

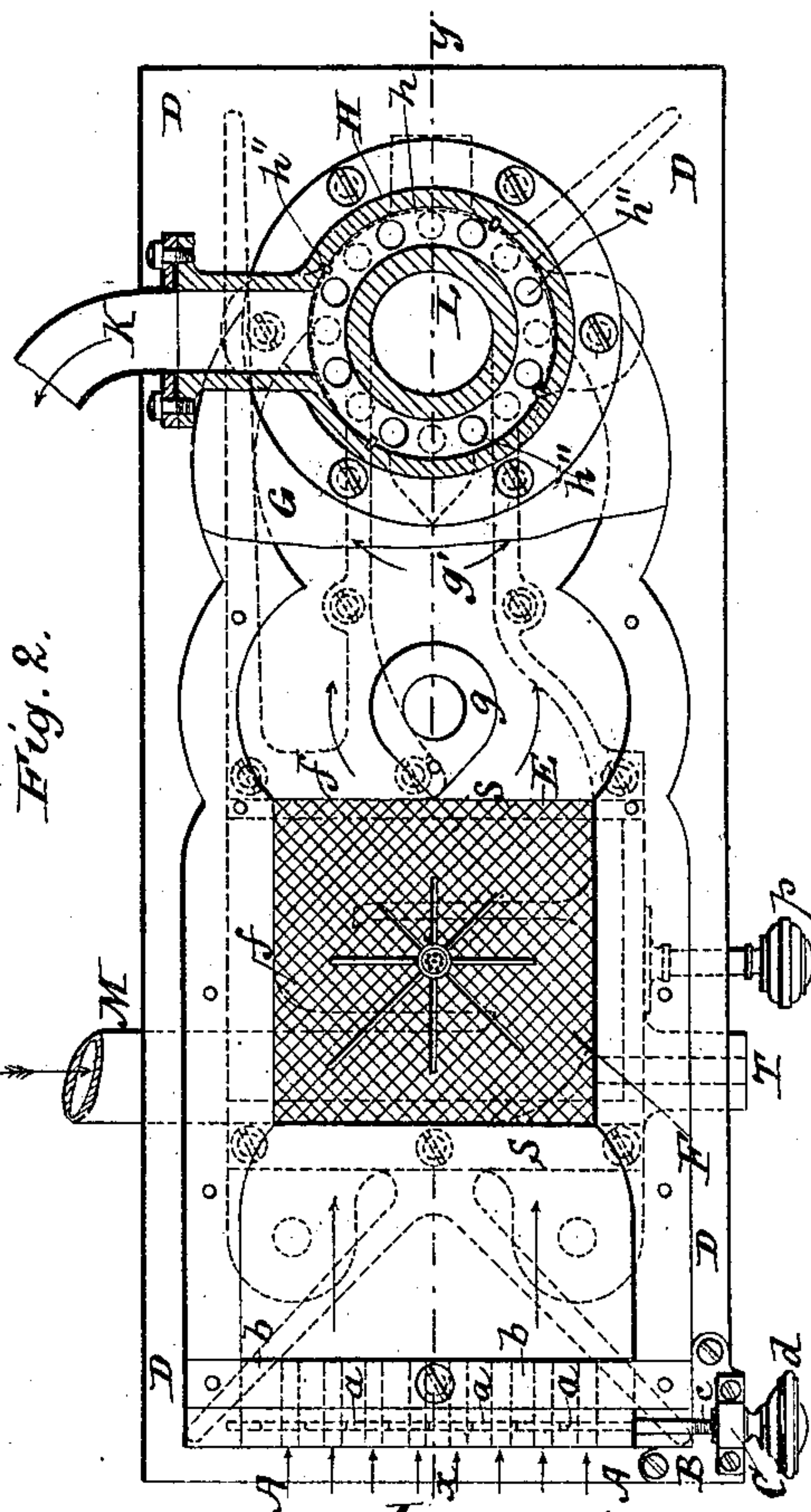
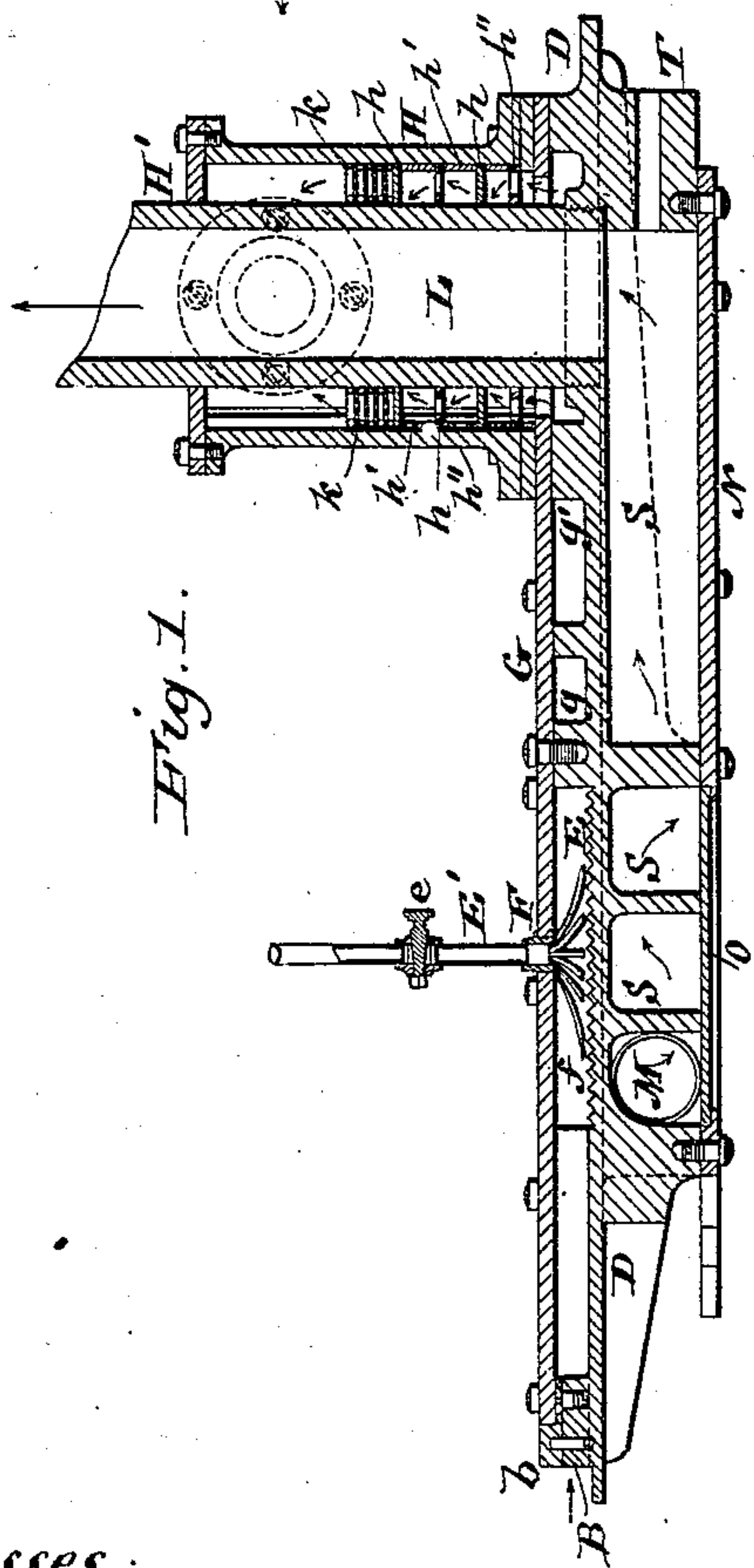
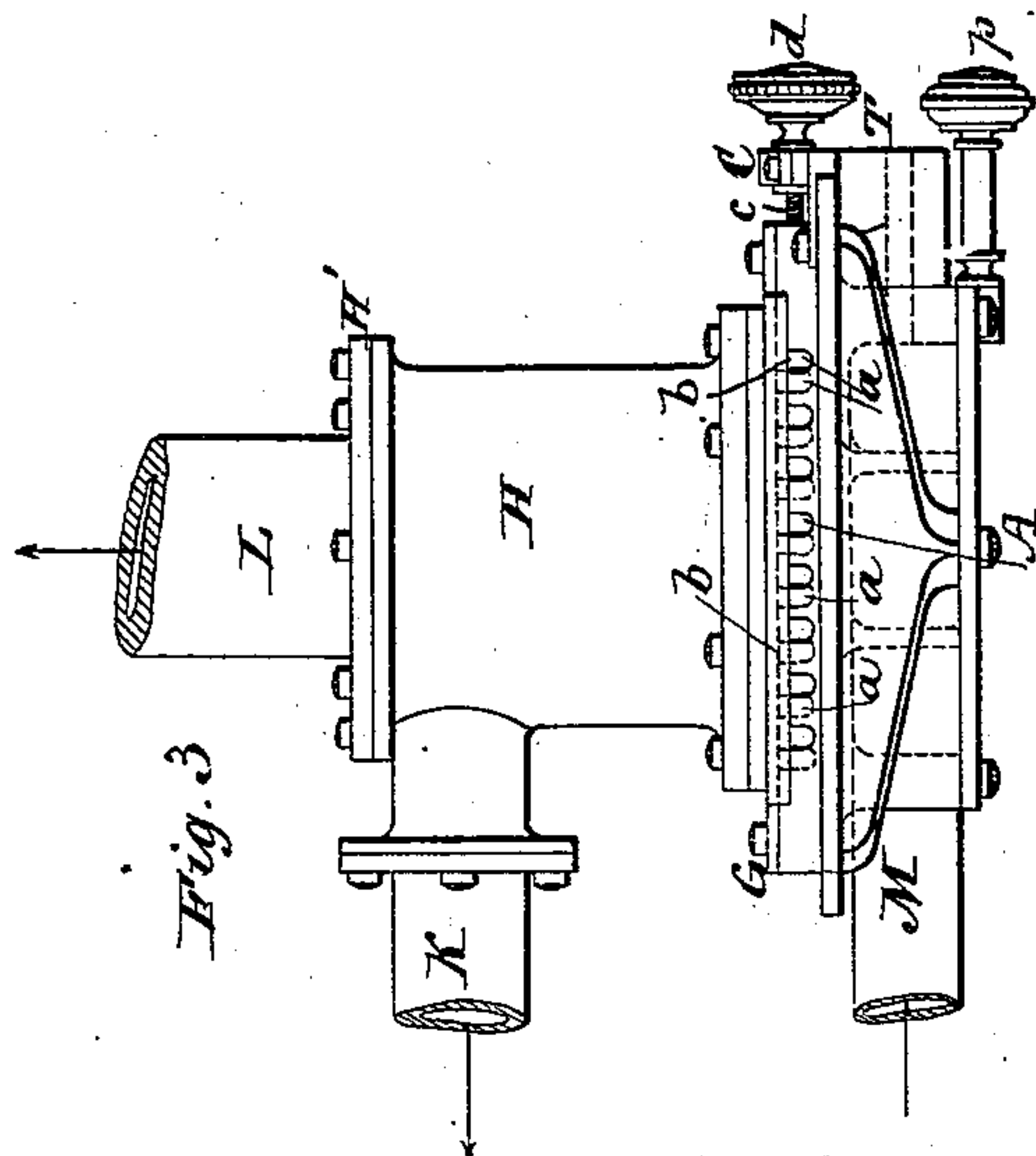
(No Model.)

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PROCESS OF AND APPARATUS FOR CARBURETING AIR.

No. 255,948.

Patented Apr. 4, 1882.



Witnesses :

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PROCESS OF AND APPARATUS FOR CARBURETING AIR.

SPECIFICATION forming part of Letters Patent No. 255,948, dated April 4, 1882.

Application filed August 25, 1881. (No model.) Patented in England July 8, 1880.

To all whom it may concern:

Be it known that I, EARDLEY LOUIS CHARLES, COMTE D'IVERNONIS, of Paris, in the Republic of France, have invented certain new
5 and useful Improvements in Processes of and Apparatus for Carbureting Air for use in Gas-Engines and for other Purposes, of which the following specification is a full description.

The present invention has for its object to
10 enable air to be carbureted so as to form at will an explosive mixture adapted for use in gas-engines, or a combustible gas capable of burning for the production of light or heat, to utilize the waste gases from a gas-engine in
15 the carbureting process, and also to produce a simple and efficient carbureting apparatus embodying or capable of use for carrying into effect the above-mentioned principles.

The process of carbureting air and rendering it either explosive or illuminating at will
20 consists in placing a hydrocarburet in contact with a body heated to a temperature sufficient to vaporize the hydrocarburet immediately, and in mingling the required proportion of vapors thus produced with the air which it is
25 desired to render carbureted.

In the present invention the heated body generally employed for vaporizing the hydrocarburets is a metallic plate, and although the
30 invention is not limited to a plate, yet in this specification the words "hot-plate" will be used to indicate the body on which the hydrocarburets are vaporized. This plate forms the bottom of a kind of box or chamber of
35 small height, and provided with openings, some of which serve to admit the exterior air, and others to conduct away this air to where it is to be utilized after having been carbureted in said box by its intermixture with the vapors produced by the flow of the hydrocarburet onto the hot-plate forming the bottom of
40 said box.

When the present process is employed for working engines driven by explosion the hot-
45 plate may be maintained at the required temperature either by means of the heat developed in the cylinder by the explosions or by means of the residual gases from the explosions, and in this latter case the degree of this temperature may be regulated by means of a cock

placed in a convenient position on the escape or exhaust pipe of the engine, or on the box itself, for the purpose of permitting the entry of the whole or a part only of the residual gases from the explosions. In consequence of
55 this new and excellent utilization of the heat in these machines, which is usually lost, gas-engines may be worked in the open country as in towns, or in fact wherever they may be required, by means of the small vaporizing apparatus, whereby these engines are enabled to
60 produce their own gas.

For practically applying the above process all that is required is to cause the residues from the explosions, when they leave the cylinder, to pass under the hot-plate. The temperature of these gases is sufficiently high to
65 easily maintain the temperature of the hot-plate for the continuous vaporization of the hydrocarburet.

Supposing it to be required to work a gas-engine by means of the present process, and that the cylinder of this engine sucks or draws in at each stroke of the piston two liters (two thousand cubic centimeters) of explosive mixture, composed, for example, of ninety-seven per cent. of air (nineteen hundred and forty cubic centimeters) and three per cent. (sixty cubic centimeters) of hydrocarburet vapor, all that is required is, first, at each stroke of the piston to conduct onto the hot-plate the quantity of hydrocarburet liquid necessary to produce sixty cubic centimeters of vapor; and, second, to allow the entry during this time into the flat box or chamber of which the hot-plate forms the bottom of
80 nineteen hundred and forty cubic centimeters of air, which, on mixing with the nascent vapors on the hot-plate, forms the required explosive compound, and which, drawn in by the piston, as required, will fill the empty space in the cylinder, there to be ignited and cause explosion.

Pure atmospheric air may be introduced either into the cylinder or into the tubes leading to it when the air that has passed over the hot-plate is carbureted to too high a degree. As soon as the cylinder of the motor thus charged is closed the flow of carbureted air ceases naturally, to commence again at the required moment, and the action of the motor or engine goes on regularly and indefinitely.

For insuring the thorough mixture of the air with the vapors, and to prevent all possibility of a communication of flame to the mixture from the interior of the motor-engine to the exterior, it is advisable to provide the tubes through which the carbureted air flows from the hot-plate to the cylinder with checks or wire-gauze. It is also desirable to regulate the emission of the hydrocarburet onto the hot-plate in such manner that its vaporization takes place regularly and continuously, so that the various parts of the air passing over the hot-plate are carbureted.

It is of course necessary for the starting of the apparatus to heat the hot-plate to the required temperature, either by means of lamps, blow-pipes, braziers, chemical processes, or in any other suitable way, until the residual gases from the explosions are sufficiently great to maintain the required temperature.

By this process not only petroleum and volatile oils may be utilized, but also thick oils, (which are very economic,) by giving a higher or lower temperature to the hot-plate, according to the hydrocarburet to be vaporized.

Meters, cocks, pistons, bellows, or any other appliances or means may be employed for conducting the hydrocarburet onto the hot-plate through one or more pipes in any desired direction. It may also be allowed to flow with more or less force, and, if necessary, may be projected against a check or obstacle for dividing it and rendering it easy to vaporize. The appliances are regulated in such manner as to conduct the hydrocarburet gradually onto the hot-plate, so that the necessary quantity will be vaporized in the required time, so that the different parts of the air flowing onto the hot-plate during this time will be carbureted to the required degree. The quantity of air is easily regulated in proportion to that of the hydrocarburet by increasing or diminishing the size of the openings through which it is admitted to the hot-plate.

In using the present process for the manufacture of gas for illuminating purposes the proportion of mixture of the air and hydrocarburet vapor is regulated accordingly.

The carbureted air may be drawn off by the combustion at the burners, or may be forced onward by a fan-blower, if necessary. A blower may be employed to throw the air onto the hot-plate, even when it is required to work an explosive-engine. The tubes also, which are provided with checks and wire-gauze, through which the carbureted air passes in its passage from the hot-plate to the cylinder, may likewise be heated, if found desirable.

The air, previous to its mixture with the hydrocarburet vapors, may be heated by the residues from the explosions by causing it to circulate in tubes made to wind around or encircle the cylinder or its casing, or in any other manner.

It is preferred to roughen or corrugate the surface of the hot-plate by grooving, filing,

covering with wire, or in any other suitable manner, so as to render the vaporization of the hydrocarburet more rapid by increasing the heated area, and also to prevent the hydrocarburet from assuming the spheroidal state. This may also be prevented by regulating the temperature of the hot-plate so that it will be below that point at which the spheroidal state is produced in the hydrocarburet employed, or by placing above and at a short distance from the hot-plate another plate, which is intended to flatten or crush the drops of hydrocarburet, which cause the spheroidal state. This upper plate may be perforated, so that the vapors which form under it may rise freely and mix with the air, and it may, if required, have a circular or other motion, and may also be heated. Finally, it will be understood that several hot-plates, pumps, pistons, bellows, meters, or other appliances may be employed in connection with the apparatus, if desired.

The accompanying drawings, which form a part of this specification, represent an apparatus constructed in accordance with the invention.

Figure 1 is a vertical section of the apparatus for carbureting air on line *xy* of Fig. 2. Fig. 2 is a plan view of the same with the top plate removed for the better exhibition of parts, and Fig. 3 is an end elevation.

The air to be carbureted enters the orifices A and passes through the small openings *a* in plate B. This plate is movable laterally in ways in the frame D, and its movement is effected by means of a screw, *c*, supported in a stud, C, or frame D, and turned by means of a knob, *d*. The object of the perforated plate B is to regulate the supply of air by increasing or diminishing the size of openings *a*. By turning knob *d* more or less of each of said openings is presented to orifices A, and the supply of air is thus increased or diminished.

The hydrocarburet is introduced through a tube, E', connected with an opening, F, in plate G, and provided with a cock, *e*, for regulating the supply of the liquid. Said tube terminates in a number of smaller tubes, *f*, by which it is brought in contact with the hot-plate or vaporizing-surface E. As the result of employing a number of small tubes the liquid is vaporized as soon as it comes in contact with the plate E. The vapor thus produced is mixed with the air entering through orifices A to the vaporizing-chamber, of which hot-plate E forms the bottom, and the mixture is conducted thence to the apparatus where it is to be utilized. Checks *g g'*, secured to plate G, assist in effecting the admixture of the air and vapor in its passage to cylinder H. This cylinder is provided with a number of small plates, *h*, supported by rings *h'* and pierced with holes *h''*, the plates being so arranged that the holes *h''* in one are opposite the solid portion of the next. The air and vapor, in circulating through and between these plates, are more thoroughly mixed together.

Above the plates *h* are several thicknesses of

5 wire-gauze, *k*, which both aid in effecting a thorough mixture of the air and vapor and also prevent the communication of flame to the carbureted air in cylinder H. The carbureted air is conducted to the motor by pipe K.

10 The temperature of the plate E is maintained during the process of carbureting air by the residual gases from the explosions in the cylinder of the gas engine. To effect this the residual gases or products of combustion are conducted through a pipe, M, connected with the exhaust or waste pipe of the motor-cylinder, to an S-shaped flue or passage, S, through which it is caused to circulate under the hot-plate E. This particular shape of the flue or passage S keeps the residual gases for a longer time in contact with hot-plate E, more perfectly heating the latter. The gases escape from passage S through pipe L, which passes through cylinder H, the heat of said gases thus serving to maintain the temperature of carbureted air in said cylinder. The pipe L, which may be of any desired length, communicates with the atmosphere, and through it the gases freely escape.

25 For heating plate E at the commencement of the operation the bottom plate, *o*, which slides in grooves in the frame, is removed and the heat applied directly to plate E by any desired means. When the proper temperature is attained cock *e* may be turned, the carbureting operation immediately begins, and the temperature of plate E is maintained by the gases of combustion circulating through passage S, as explained. A cock may be conveniently placed in pipe M to regulate the supply of the gases of combustion admitted to the apparatus. For ascertaining the temperature of the gas, so as to regulate its supply accordingly, a thermometer may be placed in tube T.

35 The drawings represent a half-size apparatus for carbureting air with which satisfactory results have been obtained in connection with a gas-engine, the gas in tube L having a temperature of 118° to 120° centigrade.

45 Various modifications may be made in the the apparatus without departing from the spirit of the invention, and parts of the invention may be used without the others.

50 The hot-plate or vaporizing-surface may be made of a cylindrical, spheroidal, or other shape as well as a plate properly called, and of any material, metal being preferred. It may be regular or irregular, of a greater or less thickness, and may be placed vertically, horizontally, or inclined. The height of the box or chamber of which the hot-plate forms the bottom may be made greater or less, if deemed expedient.

60 Having now described my said invention and the manner of carrying the same into effect, what I claim is—

1. The method of carbureting air for gas-engines and utilizing the waste gases from said engines by vaporizing the hydrocarburet, mixing the vapor with air, conducting the mixture to the cylinder of the gas-engine, where it is

exploded, and conducting the hot products of explosion into the carbureting apparatus to heat the same, substantially as described. 70

2. The combination of the carbureting-chamber provided with a vaporizing-plate and air inlets or passages with a pipe for delivering the hydrocarbon terminating in a series of small tubes above said plate and extending to different portions thereof, substantially as described. 75

3. The combination, with a carbureting-chamber provided with a vaporizing-plate and a pipe for delivering the hydrocarbon, of a series of air-inlet openings extending the width of said plate and a common valve for regulating the flow of air through said openings, substantially as described. 80

4. The combination of a delivery-pipe for the hydrocarbon and the carbureting-chamber provided with a vaporizing-plate adapted to be heated, and also with inlet and outlet openings just above the level of said vaporizing-plate, on opposite sides of the same, so that the air sweeps in a broad belt over the surface of said plate and carries off the hydrocarbon as it volatilizes, substantially as described. 85

5. The combination, with the volatilizing-chamber provided with air-inlets and a vaporizing plate or body, of a mixing-chamber having a series of perforated diaphragms for securing the thorough mixture of the air with the hydrocarbon vapors as they pass through said chamber, substantially as described. 90

6. The combination of the corrugated or roughened plate, passages for admitting air in contact therewith, and a pipe terminating above said plate for dropping hydrocarbon thereon, substantially as described. 95

7. The combination, with the pipe for delivering hydrocarbon and the volatilizing-chamber having inlet for air and outlet for the mixture of air and hydrocarbon vapor, of an S-shaped flue beneath said chamber, substantially as described. 100

8. The combination, with the vaporizing-chamber, of a mixing-chamber connected with the vaporizing-chamber and a flue communicating with the space under the latter, and passing through the mixing-chamber for maintaining the temperature thereof, substantially as described. 105

9. The combination, with the vaporizing-chamber provided with inlets for the air and outlets for the mixture of air and vapor, of the mixing-chamber communicating with the latter and having a check, perforated plates, and wire-gauze therein, substantially as described. 110

10. In an apparatus for carbureting air, a vaporizing-chamber, the bottom of which is formed by the plate by which the vaporization of the hydrocarbon is effected, and two opposite sides of which contain the one air-inlets and the other outlets for the air and vapor, the air in passing through said chamber sweeping over the top of said plate, substantially as described. 115

11. In an apparatus for carbureting air, a

volatilizing-chamber provided with a plate adapted to be heated for effecting the volatilization of the hydrocarburet liquid, means for admitting the latter into contact with said
5 plate in regulated quantities, inlets or passages for admitting external air into said chamber, a flue or passage beneath said plate adapted to convey heat thereto, and devices for effecting the thorough admixture of the air and hydrocarbon vapor, substantially as described.
10

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

E. L. C. CTE. D'IVERNOS.

Witnesses:

EMILE BARRAULT,
AUG. VINCK.