No. 712,542 Patented Nov. 4, 1902.

T. B. JEFFERY.

CARBURETER FOR EXPLOSIVE ENGINES.

(Application filed Oct. 29, 1900.)

(No Model.)

Fig. 1.

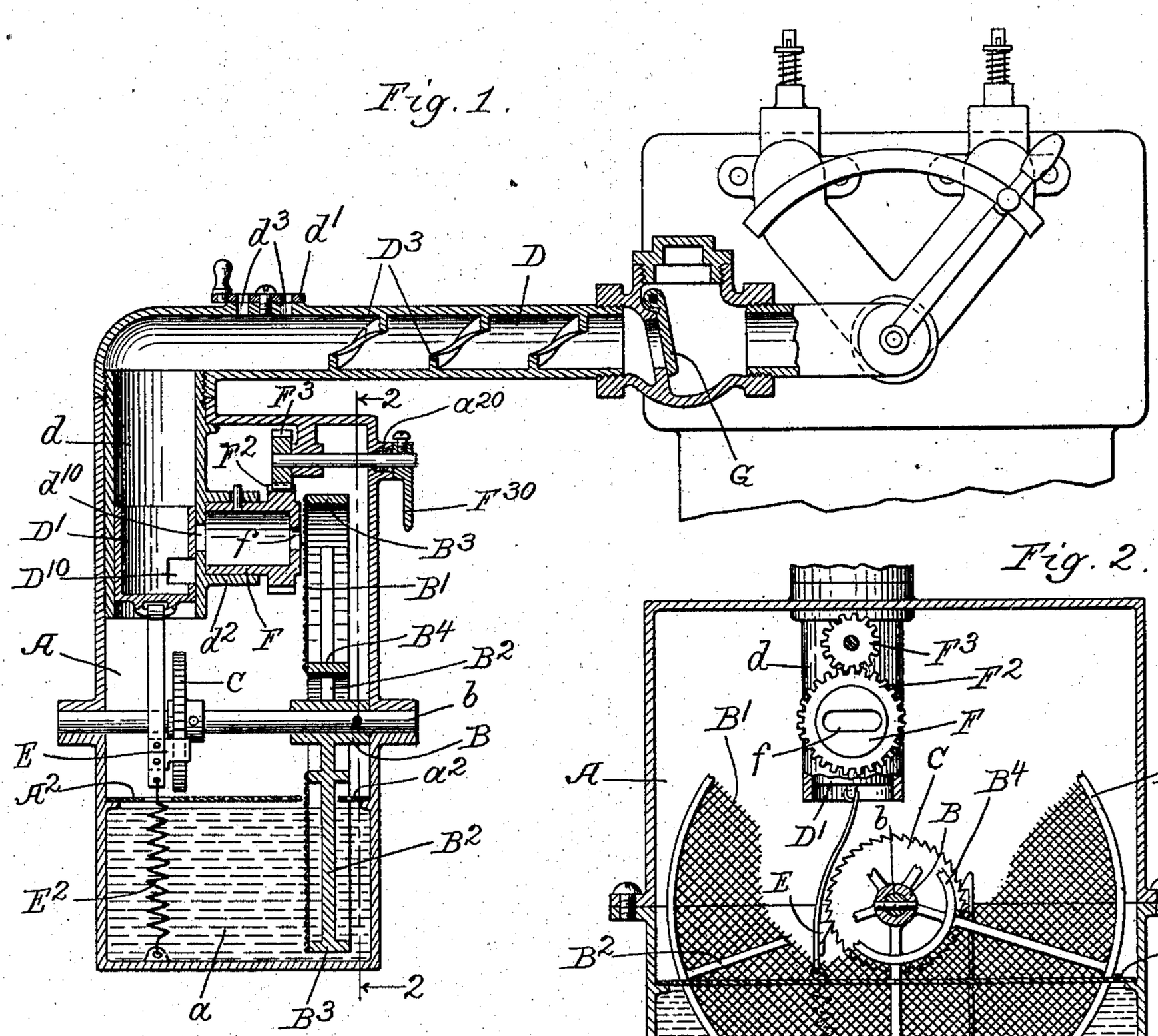


Fig. 2.

Fig. 3.

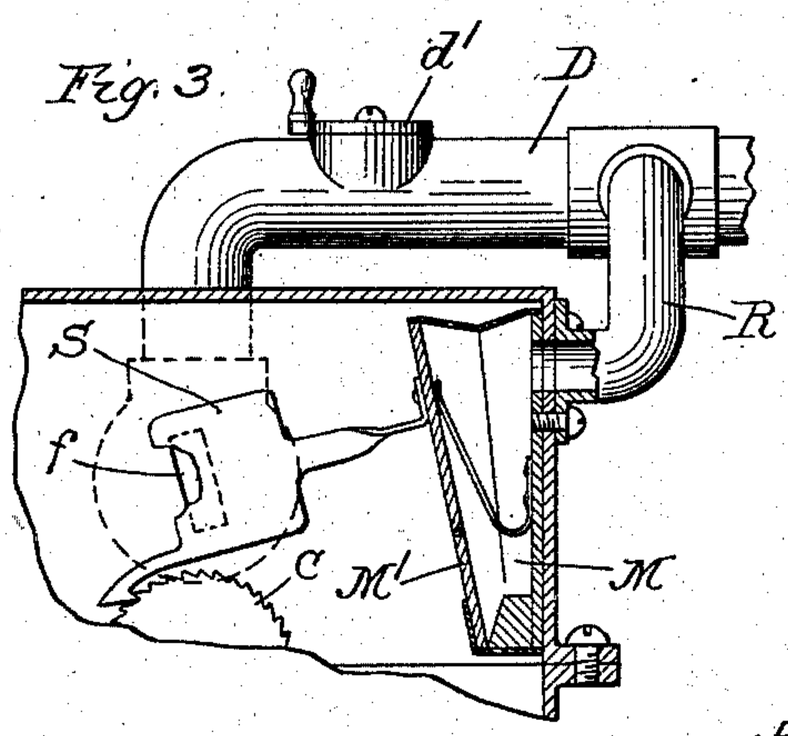


Fig. 4.

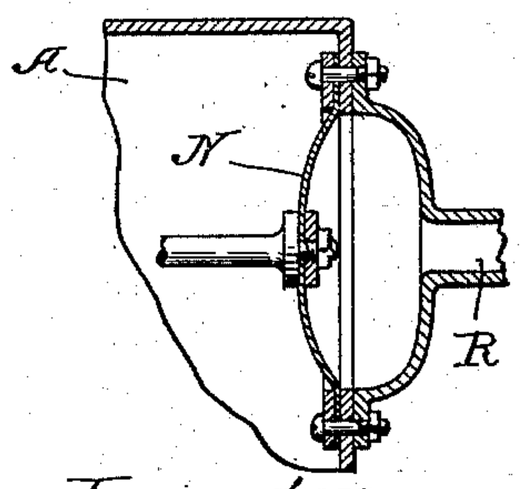


Fig. 5.

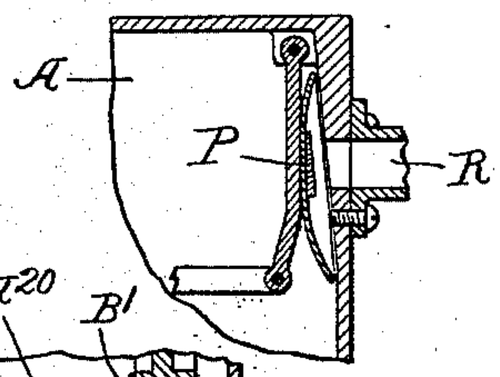
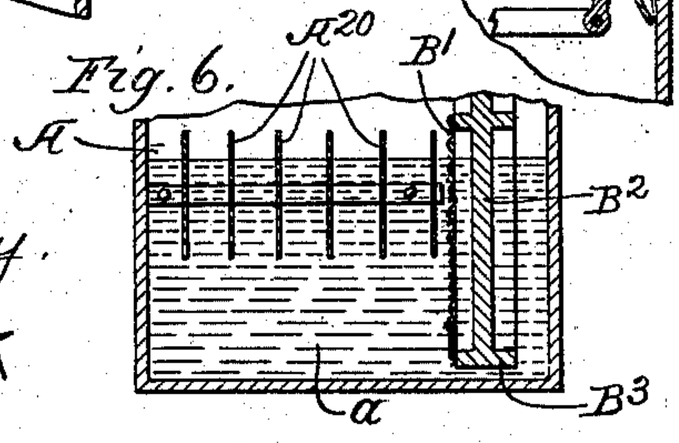


Fig. 6.



Witnesses.

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UNITED STATES PATENT OFFICE.

THOMAS B. JEFFERY, OF CHICAGO, ILLINOIS.

CARBURETER FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 712,542, dated November 4, 1902.

Application filed October 29, 1900. Serial No. 34,798. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. JEFFERY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Carbureters for Explosive-Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to carbureters, especially those designed for gas or vapor engines.

It consists of features relating to means for giving motion to the capillary web or screen by which the carbureting liquid is brought to the mouthpiece of the duct through which it passes to the engine-cylinder, means for regulating the relative supply of vapor and air, means for preventing the vapor and air from being forced out by back pressure upon the return stroke of the piston in the cylinder, and means for breaking up and more thoroughly intermixing the air and vapor on their way to the cylinder.

In the drawings, Figure 1 is a vertical section through my improved carbureter in a plane axial with respect to the rotating element, the head of the engine-cylinder being shown in elevation beyond the plane of such section. Fig. 2 is a section at the line 2 2 of Fig. 1. Fig. 3 is a detail section in a plane parallel to the shaft of the capillary diaphragm, cutting through and showing a modified portion in which a little bellows or pneumatic lever is employed for operating the pawl to rotate the shaft. Fig. 4 is a detail section showing another modification or modified form of the pneumatic lever. Fig. 5 is a similar detail section showing a still further modified form of such lever. Fig. 6 is a detail section of the lower part of the chamber containing the carbureting liquid, showing a modified form of device for preventing the wash or oscillation of the liquid.

A is a chamber which contains in the bottom part thereof the carbureting liquid *a*.

B is a rotary spider or wheel having its shaft *b* suitably journaled in the chamber, such spider being arranged to rotate within the chamber. This spider has a diaphragm B′, formed of a capillary web or screen and arranged to dip in the carbureting liquid at the lower side as the same is revolved.

C is a ratchet-disk rigid with the shaft *b*, constituting one member of an alternating clutch device, of which the other member is the pawl E, hereinafter mentioned. I design to rotate the shaft to cause the capillary web-diaphragm B′ as it revolves to move through the carbureting liquid by means of a pneumatic motor device. This pneumatic motor device may be in a variety of forms. The form in which it is illustrated in the principal views consists of the piston D′, operating in a cylinder *d*, which constitutes part of the passage D, leading to the source of pneumatic pulsation, alternating suction, and pressure or varying pressure.

E is a pawl which is attached to the head of the piston D′ and is thereby adapted to give rotary motion to the shaft *b* and to the capillary disk B′ step by step as the piston is reciprocated in the cylinder by alternate suction and pressure or varying pressure communicated from the source of pneumatic pulsation. I do not limit myself to a pawl and ratchet as the alternating clutch device for converting the pulsating action and resultant oscillating movement of the pneumatic motor-piston or equivalent element into rotary movement of the disk B′. On the contrary, I may use any form of alternating clutch—that is, a clutch in which an alternating or reciprocating element communicates motion by its alternate movements only. In the structure illustrated such source of pneumatic pulsation is the engine-cylinder, in which the pulsation is derived from reciprocation of the piston alternately sucking in the vapor and discharging the gases of combustion resulting from the same. When such source of pneumatic pressure is relied upon for furnishing the motive power for rotating the screen, the same duct D which communicates the pulsation to cause the piston to act and coöperate may also be made to serve as a passage for conducting the vapor to the engine-cylinder, and in such case also it is most convenient and economical to locate the ratchet on the shaft *b* within the chamber A; but this is not an essential feature of the structure. As the most convenient means of

adapting the structure to employ the same duct D for both purposes indicated I make the piston-cylinder d, which terminates the passage D, in a form adapting it to be intruded into the chamber A, as seen in Fig. 1, extending parallel to the plane of the rotating diaphragm-web and at a short distance only from the same, and at the side of said cylinder toward the web I extend therefrom toward the plane of the web a bearing d^2 for a mouthpiece F, which terminates in a plane as close to the web as it may be without danger of touching it as the latter rotates. The cylinder d has an aperture d^{10}, opening within the mouthpiece-bearing d^2, so as to communicate directly into the mouthpiece, which is telescoped or journaled in the bearing. The piston D′ is hollow, being a cylinder with a closed end or head, to which the pawl is connected, as stated, the other end being open outwardly—that is, toward the source of pneumatic pulsation, which is thus communicated to the interior of the piston. The piston has an aperture D^{10}, adapted at one position to register with the aperture d^{10} and at another position to be out of registration therewith, so that the latter aperture is covered and closed by the piston. As illustrated and as desirable, when the piston is operated by suction as distinguished from pressure the aperture d^{10} is out of registration with the aperture D^{10}, and the latter is closed by the piston when the piston is at the inner end of its stroke, and said apertures are registered with each other, effecting communication between the passage D and the mouthpiece when the piston is at the outer limit of its stroke. Preferably, in order that it shall not be necessary to give the piston a long stroke, I make both the apertures d^{10} and D^{10} quite narrow, as shown, relying upon their extent through at least half the circumference of the cylinder and piston to make the communication sufficiently free. When the duct D extends to the engine-cylinder, as in the construction illustrated, and such engine-cylinder becomes the source of pneumatic pulsation, it will be intended that as the piston withdraws into the cylinder of the engine, producing a partial vacuum behind it and suction in the duct D. The first effect of such suction shall be to move the piston D′ of the motor pneumatic device outward, retracting the pawl E and causing it by its engagement with the ratchet-disk on the shaft b to rotate the capillary diaphragm one step and move a fresh portion of the capillary web B′ out from the carbureting liquid and bring a fresh portion over the mouthpiece F, and it is for the purpose of insuring the occurrence of this movement before the passage D is brought into direct communication with the open mouth of the mouthpiece that the piston D′ is made as described, so as to cover the entrance to that mouth at the time the suction commences. The suction being thus caused to produce its full effect upon the piston with a tendency to move it and such tendency being practically instantaneous, the uncovering of the passages of the mouth by the coming into registration of the ports d^{10} and D^{10} may be occurring during the latter portion of this movement, and this will not interfere with the completion of the same after it is once commenced, and said motion having been completed, the full stroke having been given by the piston, registration of the apertures d^{10} and D^{10} being effected, continuing suction experienced through the mouth and operating on the film of the carbureting liquid adhering in the meshes of the portion of the web which at that instant stands opposite the mouth causes the same to be sucked out of the meshes, carried with the current of air or vapor, and drawn by the same suction through the duct D into the engine-cylinder. As soon as the vapor-drawing stroke of the engine-piston is completed the air and vapor in the passage D and cylinder d quickly resumes normal atmospheric tension through the admission of air through the ports d^3, which are provided, primarily, for the purpose of giving a proper intermixture of air with the vapor, and which, secondarily, answer the purpose of relieving the piston D′ of the suction tending to hold it at the outer limit of its stroke. To return it promptly to the opposite limit, retracting the pawl over the ratchet, and taking the ports d^{10} and D^{10} out of registration, I provide a spring E^2, connected in any such manner as to operate upon the piston, drawing it inward. Most conveniently it is attached to the end of the pawl and stretched therefrom to a proper connection on the wall of the chamber A.

I show in the drawings a mouthpiece F having a feature of construction which is fully described and claimed in my application, Serial No. 20,244, filed June 14, 1900. This mouthpiece has the aperture f, through which the carbureting liquid is sucked from the screen and adapted to be rotated, so as to change the direction of its longer dimension, and thus cause a different dimension of the mouth to stand transverse to the direction of movement of the screen in its rotation past the mouth. In order to apply this particular feature of construction to a carbureter in which the means of rotating the screen herein described is embodied in such form that the piston or equivalent device for actuating the screen is situated upon the same side thereof as the mouthpiece, I provide for rotating the mouthpiece by giving it a segment-gear rim F^2 and providing a spur-gear F^3, meshing therewith, both located within the chamber A, the shaft of the gear F^3 being extended out to a stuffing-box at a^{20} and exteriorly provided with a handle and index F^{30} for rotating it to adjust the mouthpiece and indicating its adjustment.

In order to prevent the vapor which is drawn toward the cylinder from being expelled at any point in the return stroke, I pro-

vide a check-valve G, located in the duct D, between the engine-cylinder and the carbureter, such check-valve being arranged to open normally upon movement of the air or vapor toward the engine-cylinder and to be closed upon movement or pressure in the opposite direction.

In order to admit exterior air in addition to the vapor which is drawn in in the manner described and also to regulate the proportion of air so drawn, I provide an air-inlet in the pipe D, consisting of ports d^3 and over such ports a closure, which is most conveniently made as a rotating apertured cover d', which may be made to close the ports more or less completely and by the variation thus produced to regulate the proportion of air admitted with the vapor when suction operates to draw the latter through the duct toward the engine-cylinder. For the purpose of securing more complete intermixture of the air with the vapor or spray of the hydrocarbon liquid and the complete breaking up of the latter the pipe D between the carbureter and check-valve above described has projecting from its inner wall a spiral flange D^3, tending to give to the current of air and vapor moving through it a rotary as well as a longitudinal movement, which will have a tendency to throw the fine particles of spray, which the direct suction tends somewhat to concentrate and center, outward through the surrounding air, thus effecting more complete distribution.

I do not limit myself to the use of a piston operating in a cylinder as the pneumatic motor for the purpose of giving movement to the capillary diaphragm-web. A variety of other forms of device may be used instead—as, for example, what may be termed a "pneumatic lever." In Fig. 3 I have shown one form of such pneumatic lever consisting of a bellows M, whose moving wall M' corresponds to and has the function of the piston in the motor illustrated in the principal figures. In Fig. 4 another form of pneumatic lever is illustrated, consisting of a flexible diaphragm N, mounted about an aperture in the wall of the pneumatic chamber, having at its center a suitably-rigid disk operatively connected to the mechanism for rotating the shaft *b*. In Fig. 5 I have shown a further modification of the pneumatic lever, consisting of a simple valve P, which is normally seated over an aperture in the wall of the carbureting-chamber, its margin, however, being flexible, so that it operates similarly to the diaphragm shown in Fig. 4. When any of these devices is employed, the duct D may be branched, one branch leading to the pneumatic lever and the other to the mouthpiece, through which the vapor or spray of the carbureting liquid may be drawn, and in such case a closing device for the mouthpiece may be operatively connected with the pneumatic lever to open and close the mouthpiece at proper time with respect to the movement communicated by the pneumatic lever. In Fig. 3 I have shown such a construction with the pneumatic lever in the form of a bellows. In this view, R represents the branch of the duct D, leading to the mouthpiece *f*, S representing a gate or closure for the mouth attached to the moving element M' of the bellows which constitutes the pneumatic lever, being withdrawn from over the mouth at the collapsed position of the bellows, while at the inflated position illustrated the gate closes said mouth.

The capillary web B' is preferably made of fine-meshed wire-cloth, commonly called "wire-gauze," which is stretched on a skeleton wheel or circular spider B, which comprises the spokes B^2 and the peripheral rim or flange B^3, to which the gauze may be secured at its outer circumference. The web B' is also secured at an interior circle, where the wheel or spider has a second circular flange B^4 for the purpose of preventing the web from "bellying" or buckling, as it is otherwise liable to do, such action tending to cause it to rub on the mouthpiece and be deprived of the liquid in the interstices before the same can be exposed at the mouth and sucked out.

It is important that no area of the revolving element comprising the diaphragm B' and the spider or skeleton wheel to which it is secured should be exposed at the mouth except the wire-gauze, and that only when its interstices are not closed or covered by any solid or imperforate portion of the area of the frame to which it is mounted, because in case such imperforate surface which has been dipped in the liquid and been wetted therein is brought up to the mouth the portion of the liquid which adheres to the surface and is liable to be sucked off at the mouth varies very much with the speed of rotation and somewhat with the condition of the surface, being sometimes very little or none at all and at other times a decided film greater in quantity than would be contained in the meshes of the wire-gauze. Uniformity of the quantity being essential to the result sought no area is to be exposed at the mouthpiece, which is not calculated to carry a substantially uniform quantity to the square inch of the area thus exposed. For this reason it will be noticed that while in order to stretch the diaphragm composed of the wire-gauze and cause it to present an even surface as it is carried by the mouthpiece it is secured, as described, to the peripheral flange of the skeleton wheel B. The mouthpiece stands entirely within the circumference of such flange, no portion of the latter being at any time exposed opposite the mouth.

In order to prevent the splashing of the hydrocarbon liquid in the chamber, which is liable to result from the jolting of the carriage to which a motor having this sort of carbureter pertains, I provide a wave-baffling device which may be in the form of a plate A^2, suitably secured to the wall of the chamber

and extending close to but not touching the diaphragm-web B′ at the side at which the mouthpiece stands, and I provide a similar baffle-plate a^2, secured to the opposite side of the chamber and projecting in toward the web as close as possible in view of the presence of the spokes B^2 of the spider B. There is thus left only a very small area of surface of the liquid which is not checked by the baffle-plates, and any considerable splashing is thus avoided. It is not essential that this baffling device should be in the form of a simple plate, as above described; but it may consist of a series of surfaces extending transverse to the plane of the liquid, as in the form shown in Fig. 6, which presents a grating, comprising edgewise bars A^{20} A^{20}, the bars being of sufficient width to cover the maximum variation in the liquid-level and the grate being so placed that at the lowest stage of the liquid the lower edge of the bars will preferably intrude into the liquid, while at the highest stage the upper edge of the bars will not be submerged.

I claim—

1. In a carbureter, a chamber containing the carbureting liquids; a capillary web or screen, and suitable supports therefor; a rotary shaft by which the screen is given movement into and out of the liquid; a ratchet rigid with such shaft; a pneumatic motor, and a pawl connected with its moving elements and engaging with a ratchet; and a source of pneumatic pulsation communicating with the motor.

2. In a carbureter, a chamber containing the carbureting liquid; a capillary web or screen, and suitable supports therefor; a rotary shaft by which the screen is given movement into and out of the liquid; a pneumatic motor mounted on the chamber-wall; a source of pneumatic pulsation communicating with such motor, and an alternating-clutch device having one element fast to the shaft and the other element connected with the moving element of the pneumatic motor, whereby the alternate action of the moving element of the motor gives a step-by-step movement to the capillary web.

3. In a carbureter, a chamber containing the carbureting liquid; a capillary web or screen, and means for supporting it within the chamber; a shaft by which the screen is given movement into and out of the carbureting liquid; a pneumatic motor device mounted within the chamber; a source of pneumatic pulsation communicating with the interior of the motor to give alternating movement to its moving element; and an alternating clutch device, having one element fast to the rotary shaft and the other connected to the moving element of the motor.

4. In a carbureter, a chamber containing the carbureting liquid; a capillary web or screen, and means for supporting it within the chamber; a shaft by which the web or screen is given movement into and out of the carbureting liquid; a pneumatic motor mounted within the chamber; a source of pneumatic pulsation communicating with the interior of the motor to give alternating movement in opposite directions to its moving element; a ratchet-disk on the shaft, and a pawl connected with the moving element of the motor and engaging the ratchet-disk.

5. In a carbureter, the chamber containing the carbureting liquid; a disk, comprising a capillary web or screen, journaled within the chamber, and dipping at its lower edge in the liquid; an alternating-clutch device, having one element rigid with the disk; the pneumatic motor device mounted on the wall of the chamber and having its moving element connected with the other element of the alternating-clutch device, whereby the alternating movement in opposite directions of the moving element of the pneumatic motor gives a step-by-step movement in continuous direction, to the disk, and a source of pneumatic pulsation communicating with the pneumatic motor, to give it such alternating motion.

6. In a carbureter for gas or vapor engines, a chamber containing the carbureting liquid; a capillary web or screen adapted to be moved into and out of the liquid; mechanism for so moving it; a pneumatic motor operatively connected to said mechanism; and a duct leading from the engine-cylinder to such motor and communicating with the interior thereof to give alternating movement in opposite directions to the moving element of the motor.

7. In a carbureter for gas or vapor engines, a chamber containing the carbureting liquid; a capillary web or screen adapted to be moved into and out of the liquid; mechanism for so moving it; a pneumatic motor having its moving element operatively connected to said mechanism; a duct leading from the engine-cylinder into the chamber of the pneumatic motor, such duct having an aperture intermediate the engine-cylinder and the motor-chamber, and a mouthpiece communicating with such duct and abutting on the capillary web or screen, whereby the suction produced in the engine-cylinder first actuates the screen and afterward operates to extract the liquid from its surface exposed at the mouthpiece.

8. In a carbureter for a gas or vapor engine, a chamber containing the carbureting liquid; a capillary web or screen adapted to be moved into or out of the liquid; mechanism for so moving it; a pneumatic motor device operatively connected to said mechanism; a source of pneumatic pulsation and a duct leading therefrom into the pneumatic motor to give alternating movement in opposite directions to its moving element; said duct having an aperture intermediate the source of pulsation and the motor, and a mouthpiece with which such aperture communicates, abutting on the capillary web or screen.

9. In a carbureter for gas or vapor engines,

a chamber containing the carbureting liquid; a capillary web or screen adapted to be moved into or out of the liquid; mechanism for so moving it; a pneumatic motor operatively connected to said mechanism; a source of pneumatic pulsation; a duct leading therefrom into the pneumatic motor to give alternating movement in opposite directions to the moving element of the latter, said duct having an aperture and a mouthpiece communicating with such aperture and abutting on the capillary web or screen, the moving element of the motor having connected with it means for covering and uncovering such aperture as it is moved in opposite directions by the pneumatic pulsations.

10. In a carbureter for gas or vapor engines, a chamber containing the carbureting liquid; a capillary web or screen adapted to be moved into and out of the liquid; a source of pneumatic pulsation; a duct leading therefrom into the pneumatic motor to give alternating movement in opposite directions to the moving element of the latter, said duct having an aperture within the carbureting-chamber; a boss inserted in such aperture, and a mouthpiece rotatably journaled or seated in such boss, communicating with the aperture and abutting on the capillary web or screen, said mouthpiece having an oblong mouth at the end abutting on the screen, and means for engaging the mouthpiece to rotate it in its seat, comprising a shaft extended through the wall of the chamber, and means for exteriorly operating it to rotate the mouthpiece.

11. In a carbureter for a gas or vapor engine, a chamber containing the carbureting liquid; a capillary web or screen adapted to be moved into and out of the liquid; mechanism for so moving it; a cylinder intruded into the carbureting-chamber, and a piston adapted to reciprocate therewith and operatively connected to said mechanism; a source of pneumatic pulsation; and a duct connecting the same with such cylinder to cause such pulsation to reciprocate the piston in the latter.

12. In a carbureter for gas or vapor engines, a chamber containing the carbureting liquid; a capillary web or screen adapted to be moved into and out of the liquid; mechanism for so moving it; a cylinder intruded into the carbureting-chamber, and a piston therein operatively connected to said mechanism; a source of pneumatic pulsation, and a duct connecting the same with said cylinder to cause such pulsation to operate the piston in the latter.

13. In a carbureter for gas or vapor engines, a chamber containing the carbureting liquid; a capillary web or screen adapted to be moved into and out of the liquid; mechanism for so moving it; a cylinder intruded into the carbureting-chamber; pistons reciprocating therein and operatively connected to said mechanism; a duct leading from the engine-cylinder to such intruded cylinder, the latter having an aperture; and a mouthpiece communicating with such aperture and abutting on the capillary web or screen.

14. In a carbureter for a gas or vapor engine, a chamber containing the carbureting liquid; a capillary web or screen adapted to be moved into and out of the liquid; mechanism for so moving it; a cylinder intruded into such chamber, and a piston therein operatively connected to said mechanism; a duct leading from the engine-cylinder to said pneumatic motor; a cylinder intruded into said carbureting-chamber; a piston in such cylinder, operatively connected to such mechanism; ducts leading from the engine-cylinder to such intruded cylinder, the latter having an aperture intermediate the engine-cylinder, and the nearest position of the piston-head thereto; a mouthpiece communicating with such aperture and abutting on the capillary web or screen; means for closing said aperture connected to and moved by the piston in its reciprocation, and adapted to uncover the aperture at one limit of the piston's movement, and to cover it at the opposite limit.

15. In a carbureter for gas or vapor engines, a chamber containing the carbureting liquid; a capillary web or sereen adapted to move into and out of the liquid; mechanism for so moving it; a cylinder intruded into the carbureting-chamber; a hollow piston operating in said cylinder, closed at one end and open at the other end; a duct leading from the engine-cylinder to the intruded cylinder at the end toward which the hollow piston opens; said intruded cylinder having an aperture, and a mouthpiece communicating with such aperture and abutting on the capillary web or screen; the hollow cylinder having a lateral aperture adapted to register with said aperture of the cylinder at one limit of the piston's movement, and to be out of registration therewith at the opposite limit.

16. In a carbureter for a gas-engine, a chamber containing the carbureting liquid; a capillary web or screen; a skeleton wheel having a peripheral flange to which the capillary web or screen is secured and by which it is held stretched in proper plane; means for rotating the wheel to cause the capillary web or screen to pass into and out of the carbureting liquid; a duct connected with the engine-cylinder, having a mouthpiece with the carbureting-chamber, abutting near the capillary web, wholly within the circle bounded by the flange to which the web is secured.

17. In a carbureter for a gas-engine, a chamber containing the carbureting liquid; a liquid-carrying device, and means for moving it into and out of the liquid; a wave-baffling device, located substantially at the liquid-level and extending near the surface of the liquid-carrying device to check the wave action or splashing of the liquid.

18. In a carbureter for a gas-engine, a chamber containing the carbureting liquid; a liq-

uid-carrying element, and means for moving it in and out of the liquid; a baffle-plate supported within the chamber, substantially at the liquid-level, and having an edge extending near the surface of the liquid-carrying element to prevent the liquid splashing against the liquid-carrying element.

19. In a carbureter for a gas-engine, a chamber containing the carbureting liquid; a capillary web or screen, and means for revolving it with its lower portion dipped in the liquid; a baffle-plate extended approximately at the liquid-level, secured to the wall of the chamber and having an edge abutting near the web or screen, to check the splashing of the liquid.

20. In a carbureter for a gas-engine, a chamber containing carbureting liquid; a capillary web or screen, and means for revolving it with its lower portion dipped in the carbureting liquid; and a baffle-plate secured to the wall of the chamber immediately above the surface level of the liquid therein, extending close to the capillary web or screen without touching the same, to check the splashing of the liquid.

In testimony whereof I have hereunto set my hand, at Chicago, Illinois, in the presence of two witnesses, this 26th day of October, A. D. 1900.

THOS. B. JEFFERY.

In presence of—
CHAS. S. BURTON,
EDGAR L. CONANT.