No. 813,653. PATENTED FEB. 27, 1906.

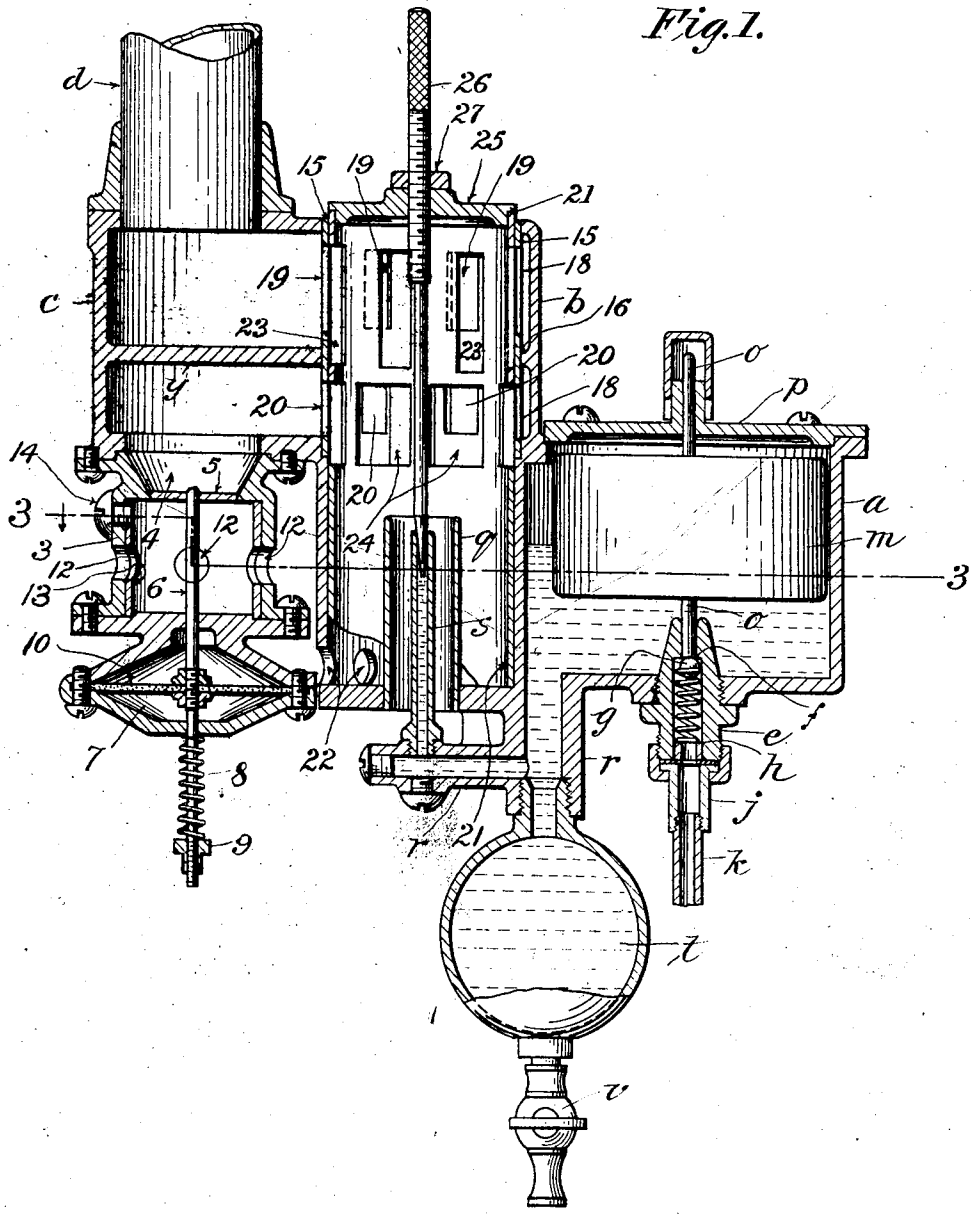
F. A. LAW.

CARBURETER.

APPLICATION FILED APR. 10, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

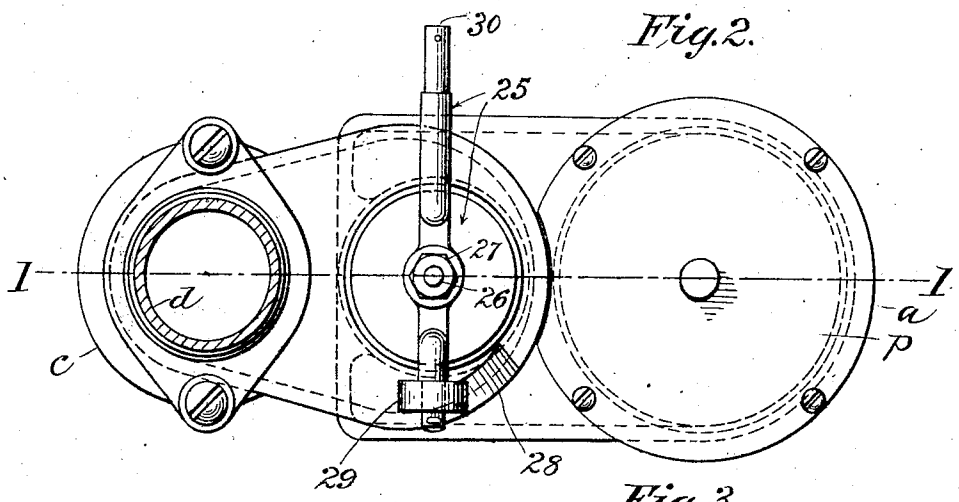
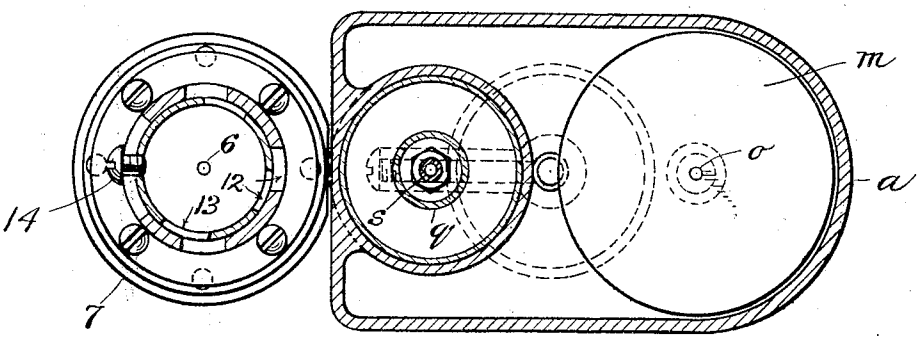


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 5.

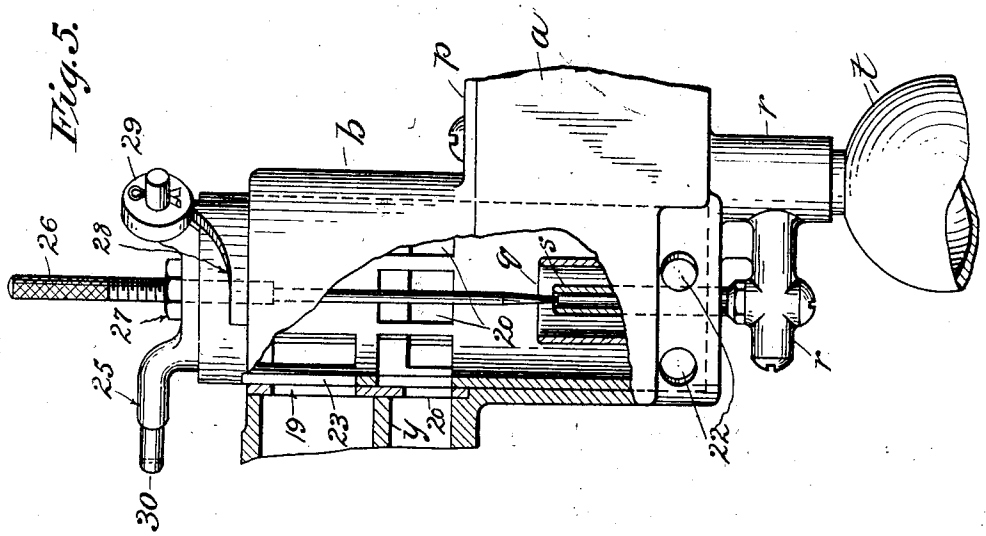
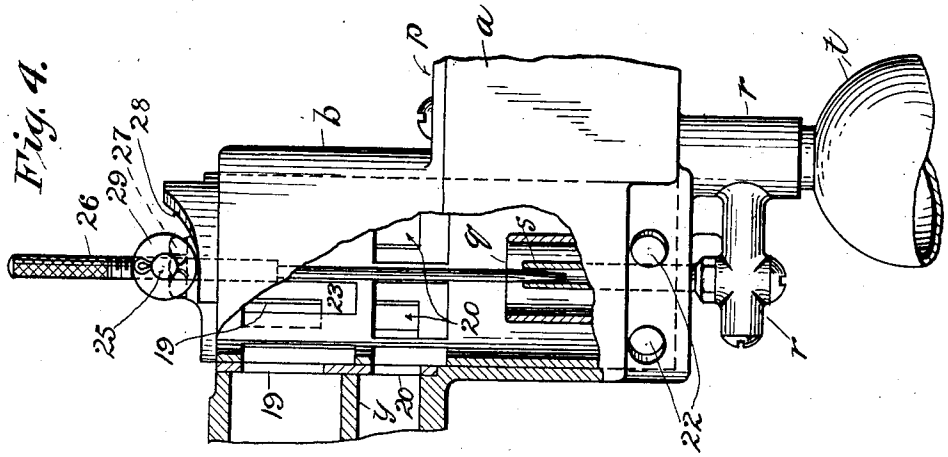


Fig. 4.



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UNITED STATES PATENT OFFICE.

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CARBURETER.

No. 813,653. Specification of Letters Patent. Patented Feb. 27, 1906.

Application filed April 10, 1905. Serial No. 254,847.

To all whom it may concern:

Be it known that I, FRED A. LAW, a citizen of the United States of America, residing at Hartford, in the county of Hartford and State of Connecticut, have invented new and useful Improvements in Carbureters, of which the following is a specification.

This invention relates to carbureters such as are used in connection with internal-combustion engines, the object of the invention being to provide a carbureter of this type capable of adjustment to normal conditions of operation and being provided with means whereby under abnormal conditions the required volume of combustible may be drawn from the carbureter and the required additional volume of air automatically added thereto substantially at the atomizing or vaporizing point in the carbureter.

A further object of the invention is to provide means of adjustment whereby this additional or auxiliary supply may be regulated, a still further object being to provide a separator between the atomizing-point in the carbureter and the source of supply of the combustible, whereby any water or other fluid having a greater specific gravity than that of the combustible will separate from the latter before reaching the atomizing-point.

Another object of the invention is to provide means whereby from a point outside of the carbureter the volume of air and combustible may be increased by the manipulation of a single device without disturbing the normal adjustments of the carbureter and independently of the automatically-operating air-supplying devices.

The invention is fully illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation of the carbureter, taken on line 1 1, Fig. 2. Fig. 2 is a top plan view of the same. Fig. 3 is a sectional plan view taken in the plane of line 3 3, Fig. 1. Fig. 4 is an elevation, partly in section, of that part of the carbureter comprising the atomizing-chamber and showing the means of adjustment for the combustible and air-supply; and Fig. 5 is a similar view to Fig. 1, showing these parts in a different position.

The carbureter comprises three general divisions or chambers, preferably cast in one piece, each chamber being cylindrical in form and preferably located in the same vertical plane, and they consist of the chamber *a*, (which constitutes a reservoir for the liquid combustible,) the chamber *b*, (which constitutes the atomizing-chamber,) and the chamber *c*, which is the mixing-chamber or that into which the atomized or vaporized combustible, mixed with the requisite volume of air, is discharged on its way to the motor, the pipe *d* being the conduit between the carbureter and the motor.

In the bottom of the fuel-reservoir *a* is fitted a plug *e*, having a valve-seat *f* near the upper end thereof, against which a suitable valve *g* seats and which is held to its seat by a spring *h*, supported in said plug in any suitable manner, as by means of the union-coupling *j*, whereby through a pipe *k* liquid combustible may flow into the reservoir when the position of the valve *g* permits. Automatic means common to carbureters of this type are provided to effect this unseating of the valve by means of a float *m* in the reservoir, having a stem *o*, axially located thereon, which extends from the under side of the float into an opening in the top of the plug *e* and from the other or upper side of the float into a suitable bearing in the top wall of the reservoir, which preferably is made in the form of a circular cap *p*. This float controls the valve *g* and regulates the height of the combustible in the reservoir in the well-known manner.

Axially located in the bottom of the atomizing-chamber *b* is the tube *q*, which is of such diameter as to supply the air required under normal conditions of operation.

From the reservoir *a* an angularly-disposed conduit *r* extends beneath the chamber *b* to a point somewhat beyond the center thereof, and connected to this conduit is the combustible-supply tube *s*, the upper end of which lies substantially on a level with the surface of the combustible in the reservoir, which, as is well known, is the usual construction in this type of a carbureter. The conduit *r*, as shown in Figs. 1, 4, and 5, extends downwardly from the bottom of the reservoir and thence horizontally at right angles to said downwardly-extending portion, the supply-tube *s* being screwed into said horizontal portion, near the end thereof. At the angle formed by said downwardly and horizontally extending portions of the conduit and below both is a small reservoir *t* in communication with the conduit and axially in line with the vertical portion of the latter. Naturally this reservoir *t* will fill with the combustible as it flows to the tube *s*, and should any water be mixed with combustible, as not

infrequently happens, it will settle in the lower end of this reservoir *t* and not pass on with the combustible to the supply-tube, thereby contributing to the more even running of the motor. At the lower part of the reservoir *t* a valve *v* is fitted, whereby any accumulation of water in the reservoir may be drawn off.

The chamber *c* is divided transversely of its axis by a partition *y*, and with the upper part of this chamber the tube *d* is connected, and with that part below the partition *y* is connected those devices whereby air may be supplied to the carbureter which is required under abnormal conditions of operation. These devices consist of a cylindrical casing 3, having an opening 4 therein, which is provided with a valve 5, to which a valve-stem 6 is secured, which extends axially through the casing, as shown in Fig. 1, and near the outer end thereof it extends through a diaphragm-casing 7, attached to the under side of the casing 3, the outer end of the stem being provided with an adjusting-spring 8 and a nut 9, whereby the tension of this spring may be regulated, the stem being fixed to a flexible diaphragm 10 within the casing 7. The casing 3 is secured to the under side of the chamber *c*, there being an opening through the bottom of the latter registering with the opening 4 in the upper end of the casing. Beneath the valve are air-ports 12 through the wall of the casing, and within the latter is a metal shell 13, having holes therein registering with the air-ports 12, this shell being rotatable in the casing 3, whereby more or less of the air-ports may be covered, means being provided (as the screw 14, which extends through a slot in the wall of the casing and screws into a hole in said shell) whereby the latter may be fixed in its adjusted position.

The upper portion of the chamber *b* for a distance substantially coextensive with the height of the mixing-chamber *c* is made of a greater diameter than the lower portion thereof, as shown particularly in plan view, Fig. 2, in dotted lines, and also in Fig. 1 in section, and fitted into the upper end is a fixed thin metal shell 15, whose internal diameter is the same as the diameter of the lower portion of said chamber. When this shell 15 is in place in the enlarged upper portion of the chamber *b*, it results in the formation of an annular space between it and the wall of the chamber, which space is divided in the plane of the partition *y* of the chamber *c* by a rib 16, which shows only in Fig. 1. The location of this rib 16 at this point makes that part of the annular space 18 above it a part and practically a continuation of that part of the chamber *c* which lies above said partition, while that part of said annular space below the rib 16 has a like relation to that part of the chamber *c* lying below the partition *y*, the ports 19 and 20 placing these spaces in communication, respectively, with the upper and lower portions of the chamber *c*, the ports being located, respectively, in those parts of the casing which lie in the plane of the upper and lower portions of the chamber *c*. Thus if suction were applied to the conduit *d* air would be drawn through the vertical tube *q* to the limit of its capacity, said air passing through the openings 19 in the shell 15 and thence into the upper part of the chamber *c*, certain of these ports opening directly into the chamber. If, however, the suction stroke is strong enough to exceed the capacity of the tube *q*, then the valve 5 at the bottom of the chamber *c* will be raised from its seat and air will enter through the ports 12, passing through the valve-opening 4 into the lower part of the chamber *c* and from thence through the openings 20 in the shell 15 into the mixing-chamber *b*, the direction of the air-current being substantially at right angles to the current of air being aspirated through the tube *q* and mingling therewith will pass upward through the openings 19 into the upper part of the chamber *c* and out through the conduit *d*. This is the automatic functioning of the device to supply air to the atomized combustible in the mixing-chamber when an abnormal demand is made on the carbureter by the engine.

Means whereby an increased quantity of fuel and a properly-proportioned increased volume of air may be attained at will by the operator will now be described, and these means consist in mounting in the mixing-chamber *b* a revoluble cylindrical shell 21, which fits closely the interior of the shell 15 in the upper part of the chamber *b* and the wall of the latter in the lower part. In said lower part air-ports 22 are formed which normally are covered by the shell 21, but which may be uncovered by the raising of this shell, whereby air may be admitted around the base of the atomizing-tube *q*. The shell 21 is provided with ports 23 in the plane of the ports 19 and is also provided with other ports 24 in the plane of the ports 20, whereby by the rotation of the shell 21 more or less of the ports 19 may be covered or uncovered, as desired; but the ports 24 opposite the ports 20 in the shell 15 are made wide enough so that whatever may be the adjustment of the area of the ports 19 the area of the ports 20 will be unaffected thereby. Therefore the conditions under which the valve 5 beneath the chamber *c* will operate to admit an extra supply of air are always the same as regards the degree of vacuum that is required to cause that valve to open. The upper end of the shell 21 is closed by a cap 25, through which extends the stem 26, whose lower end is tapered and enters the upper end of the combustible-supply tube *s*. This stem is threaded into the cap and a check-nut 27 locks the stem in its adjusted position.

From the foregoing description it is clear that by adjusting the stem 26 (which constitutes practically a needle-valve for the combustible-supply tube *s*) the amount of combustible may be adjusted to the volume of air which may be drawn through the tube *q*, thus adjusting the carbureter to normal conditions of operation. Then under abnormal conditions arising from increased demands of the engine an extra quantity of air will be supplied through the valve 5 to provide the necessary quantity demanded by the increased supply of combustible, and if the shell 21, carrying, as it does, the stem 26, be moved upwardly and at the same time rotated to uncover more of the ports 19 and to uncover more or less of the ports 22 it will be seen that the additional air-supply and the additional supply of combustible can both be effected at will by the operator in precisely the same way that the result is obtained automatically under abnormal suction force, and in order to effect the rotation and simultaneous endwise movement of the shell 21 an inclined camway 28 is formed on the upper end of the chamber *b*, as shown particularly in Figs. 2, 4, and 5, and on an arm connected with the cap 25, which is fixed to the end of the shell 21, is a wheel 29, which runs on the camway 28, and by any suitable means—as, for example, the arm 30, extending at right angles to the axis of the shell—the latter may be rotated to cause the wheel 29 to run up the camway, thereby lifting the lining coincidently with the rotation thereof, whereby the ports 22 may be uncovered and the area of the ports 19 increased and the volume of combustible increased by the withdrawal of the stem 26 from the end of the combustible-supply tube *s*. By swinging the arm 30 in one direction the increased air and combustible supply is effected, and by swinging the arm 30 in the opposite direction the parts are all returned to their position of adjustment to normal conditions of operation.

It will be noticed that the stem 6 of the valve 5 extends through and is attached to the diaphragm 10, (see Fig. 1;) but the latter has no function whatever save to retard more or less the movements of the valve, the flexible diaphragm acting as a check to the violent opening or closing movement of the valve which might take place otherwise.

From the foregoing description it is clear, therefore, that the normal supply of combustible and air is supplied by the aspiration of air through the tube *q*, that an abnormal suction stroke, whereby an increased quantity of combustible is drawn through the tube *s*, will effect the automatic opening of the valve 5 and supply an increased volume of air for mixing with this increased supply of combustible, and this added volume of air will be drawn through the ports 20 practically in a direction at right angles to the flow of the mixture through the tube *q*, and from thence upward through the openings 19, and on through the upper part of the chamber *c* to the motor, and, as described, the same effect may be produced by the manipulation of the shell 21, the maximum capacity of the carbureter being attained when this shell has been adjusted to supply the maximum quantity of combustible and air and when the suction effect of the motor is sufficient to actuate the valve 5 to open the same under the described condition of adjustment of said lining 21.

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

1. A carbureter comprising an atomizing-chamber, an air-tube extending from the interior through the bottom of the chamber, a supply-tube for combustible located axially of the air-tube, a shell to fit the interior of the atomizing-chamber, endwise movable therein, there being air-ports through the wall of the chamber below the inner end of the air-tube and normally covered by said shell, the opposite end of the latter being closed; a valve for the supply-tube operable by the movement of said shell to vary the supply of combustible coincidently with the opening of said air-ports, and suitable means to move the shell endwise.

2. In a carbureter, an atomizing-chamber provided with an inlet-opening at one end and an outlet-opening at the other, there being ports in the wall of the chamber communicating with an annular space extending around the chamber in the plane of the outlet and communicating with the latter through one or more of said ports, and there being other ports extending through the wall of the chamber near said inlet-opening; atomizing devices associated with the latter, and a shell to fit the interior of the chamber to normally cover the ports near the other end thereof to register in one position with the ports in communication with the outlet-opening; a valve for the atomizing device connected with the shell, and means to move the shell rotatably to adjust the area of the ports at one end of the chamber and vertically to operate the valve and to cover and uncover the ports at the opposite end of the chamber coincidently with the actuation of the valve.

3. In a carbureter, an atomizing-chamber provided with an inlet-opening at one end and an outlet-opening at the other, atomizing devices located at the inlet-opening, the opposite end of said chamber being provided with two annular circumferentially-disposed spaces located in different planes and communicating with the interior of the chamber by suitable ports, one of said spaces through said ports being in communication with the outlet-opening, and the other of said spaces being in communication through its ports with

a closed chamber; an inwardly-opening valve in said closed chamber; a rotatable and endwise-movable shell to fit the atomizing-chamber and provided with ports to register with the ports communicating with said annular spaces; a valve on said shell, and means to rotate the latter and to simultaneously impart endwise movement thereto.

4. In a carbureter, an atomizing-chamber, a second chamber communicating therewith through ports in the contiguous walls of said chambers located in different planes, said second chamber being divided into two compartments one of which has a pipe connection to extend to the motor; a valve in the other compartment opening inwardly; a rotatable shell in the atomizing-chamber having ports to register with the ports through which communication is established with the connection extending to the motor; suitable atomizing devices connected with the atomizing-chamber located at the inlet-opening therein there being ports through the wall of the atomizing-chamber near the inlet-opening and normally covered by the shell; a valve connected with the shell to control the supply of combustible delivered by the atomizing devices, and means to move the shell to simultaneously vary the area of the ports leading to the motor connection, and to vary the supply of combustible delivered from the atomizing devices and to coincidently uncover the ports near said inlet-opening without varying the area of the ports communicating with the valve-containing compartment.

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