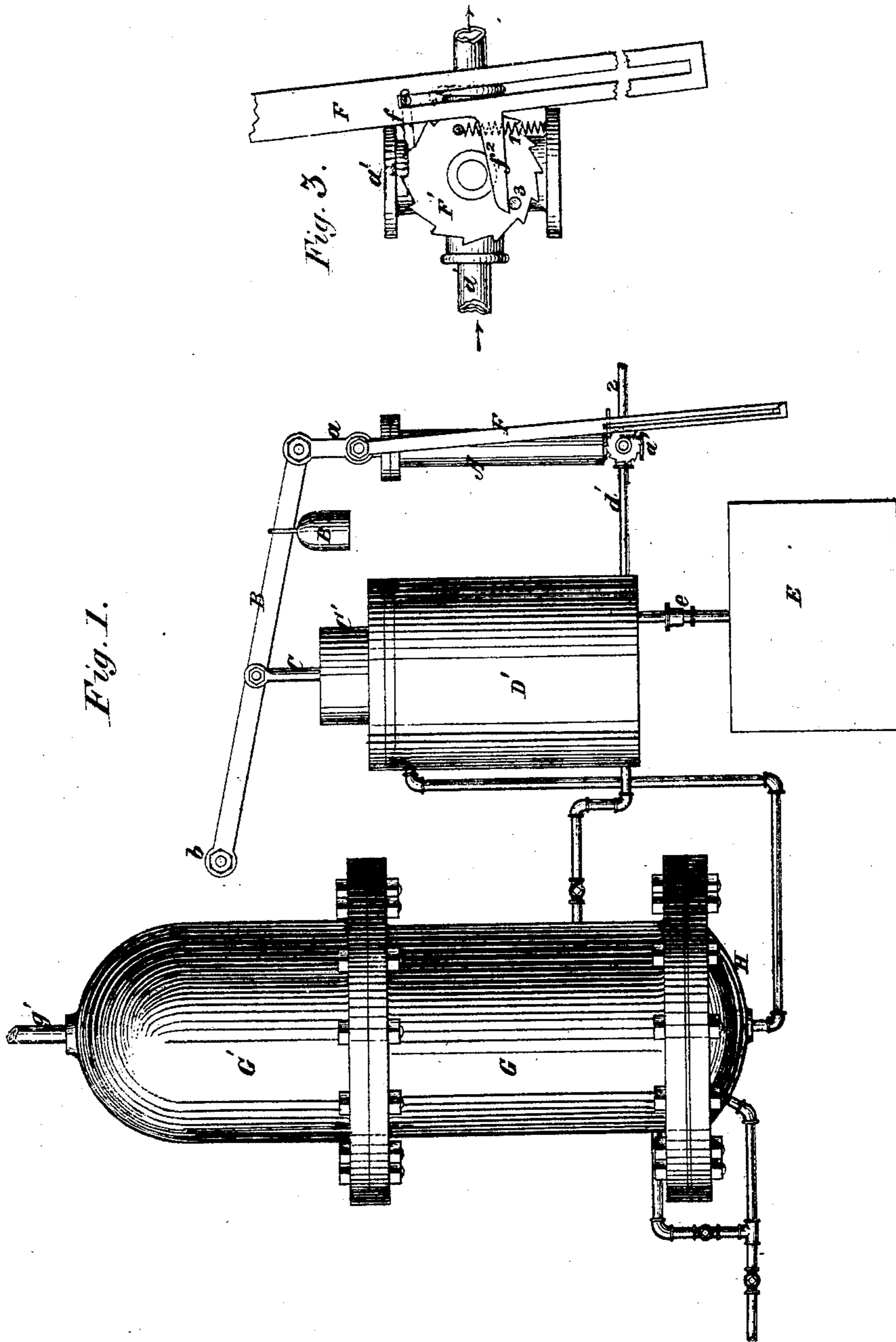


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Improvement in Apparatus for Generating Hydrocarbon Vapor.

No. 114,603.

Patented May 9, 1871.



Witnesses:

J. C. Brecht.  
Wm. H. Rowe

Inventor:

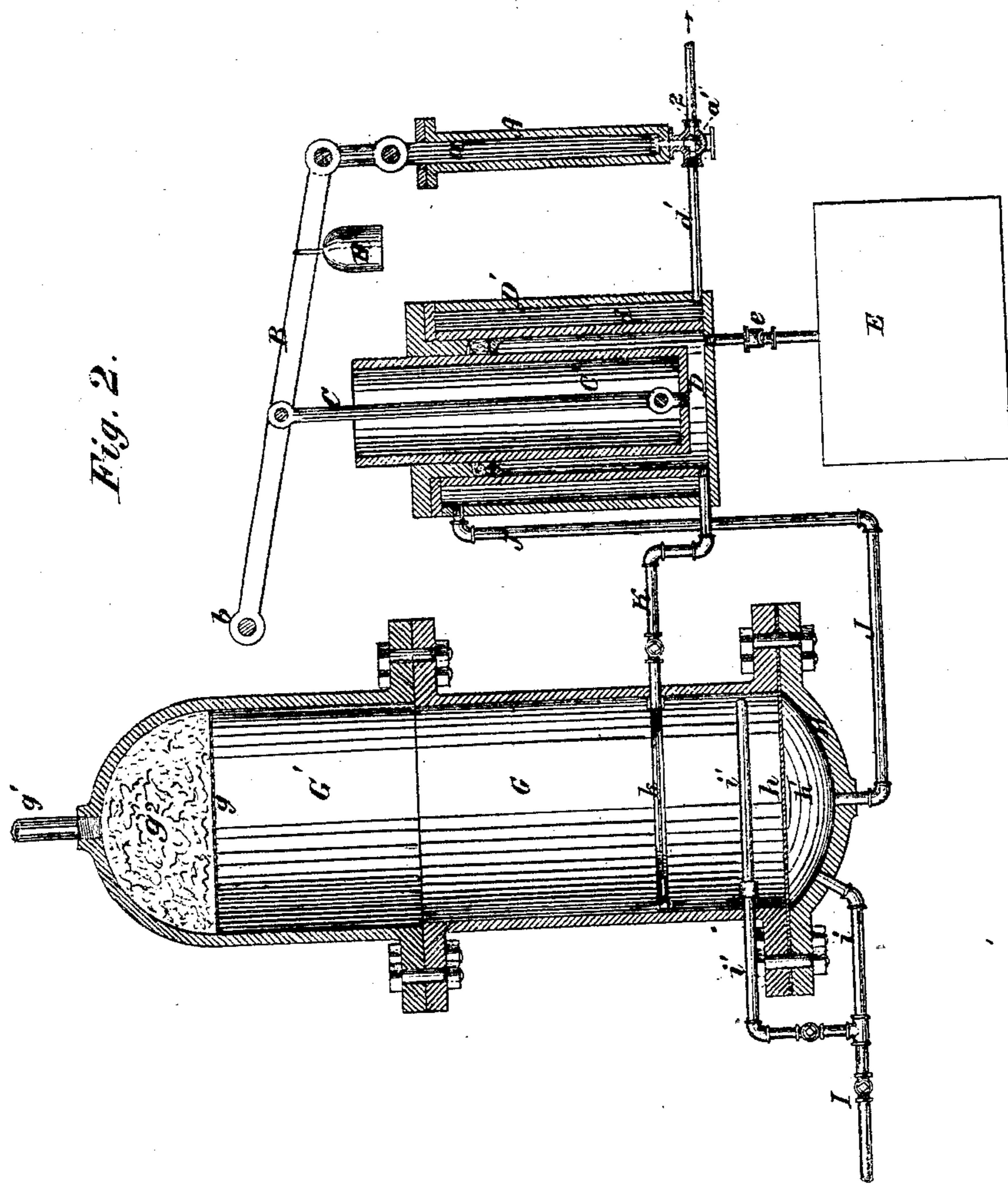
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# UNITED STATES PATENT OFFICE.

WILLIAM R. ROBERTS, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN APPARATUS FOR GENERATING HYDROCARBON VAPOR.

*Specification forming part of Letters Patent No. 114,603, dated May 9, 1871.*

*To all whom it may concern:*

Be it known that I, WILLIAM R. ROBERTS, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Hydrocarbon-Vapor Generators, of which the following is a specification.

My invention relates to that class of vapor-generators in which a liquid hydrocarbon, such as petroleum, for instance, is exposed to the action of superheated steam, the vapor thus produced being used for lighting or heating purposes.

The object of the first part of my invention is automatically to feed the hydrocarbon to the generator; and the improvement, to this end, consists, first, in combining with the injection-pump mechanism to automatically force out the plunger, and to force it in again, so the injector may quickly be filled with oil, which is gradually and gently supplied to the generator in regulated quantities; second, my improvement further consists in operating the injection-pump by the waste steam from the generator by means of the automatic apparatus hereinbefore specified.

The next part of my invention relates to the injection-pump. Its object is to heat the oil before forcing it into the generator; to which end the improvement consists, third, in combining with the oil-pump or injector a steam-jacket, which envelops it, and through which jacket steam is conveyed to the injection-pump from the generator.

The next part of my invention relates to the generator and receiver; and the improvement consists, fourth, in combining the offices of both the generator and receiver heretofore employed in a single column or chamber without vertical tubes, or an oil-reservoir, thus simplifying the cost, construction, and efficiency of the apparatus; fifth, my invention further consists in combining with the generator a heating-chamber separated from it by a diaphragm or dome of thin sheet metal of high conducting power, into which chamber superheated steam is admitted, and from which the waste steam may be conducted to the injection-pump and injector, either or both; sixth, my improvement further consists

in combining with the generator a perforated oil-supply pipe, which deposits oil on the diaphragm above mentioned to be vaporized; seventh, my invention further consists in combining with the oil-supply pipe in the generator a steam-jet pipe, through which superheated steam is injected upon the diaphragm to mingle with the vapor evolved from the hydrocarbon, and to prevent any deposit of solid carbon upon the diaphragm; eighth, my invention further consists in combining the injection-pump, oil-pump, or injector and generator, substantially as hereinafter set forth; ninth, my invention further consists in combining the injection-pump, injector, oil-supply pipe, steam-jet generator, heating-chamber, and its steam-pipes, substantially as hereinbefore set forth.

The accompanying drawing shows all my improvements embodied in one apparatus, the details of construction of which obviously may be varied in various well-known ways without departing from the spirit of my invention.

Some parts of my improved apparatus may be used without the others, and may likewise be adapted to other apparatus of different construction from that shown.

Figure 1 represents a view in elevation of so much of my improved apparatus as is necessary to illustrate the invention herein claimed. Fig. 2 represents a vertical longitudinal central section through the same. Fig. 3 represents the details of the automatic cut-off which operates the valve of the injection-pump.

A steam-tight cylinder, A, is provided with a plunger, *a*, pin-jointed to a lever, B, pivoted at *b* to some fixed part of the frame-work of the apparatus or building. The lever is provided with a weight, B', for a purpose hereinafter described. A pitman, C, is pin-jointed at one end to this lever B, and at the other to the head of a plunger, C', working through a tight stuffing-box in a cylinder, D, which I call the injector. Oil or petroleum is conveyed from a suitable tank, E, located in any proper place, to this injector, through a pipe, *e*. The injector is surrounded by a jacket, D', forming an annular steam-space, *d*, for a purpose hereinafter described. A steam-pipe, *d'*, leads

from the steam-space  $d$  to a two-way cock or valve,  $a$ , through which steam is conveyed to the cylinder A. The details of the mechanism for tripping this valve are shown in Fig. 3. A slotted link, F, is pivoted to the plunger  $a$ .

In the drawing, the valve is represented as open, and with the plunger in the act of rising. As the plunger lifts, the link F also rises and releases its pawl  $f$  from the ratchet-wheel F' on the valve-spindle. As soon as this ratchet is released by the pawl, the spring 1 turns the two-way cock, so as to cut off the steam and open the exit-port 2. The steam then escapes from the cylinder A, and the plunger descends to its normal position. In its descent, a toe,  $f^2$ , on the link strikes a pin, 3, on the ratchet-wheel F', and opens the valve again, when the operation above described is repeated. It is obvious that other and well-known forms of cut-offs might be adapted to working this plunger. As the lever B rises, the plunger C' is lifted, and oil is drawn from the tank into the injector D.

In order to simplify the construction of the apparatus, I by preference construct the generator of a simple cylinder, G, and bolt a similar receiver, G', directly upon it.

The dome or upper end of the receiver is provided with a wire-gauze diaphragm,  $g$ , forming a chamber,  $g^2$ , to contain broken pumice-stone, or other porous substance, to prevent the puffing or pulsation of the vapor as it escapes from the receiver. A pipe,  $g^1$ , leads from the receiver to the point where the vapor is to be used. The lower part of the generator is closed by a diaphragm,  $h$ , of thin sheet metal, by preference of copper, clamped between the flanges of the generator and the head H, so as to form both a partition and a packing between the joint of the head and generator. A pipe, I, conducts superheated steam from a suitable furnace or superheater to the steam-chamber  $h'$ . This superheater need not be described here, as it forms no part of the subject-matter herein claimed, and is well known in its various forms of construction to skilled engineers. This pipe I is provided with suitable valves and cock-stops. One branch,  $i$ , of it enters the heating-chamber  $h'$ , as above mentioned, while another branch,  $i$ , enters the generator above the diaphragm  $h$ , passes around it, and is perforated with numerous small holes on its under side to direct minute jets of superheated steam down upon the diaphragm. A pipe, J, conducts steam from the chamber  $h'$  to the annular chamber D' surrounding the injector, and a pipe,  $d'$ , conducts steam from this annular chamber to the cylinder A, as above described. A pipe, K, leads from the injector to a pipe,  $k$ , encircling the interior of the generator, and slotted on its inner side, so as to allow the oil to drip from it.

The operation of my improved apparatus will readily be understood from the foregoing description.

To begin the operation, the superheated steam is turned on to heat the various parts of the mechanism, proper outlets being provided for condensed steam to escape, which outlets are not shown, being of obvious construction.

When steam is admitted to the cylinder A its plunger rises and lifts the plunger C' of the injector at regulated intervals by the automatic devices hereinbefore described, thus drawing oil from the tank into the injector.

When the steam is cut off from this cylinder A, the counter-balance B' gradually forces down the plunger C', and drives the oil from the injector D' through the pipe K' into the generator, where it drips down upon the heated diaphragm  $h$  and is vaporized, being mingled with steam from the jet-pipe  $i'$ .

I thus by my invention secure a simple, cheap, and efficient apparatus, which flashes the petroleum into vapor in an unobstructed chamber, into which it is gradually fed in a continuous stream as rapidly as may be necessary, but only exposes so much of the petroleum at a time as may actually be required to the intense heat of the generator.

I also mingle the steam and vapor in regulated proportions in the act of generating it, instead of mingling it in the receiver after being generated, or of boiling the vapor in a tubular generator, which may, under some circumstances, become clogged.

In my apparatus the generation of vapor is instantly stopped by cutting off the supply, which cannot be done in a tubular generator containing a large quantity of the oil.

I claim as my invention—

1. The combination, in a hydrocarbon-vapor generator, of the plunger of the injector with the injection-pump, and its automatic mechanism, or its equivalent, so as quickly to lift the plunger to fill the injector, and gradually to force the oil into the generator, these members being constructed to operate in combination, substantially as hereinbefore set forth.

2. The combination, in a hydrocarbon-vapor generator, of the injector, its surrounding steam-chamber, the injection-pump, its automatic mechanism, and the steam-pipe leading from the steam-chamber to the injection-pump, all these members being constructed to operate in combination, substantially as hereinbefore set forth, to operate the injector by its own waste steam.

3. The combination, in a hydrocarbon-vapor generator, of a tank, a supply-pipe leading from the tank to the injector, an injection-pipe, leading from the injector to the generator, and the heating-chamber enveloping the injector, all these members being constructed to operate in combination, substantially as hereinbefore set forth, to heat the oil before reaching the generator.

4. The combined generator and receiver, constructed, as hereinbefore described, of two cylindrical sections arranged one above the

other, without vertical tubes or an oil-reservoir.

5. The combination, in a hydrocarbon-vapor generator, of the steam-chamber, its steam-pipes, the diaphragm, and the generator, all these members being constructed to operate in combination, substantially as hereinbefore set forth, so as to heat both the generator and injector.

6. The combination of the generator, its diaphragm, and the slotted oil-supply pipe encircling the interior of the generator, these members being constructed to operate in combination, substantially as described, to inject oil upon the heated diaphragm.

7. The combination of the generator, its diaphragm, the oil-supply pipe, and the steam-jet pipe, all these members being constructed to operate in combination, substantially as hereinbefore set forth.

8. The combination of the injection-pump,

the injector, and the generator, all these members being constructed to operate, in combination, substantially as hereinbefore set forth, automatically to inject oil in regulated quantities into a vaporizing-chamber.

9. The combination of the injection-pump, the injector, the oil-supply pipe, the steam-jet, the generator, its heating-chamber, and the series of steam-pipes, all these members being constructed to operate, substantially as hereinbefore set forth, automatically to inject, vaporize, and mingle heated oil with steam in a generator unobstructed by oil-reservoirs or nests of tubes.

In testimony whereof I have hereunto subscribed my name.

WILLIAM R. ROBERTS.

Witnesses:

WM. B. DAYTON,

WM. E. MORGAN.