *t*, and a gas-pipe H is attached to the pipe P outside of the receiver to deliver the mixed air and vapor. The bent lever actuates the tilt-lever by an arm *s*, fixed upon the rock-shaft and connected with the lever *t* by a slotted link *s'*, such construction permitting the tilt-lever to move suddenly after it has been carried to the horizontal position by the lever *t*, as is common with such mechanism.

The valve-box L contains two check-valves *a* and *b*, between which is connected the bore *d* of the pump-barrel *c*, and a plunger I, fitted to the pump, furnishes the means of drawing the hydrocarbon fluid through pipe *p'* and discharging it through pipe *f* into the lower part of the generator.

In operating the machine such pump, if used, would be operated by hand, or the receiver charged with an initial supply of hydrocarbon fluid in any convenient manner.

The operation of the apparatus thus charged is as follows: The pipes *n* and *o* are connected with suitable supplies of hot and cold fluid—as steam, water, or air—and the valve *m'* is turned to admit the heated fluid to the jacket *i*. Such heated fluid, when introduced by the pipe *m*, flows first into a conical distributer *k*, (shown in Fig. 4,) formed of thin metal and clamped by means of a flange (formed at its larger end) between the jacket *i* and stuffing-box N. The heating-fluid passes through notches *l*, which are formed in the distributer adjacent to the shell of the generator G, such notches being formed all around the distributer to throw the heating or cooling fluid into contact with all parts of the shell. The heat applied to the generator vaporizes the liquid which passes through the check-valve V into the nozzle of the inspirator, the opening of which is regulated by a valve-rod Q. With the valve properly adjusted, the vapor operates to draw a current of air through the inlet-aperture Y, and the delivered air and vapor then pass through the check-valve F to the receiver E and delivery-pipe *h*. The pressure of the vapor operates to expand the diaphragm *v* of the receiver, and to lift the weight J by moving the bent lever *t*, thus holding the valve *m'* in the desired position to supply the hot fluid to the jacket *i*, so long as the generation of vapor exceeds the consumption or draft upon the delivery-pipe *h*. When the pressure of the vapor falls below the desired limit, the diaphragm *v* is pressed inward by the operation of the weight J, and the link *s'* then operates gradually to shift the tilt-lever G and valve *m'* until the tilt-lever passes a horizontal position, when the mercury within its tube immediately shifts to the opposite end of the tilt-lever, and turns the valve *m'* into a suitable position to admit cold fluid to the jacket of the generator. Such cold fluid rapidly condenses the vapor in the generator, producing a sufficient vacuum therein to draw the hydrocarbon liquid from its reservoir, the current of cold fluid passing into the pipe *m* and from the pipe *y* until the discharge of vapor from the receiver, under the pressure of the weight J, shifts the bent lever to reverse the position of the tilt-lever and admit the hot fluid through the valve *m'*. The hot fluid would then flow again into the jacket and operate to vaporize the liquid therein, as before, such vaporization continuing until the pressure in the receiver has again lifted the weight J and shifted the tilt-lever to admit the cooling-fluid to the jacket. If the draft upon the machine were about equal to its normal capacity, the supply of hydrocarbon liquid would thus be intermittently drawn into the generator and vaporized at the desired rate; but if the demand upon the machine should cease the generation of vapor would be also stopped, as it could continue only until the increase of pressure in the receiver operated to raise the weight J, and thus turn the valve *m'* into the position to direct the cooling-fluid into the jacket. The cooling of the generator would arrest the formation of vapor, and the generator of the latter could not be resumed until the excess of pressure in the receiver above the regulated point was again reduced.

Whenever the pressure of vapor in the receiver was too high it would indicate that the production of vapor was greater than its consumption, and that the generator should be cooled off, and such effect would follow from the automatic movement of the valves and levers connected with the diaphragm *v'*.

It is understood that the reservoir of volatile fluid connected with the pipe *p'* is below the level of the generator, and the fluid is thus prevented from flowing into the generator except when drawn therein by means of the vacuum produced by the condensation of the vapor. The valve V at the discharge-outlet of the generator prevents the return of the vapor when discharged thereat, and the vacuum when formed in the generator results directly in drawing a portion of the unvaporized liquid into the generator, as desired.

It will be seen that the vacuum could not be produced without the presence of the vapor, and that the alternate application of heat and cold to the same generator is therefore necessary to effect the alternate discharge of the vapor and the drawing in of the liquid.

Having thus set forth my invention, what I claim herein is—

1. In the art of generating vapor from a hydrocarbon liquid, the method of drawing the liquid intermittently into the generator, which consists in intermittently heating and

cooling the generator, and forming a partial vacuum therein, to lift the liquid from its reservoir, substantially as herein set forth.

2. The process of generating vapor from a hydrocarbon liquid, which consists, first, in supplying the liquid to the generator; secondly, heating the generator to vaporize the liquid; thirdly, cooling the generator to condense the contained vapor and form a partial vacuum, and, fourthly, drawing the liquid into the generator from its reservoir by such vacuum, substantially as herein set forth.

3. The process of manufacturing an illuminant with hydrocarbon vapor, which consists, first, in supplying the hydrocarbon fluid to the generator; secondly, heating the same to vaporize the liquid; thirdly, discharging the vapor from the generator against a regulated pressure; fourthly, cooling the generator when such pressure rises too high, to produce a partial vacuum, and, fifthly, drawing the liquid into the generator from its reservoir by such vacuum, substantially as herein set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 30th day of November, 1887.

HERBERT COTTRELL.

Witnesses:

LOUIS A. SAYRE,

HOWARD C. CONDIT.