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G. F. SWAIN.

CARBURETER FOR GAS ENGINES.

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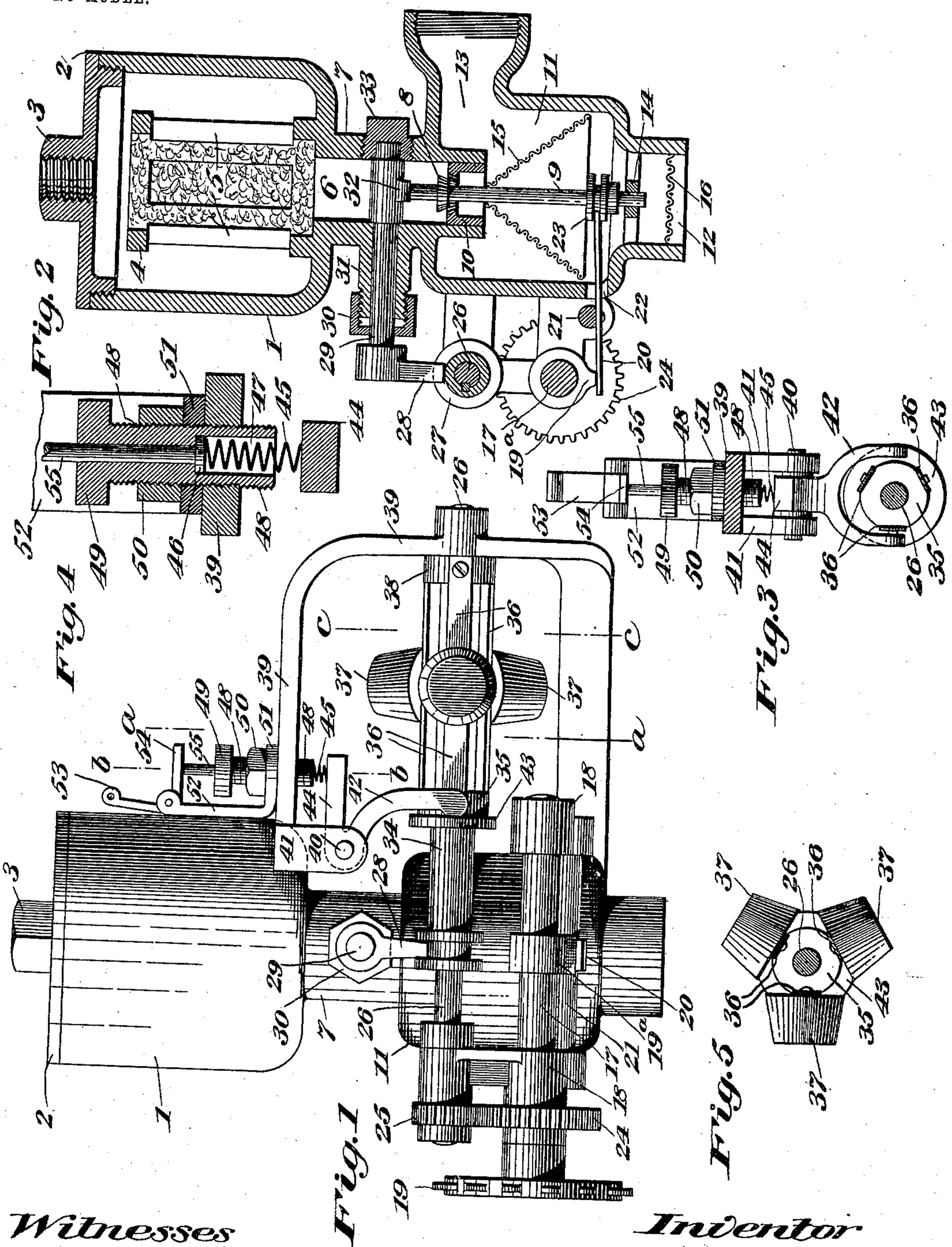
NO MODEL.



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UNITED STATES PATENT OFFICE.

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CARBURETER FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 756,908, dated April 12, 1904.

Application filed October 27, 1902. Serial No. 128,862. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. SWAIN, a citizen of the United States, and a resident of Harvey, Cook county, Illinois, have invented certain Improvements in Carbureters, of which the following is a specification.

This invention relates to certain improvements in carbureters, and has for its object to provide a device of this character of a simple and inexpensive nature and of a compact and durable construction, not likely to become deranged in use, and by means of which the combustible or gaseous mixture is more readily produced and the proportions of air and hydrocarbon for forming said mixture are more conveniently and accurately regulated and controlled.

The invention consists in certain novel features of the construction, combination, and arrangement of the several parts of the improved carbureter, whereby certain important advantages are attained and the device is made simpler, cheaper, and otherwise better adapted and more convenient for use than various other similar devices heretofore employed, all as will be hereinafter fully set forth.

The novel features of the invention will be carefully defined in the claims.

In the accompanying drawings, which serve to illustrate my improvements, Figure 1 is an elevation showing a carbureter constructed according to my invention, and Fig. 2 is an axial section taken vertically through the same and showing the construction and arrangement of certain of the internal parts of the device. Fig. 3 is a partial section taken vertically through the device in the plane indicated by the line *a a* in Fig. 1 and showing certain features of the means for regulating the proportions of air and hydrocarbon for forming the combustible mixture. Fig. 4 is an enlarged partial section taken vertically through the device in the plane indicated by the line *b b* in Fig. 1 and showing other features of the regulating means to be hereinafter described. Fig. 5 is a partial section also taken vertically through the device, but in the plane indicated by the line *c c* in Fig. 1, and showing still other features of the regulating means.

As shown in the views, the improved carbureter is constructed with a casing formed from cast metal, the upper part 1 of said casing being made enlarged and hollowed out interiorly to produce a chamber for the reception of the liquid hydrocarbon from which the gaseous mixture is to be formed. The enlarged upper part or chamber 1 of the casing is provided with a screw-cap 2, adapted for removal to provide access to its interior, and said cap is formed with a central projection 3, interiorly screw-threaded for connection with a hydrocarbon-supply pipe. (Not shown.)

Inside the hollow or chamber of the upper enlarged portion 1 of the casing is provided a cylindrical or tubular support 4, adapted to receive and hold a fibrous packing, (not shown,) which may be formed from cotton, asbestos, or other suitable substance adapted to act as a filter or strainer to separate particles of foreign matter from the liquid hydrocarbon supplied to the carbureter. The walls of the support 4 are perforated, as shown at 5, for the passage of the filtered hydrocarbon, and the interior of said support is adapted to discharge to a passage 6, extended downward in a contracted central portion or neck 7 of the casing of the device.

In the passage 7 is arranged a valve 8, held on a vertically-extended valve-stem 9 and adapted when lowered to seat itself upon a valve-seat 10, herein shown as pressed from metal and inserted in said passage 6. When the valve 8 is raised, it opens a passage for the downward flow of the liquid hydrocarbon from the chambered upper portion 1 of the casing through the passage 6, whence it escapes and drops into a chambered or hollowed lower portion 11 of the casing located below the neck or reduced portion 7 and formed in its bottom with an opening 12 for receiving a supply of air and in the upper portion of one of its side walls with an outlet-passage 13 for the outflow of the combustible mixture of air and hydrocarbon vapor, said outlet 13 being adapted for communication with a motor or other device in a well-known way.

The lower end of the passage 6 is extended down within the chambered lower portion 11

of the casing, as shown in Fig. 2, and the valve-stem 9 is extended down through said chambered portion of the casing and is guided in a central bearing in a spider 14, extended across the air-inlet opening 12 at the bottom of said chambered portion 11, and within the hollow of said portion 11 is arranged a cone-shaped vaporizer 15, herein shown as formed from a piece of wire-gauze or similar substance bent into conical form and held at its apex to the upper part of the valve-stem with its sides inclined downward around the same in position for the downflow of the liquid hydrocarbon over them when discharged through the passage 6 on the lifting of the valve 8. The diameter of the lower or base portion of the conical vaporizer 15 is substantially equal to that of the hollow or chamber of the enlarged lower portion 11 of the carbureter-casing, and since the air-inlet 12 to said casing is below said base portion of the vaporizer, while the outlet 13 of the casing is at or above the apex of the conical vaporizer, it will be evident that the air for forming the combustible mixture will be drawn upward through the inlet-opening 12 and will be caused to circulate through the apertures of the foraminous conical vaporizer in such a way as to absorb or take up in the form of vapor all of the liquid hydrocarbon flowing over the vaporizer. A second sheet of wire-gauze or other suitable foraminous material is also preferably extended across the air-inlet 12, as indicated at 16 in Fig. 2, in position to receive any excess supply of liquid hydrocarbon which might at starting drop from the edges of the vaporizer 15.

In carbureters for use in connection with motors it is customary and desirable to supply the combustible vapor from the carbureter at certain strokes of the piston, and in order to so supply the combustible vapor from the improved carbureter constructed as above described I provide means for actuating the valve 8 to lift it from its seat, so as to permit the supply of the liquid hydrocarbon through the passage 6 into chamber 11, which means, as herein shown, comprises a shaft 17, held to turn in suitable bearings 18 18, extended from the casing and provided at one end with a sprocket-wheel 19, adapted to receive a chain, by means of which said shaft may be driven from the motor in connection with which the carbureter is used.

On the shaft 17 is arranged a cam 19^a, adapted for engagement upon one end of a lever 20, centrally pivoted on a shaft 21 and having its opposite end extended through an opening 22 in the wall of the enlarged lower portion 11 of the casing and into the interior vaporizing-chamber therein, in which chamber said end of the lever has engagement with a grooved collar 23 on the lower end of the valve-stem 9. By this construction it will be seen that at each turn of the shaft 17 the cam 19^a thereon impels downward the outer end of lever 20, the opposite end whereof is correspondingly elevated and by its engagement with the collar 23 acts to lift the valve 8 from off its seat, so that a suitable supply of liquid hydrocarbon may escape through the passage 6 and flow down over the foraminous vaporizer, being converted into combustible vapor by admixture with the air passing up through said vaporizer, as above described.

The lever 20 is formed from elastic material, such as spring-steel or other spring metal, and in connection with the means above described for feeding the liquid hydrocarbon to the vaporizer by lifting of the valve 8 from its seat I provide other regulating or controlling means for governing the operation of said hydrocarbon-feeding mechanism, so as to regulate such supply to the requirements of the motor under varying conditions and at different times, and this regulating or controlling means I will now describe.

On the shaft 17 is a gear-wheel 24, the teeth of which are in mesh with those of a pinion 25 on one end of a shaft 26, held to turn in a bearing at the front of the casing and above the shaft 17, the proportion of the wheel 24 and pinion 25 being such that the shaft 26 is driven at a higher speed than the shaft 17. On the shaft 26 is a grooved collar 27, with the groove in which is engaged the extremity of an arm or finger 28 on one end of a rock-shaft 29, the opposite end of which is passed across and through the downwardly-extended passage 6 in the reduced neck 7 of the carbureter-casing, said neck being provided at its front side with a boss 31, having a stuffing-box 30, through which the rock-shaft is passed, as shown in Fig. 2, and having at its rear side a screw-plug, in which the rear end of said shaft 29 has a bearing, as indicated at 33.

Within the passage 6 the rock-shaft 29 is provided with a cam 32, which has engagement upon the upper end of the valve-stem 9 above the valve 8 and serves in its different positions to regulate the extent of opening or upward movement of the valve, such regulation of the movement of the valve being permitted by reason of the elasticity of the valve-operating lever 20, which is capable of flexure when the full upward or opening movement of the valve is prevented by engagement of the cam 32 upon the stem 9 of the valve.

The grooved collar 27 on shaft 26 is connected with one end of a sleeve 34, mounted for sliding movement longitudinally of the said shaft 26, but held to turn in unison with said shaft, and at the opposite end of said sleeve 34 is produced an enlargement 35, with which are connected the ends of a plurality of leaf-springs 36, which are spaced equidistant about the shaft and have their opposite ends held to a collar 38 thereon, their central portions being provided with weights 37, adapted in their rotation or revolution about the shaft

26 to be actuated by centrifugal force in such a way as to cause them to move outward and away from the axis of rotation of the shaft, such centrifugal movement being permitted by the flexibility of the springs 36 and being attended by a movement of the sleeve 34 endwise along the shaft owing to the flexure of said springs. The outer end of shaft 26 beyond the collar 28 is supported by a bearing-piece 39, extended laterally from the side of the carbureter-casing. By this construction it will be seen that when the shaft 26 is turned its rapidity of rotation will control the centrifugal movement of the weights 37, causing flexure of the springs 36, by which said weights are carried, so that the sleeve 34 is moved endwise upon the shaft 26, carrying with it the grooved collar 27, so that the shaft 29 is rocked and the position of the cam 32 in passage 6 is changed to cause it to bear down upon the upper end of the valve-stem 9 to limit the opening movement of the valve, so that the supply of liquid hydrocarbon to the vaporizing-chamber of the carbureter is reduced. When the speed of the shaft 26 is again lowered, the elasticity of the springs 36 again serves to draw the weights 37 toward the shaft, causing the sleeve 34 to be moved in a reverse direction upon the shaft and turning the rock-shaft in an opposite direction, so that the cam 32 in passage 6 is lifted and the valve 8 is permitted to be more completely opened and the supply of liquid hydrocarbon to the vaporizing-chamber of the device is again increased. By this construction it will be seen that the supply of liquid hydrocarbon to the carbureter for forming the combustible or gaseous mixture is automatically controlled and regulated, so as to accord at all times with the conditions and requirements of the motor in connection with which the carbureter is used, and in order to provide means for preventing excessive movement of the cam 32 and of the weights 37 when the speed of rotation of shaft 26 reaches a predetermined point I provide an elbow-lever pivoted at 40 between arms 41 41, extended down from the upper part of the bracket or bearing-piece 39, said elbow-lever being provided with a downwardly-bent forked arm 42, the forks of which are adapted for engagement behind the sides of a shoulder 43, produced upon the collar or enlargement 35 on sleeve 34.

The upper arm 44 of the elbow-lever is horizontally extended beneath the bearing-piece 39, and upon its free end is engaged the lower end of a spiral spring 45, the upper end of which is held beneath a disk 46, fitted for vertical movement in a recess or bore 47, formed axially in an adjusting-screw 48, which has threaded engagement with and is extended below the bracket or bearing-piece 39 and has at its upper end a head 49, by means of which it may be conveniently turned. For holding the screw 48 in position when adjusted I provide a lock-nut 50, held on it above the bearing-piece 39, and between said bearing-piece and the lock-nut is held one end 51 of an angular bracket, the other end or arm of which is extended up alongside of the enlarged upper portion 1 of the carbureter-casing, as shown in Fig. 1, and has at its upper end perforated ears, between which is pivoted an angle-lever, one arm, 53, of which is extended upward and is adapted for connection with a chain, cord, or other connection, which may be extended within easy reach of a person controlling the motor, and the other arm, 54, of which is horizontally extended and is adapted to be engaged upon the upper end of a pin or stem 55, which is extended down through the adjusting-screw 48 and has its lower end arranged to bear upon the disk 46 above the spring 45.

The detailed construction of these parts is shown in Figs. 3 and 4, and it will be evident from the above description that in the operation of the device when the shaft 26 is rotating at normal speeds a sufficient movement of the sleeve 34 and of the weights 37 is permitted to afford an automatic control of the operation of the carbureter at ordinary times and under all normal conditions, the spiral spring 45 being compressible to permit of the required pivotal movement of the elbow-lever before the upper arm 44 thereof is engaged beneath the lower end of the adjusting-screw 48. When the speed of the shaft 26 is increased above the predetermined limit, the engagement of the shoulder 43 with the forked end 42 of the elbow-lever will serve to rock said lever and uplift the upper arm 44 of said lever against the tension of spring 45 and into engagement with the lower end of the adjusting-screw 48, whereupon further movement of the parts will be prevented. Under conditions also where the shaft 26 is running at a certain speed it may be at times desirable to supply to the carbureter an increased volume of liquid hydrocarbon at each feeding impulse of the valve, and for this purpose the operator by proper manipulation of the cord, chain, or other device connected with the upturned arm 53 of the upper elbow or angle lever may move said lever pivotally, so as to cause the arm 54 thereof to press downward upon the upper end of the pin or stem 55, whereby the spring 45 is compressed and caused to bear with increased tension upon the arm 44 of the lower elbow-lever, and said elbow-lever being rocked pivotally is caused to move the sleeve 34 endwise upon shaft 26 to move the cam 32 in such a way as to permit of increased opening movement of valve 8. It will also be seen that in the operation of the improved carbureter the suction of the engine will be exerted through the vaporizing-chamber of the casing to draw air in through the air-inlet opening at the bottom of said casing, and the current of air thus drawn into the vaporizing-chamber will in passing through

the meshes of the vaporizer exert a lifting movement thereon in such a way as to tend to lift said vaporizer and since the vaporizer is connected with the valve-stem 9 to also lift the valve for the admission of liquid hydrocarbon into said chamber, the draft thus produced in the operation of the engine serving to reinforce the mechanical means employed for moving the vaporizer and valve and also serving to hold the valve in raised position for a longer time than it would be held opened by the mechanical means alone, so that the admission of the liquid hydrocarbon is to an extent controlled by the suction of the engine.

From the above description of my improvements it will be seen that the improved carbureter is of an extremely simple and inexpensive nature and is especially well adapted for use, since it permits of producing an intimate mixture of the hydrocarbon vapor and air without danger of the liquid hydrocarbon being supplied to the motor or other device in connection with which the carbureter is used. Since the air for forming the combustible mixture is drawn in at the bottom of the casing of the carbureter and is caused to circulate through the openings or meshes of the conical vaporizer 15 instead of over the surface thereof, it will be seen that a more intimate and complete vaporization and mixture is produced, any surplus liquid hydrocarbon falling upon the lower gauze diaphragm 16 and being prevented from passing to the motor. It will also be obvious from the above description that the supply of liquid hydrocarbon to the carbureter is automatically governed and controlled at all times, so that the proportion of vapor and air is regulated according to the requirements of the motor under different conditions, and, furthermore, it will be obvious that the device is capable of some modification without material departure from the principles and spirit of the invention, and for this reason I do not wish to be understood as limiting myself to the precise form and arrangement of the several parts as herein set forth in carrying out my invention in practice.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a device of the character described, the combination of a carbureter having a passage for supplying liquid hydrocarbon to it, a valve controlling said passage, a device movable to engage and control the opening movement of the valve, a shaft mounted to turn and provided with a cam and means, independent of the valve-controlling device and actuated from said cam for moving the valve, said valve-moving means comprising a resilient part adapted to yield when the opening movement of the valve is limited.

2. In a device of the character described, the combination of a carbureter having a passage for supplying liquid hydrocarbon to it, a valve controlling said passage, means for limiting the opening movement of the valve, resilient means for opening the valve and adapted to yield when the opening movement of the valve is limited and actuating mechanism connected with and arranged to actuate the valve-limiting means and also arranged to actuate the valve-moving means.

3. In a device of the character described, the combination of a carbureter having a passage for the supply of liquid hydrocarbon to it, a valve controlling said passage, speed-controlled means for limiting the opening movement of the valve, and resilient means for opening the valve and adapted to yield when the opening movement of the valve is limited, substantially as set forth.

4. In a device of the character described, the combination of a carbureter having a passage for the supply of liquid hydrocarbon to it, a valve controlling said passage, means for opening said valve and comprising a resilient part, and speed-controlled means comprising a part adapted to engage and control the movement of the valve, substantially as set forth.

5. In a device of the character described, the combination of a carbureter having a passage for the supply of liquid hydrocarbon to it, a valve controlling said passage, means for opening the valve, a part movable to engage and limit the opening of the valve, speed-controlled means for moving said part and mechanism, independent of said speed-controlled means, for moving said part, substantially as set forth.

6. In a device of the character described, the combination of a carbureter having a passage for the supply of liquid hydrocarbon to it, a valve controlling said passage, means for opening the valve and mechanism, independent of said valve-opening means, and adapted to engage and control the opening movement of the valve, substantially as set forth.

7. In a device of the character described, the combination of a carbureter having a passage for the supply of liquid hydrocarbon to it, a valve controlling said passage, means comprising a cam and lever for opening the valve, another cam mounted for movement and adapted to engage and control the opening of the valve and speed-controlled mechanism for operating said cam, substantially as set forth.

8. In a device of the character described, the combination of a carbureter having a passage for supplying liquid hydrocarbon to it, a valve controlling said passage, a shaft having driving means and provided with a cam, an elastic part interposed between the cam and valve for communicating movement to the valve to open the same, and means for controlling the opening movement of the valve, substantially as set forth.

9. In a device of the character described, the combination of a carbureter having a passage for the supply of liquid hydrocarbon to it, a

valve controlling said passage, a shaft having driving means and provided with a cam, a lever formed from elastic material with one end engaged with said cam and its opposite end connected with the valve for communicating the movement of the cam to the valve to open the same, and means for controlling the opening of the valve, substantially as set forth.

10. In a device of the character described, the combination of a carbureter having a passage for supplying liquid hydrocarbon to it, a valve controlling said passage, a stem connected with the valve and provided with a grooved collar, a shaft having driving means and provided with a cam, a lever formed from elastic material with one end engaged with said cam and its opposite end engaged with the grooved collar of the valve-stem for communicating movement to the valve to open the same and means for controlling the opening movement of the valve, substantially as set forth.

11. In a device of the character described, the combination of a carbureter having a passage for supplying liquid hydrocarbon to it a valve controlling said passage, means for opening said valve and comprising a resilient part, a cam arranged for movement and adapted for engagement with the valve to limit the opening movement thereof and speed-actuated means for moving said cam, substantially as set forth.

12. In a device of the character described, the combination of a carbureter having a passage for supplying liquid hydrocarbon to it a valve controlling said passage, means for opening the valve and comprising a resilient part, a cam mounted for movement and adapted for engagement with the valve to limit the opening movement thereof, a shaft on which said cam is held, an arm on said shaft, a shaft held to turn, a governing device held on said shaft, and operated therefrom, and a sleeve on said shaft and movably connected with the governing device and having engagement with the arm of the cam-shaft to move the same, substantially as set forth.

13. In a device of the character described, the combination of a carbureter having a passage for supplying liquid hydrocarbon to it, a valve controlling said passage, means for opening said valve and comprising a resilient part, a cam mounted for movement and adapted for engagement with the valve to limit the opening movement thereof, a shaft on which the cam is held, an arm on said cam-shaft, a driven shaft having a sleeve connected with and arranged to move the arm on the cam-shaft and provided with a governing device for moving said sleeve, and means for moving the sleeve independently of the governing device, substantially as set forth.

In testimony whereof I have hereunto signed my name, at Chicago, this 18th day of October, 1902, in the presence of two subscribing witnesses.

GEORGE F. SWAIN.

Witnesses:
H. E. KELLOGG,
ABNER A. HODGES.