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CARBURETER.

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1,014,188.

Patented Jan. 9, 1912.

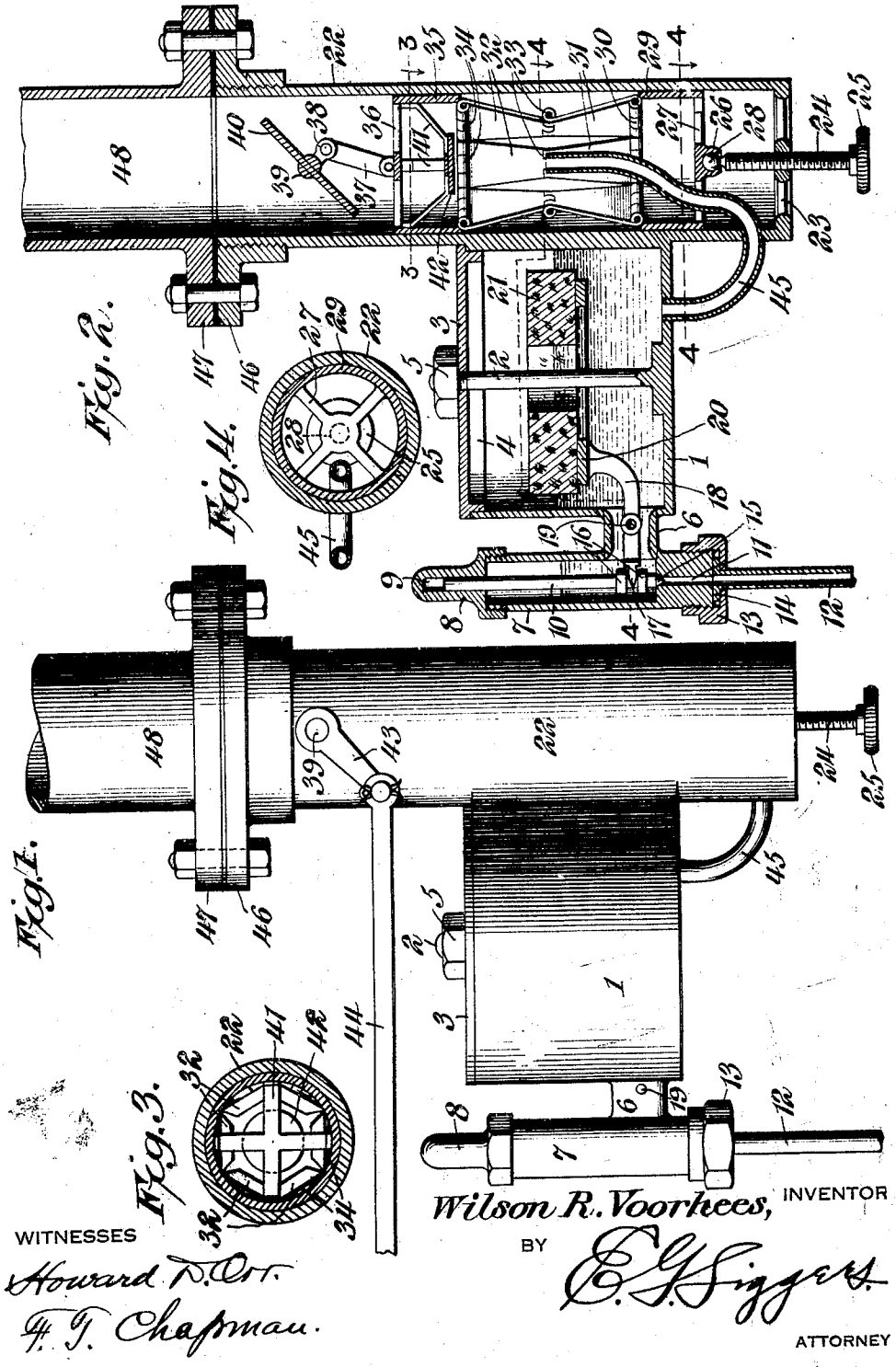

Fig. 2.

Fig. 4.

Fig. 1.

Fig. 3.

WITNESSES

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CARBURETER.

1,014,188. Specification of Letters Patent. Patented Jan. 9, 1912.

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To all whom it may concern:

Be it known that I, WILSON R. VOORHEES, a citizen of the United States, residing at Perth Amboy, in the county of Middlesex and State of New Jersey, have invented a new and useful Carbureter, of which the following is a specification.

This invention has reference to improvements in carbureters, and its object is to provide a means whereby there is produced an intimate admixture of air and hydro-carbon gas, controllable either automatically or by hand, the structure being such that a liquid hydro-carbon drawn from a suitable tank by the suction of the engine is sprayed into a moving column of air, the speed of which where intersecting the spray of hydro-carbon liquid is readily controllable, while at the same time the passage through which the carbureted air is directed to the engine may be throttled or enlarged as needed.

In accordance with the present invention there is provided an air duct in which there is lodged means whereby the effective cross-sectional area of the duct may be varied at will for accelerating or retarding the speed of flow of the air therethrough and at an appropriate point with relation to the accelerating means other means are provided for the injecting of a stream of liquid hydro-carbon into traversing relation to the accelerated column of air, the liquid being at the same time sprayed so as to become intimately mixed with and vaporized by the air column, and then absorbed thereby, so that the air is suitably enriched. Between this mixing portion of the conduit and the intake of the engine there is provided a valve, whereby the volume of air passing to the engine may be controlled and this will in like manner control the speed of the air at the mixing zone in such manner that when the air column is throttled to a greater degree the passage for the air at the mixing zone is decreased in order that the speed of travel of the air at this point will proportionately increase and by properly proportioning and adjusting the parts a speed of travel of the air in the mixing zone may be established under all conditions of engine demand which will give the best intermixture of air and hydro-carbon for the production of the explosive charge.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of this specification, with the understanding, however, that while the drawing illustrates a practical form of the invention, the latter may be incorporated in numerous other forms while still retaining salient features of the invention.

In the drawings:—Figure 1 is an elevation of the carbureter. Fig. 2 is a central longitudinal section through the air conduit and adjacent parts. Fig. 3 is a section on the line 3—3 of Fig. 2 omitting more distant parts. Fig. 4 is a section on the line 4—4 of Fig. 2.

Referring to the drawings, there is shown a casing 1 constituting an intermediate storage chamber for the liquid hydro-carbon which hereinafter will be referred to as gasolene for convenience, without, however, in any manner limiting the invention to the use of gasolene as the hydro-carbon employed. This gasolene chamber 1 is shown as provided with an axial stem 2 and a cover 3, the latter being preferably formed with a flange 4 designed to enter the open top of the casing 1 with the stem 2 transversing a central perforation in the cover, and this stem at its free end is threaded for the reception of a nut 5 designed to hold the cover in place, but still permit its ready removal when desired. Of course, suitable packing may be employed to render the junction of the cover and casing fluid tight if such be desired. At one point the casing 1 is connected by a neck 6 to a valve casing 7 provided with a cap 8 with an axial guide passage 9 for a valve stem 10, and at the end remote from the cap the casing 7 is formed with an axial passage 11 in line with a supply pipe 12 held to the valve casing by a cap nut 13 provided with a central passage for the pipe 12, and the latter may be formed at the end adjacent the passage 11 with an outstanding flange 14, by which the cap 13 holds the pipe to the valve casing. The valve stem 10 is provided with a valve end 15 adapted to close the end of the passage 11 where entering the valve casing and on the stem are spaced collars 16 between which engages a yoke 17 formed on one end of a lever 18 extending through the neck 6, being there mounted upon a pivot pin 19 traversing the neck. The other end of the lever 18 from that carrying the yoke 17 enters the casing 1 and is there formed with

a sustaining annulus 20 for an annular float 21 which may be made of cork or some other suitable material readily sustainable on gasolene or other hydro-carbon.

The structure is such that gasolene coming through the pipe 12 from a suitable reservoir will pass the valve 15, which latter is held away from the passage 11 by the gravitating action of the float 25 in the absence of any liquid within the casing 1, it being understood that the casing 1 has its longitudinal axis substantially upright when the device is in use. As soon as a sufficient quantity of gasolene enters the casing 1 the float is raised thereby until ultimately the valve 15 is seated, and further inflow of gasolene is prevented until the demand upon the gasolene within the casing so lowers the level thereof that the valve 15 is opened sufficiently to permit a further inflow of gasolene, the reservoir being either so placed that the gasolene will flow into the casing 1 by gravity or a super-atmospheric pressure may be produced within the reservoir to cause the flow of the gasolene, these features being common in the art to which this invention relates.

Either formed on or made fast to one side of the casing 1 is a tube 22, preferably of even diameter throughout, but not necessarily so. This tube or conduit 22 is formed at the lower end, considering the device in use, with a spider 23 at the center of which there is formed a nut for a threaded stem 24 provided at its outer end with a manipulating wheel or button 25 and at the other end into a rotatable connection with a boss 26 on another spider 27, the connection being shown as in the form of a ball and socket joint 28, but this particular connection is not mandatory. The spider 27 is carried by one end of a sleeve 29 fitted to the interior of the tube 22 for a close but easy fit therein. Connected by hinges 30 to what may be termed the upper end of the sleeve 29 is a circular series of segmental plates 31 each narrowing at the end remote from the hinge 29, and these plates are each connected to similar plates 32 by hinges 33, while the ends of the plates 32 remote from the hinges 33 are connected by hinges 34 to a sleeve 35 also closely but freely fitting the interior of the tube 22, and this sleeve 35 at the end remote from the hinges 34 is formed with, or has attached thereto a spider 36, to the center of which there is pivoted one end of a link 37, the other end of which is pivoted to a stud 38 projecting radially from an arbor 39 journaled in the side walls of the tube 22 and carrying a valve or damper 40 in the form of a circular plate such as is commonly employed in stove pipe dampers. The sleeve 35 has attached thereto the ends of the arms of a spider 41 carrying a plate 42 central to the sleeve and the longitudinal axis of the tube or pipe 22, this plate 42 being of considerably less diameter than the interior of the sleeve. The arbor 39 extends to the exterior of the pipe or tube 22 and is there provided with a crank 43 to which is connected a rod 44 which may lead to some distant point of operation.

Opening through the bottom of the casing 1 is a pipe 45 carried through the wall of the tube 22 to the interior thereof, thence through the spider 27 and up part way through the throttling leaves 31, 32, the pipe terminating at a distance below the plate 44 in the longitudinal axis of the tube 22 and is there open, the top of the pipe being above the highest level of the gasolene within the casing 1 when the device is in operation. In the particular structure shown, that end of the tube or pipe 22 which may be termed the upper end has applied thereto a coupling flange 46 to which is attached a mating flange 47 on another pipe or tube 48 which may lead to the fuel intake of the engine, the carbureter being designed particularly for explosion engines.

Let it be assumed that a suitable source of gasolene supply is connected to the pipe 12 and that by means of the float valve a certain level of gasolene is maintained in the casing 1, and, of course, in the pipe 45. On the suction stroke of the engine air flows through the pipe 22, entering through the spider 23, with a speed determined by the action of the engine and the position of the valve 40. If this valve extends diametrically with relation to the pipe 22, the pipe is closed to the passage of air therethrough, while the effective area of the pipe for the passage of air is increased as the valve is moved toward the open position. Any movement of the valve 40 due to the rotation of the shaft 38 is participated in by the sleeve 35 and consequently by the deflector plate 42 and by the throttling plates 31 and 32. When the valve 40 is in the full open position the sleeve 35 is at its distant limit of travel with relation to the sleeve 29 and the plates 31 and 32 are brought the nearest into alinement. When the valve 40 is moved toward the closed position, the sleeve 35 is caused to approach the sleeve 29 and the plates 31 and 32 are moved so that their hinge junctions 33 approach the longitudinal axis of the pipe or tube 22, and the effective area of the pipe 22 at this point is reduced to a commensurate extent. The suction of the engine may, for the purposes of illustration, be taken as constant, although in practice the amount of air drawn through the tube 22 at each suction stroke of the engine may be less at high speed than at low speed. If it be assumed that the engine is running and that the valve 40 is in a partially closed position as shown in Fig. 2, then at a certain speed

a certain flow of air occurs through the pipe or tube 22 at each suction stroke of the engine. However, the effective area of the tube 22 is reduced at the hinge connections 33 of the plates 31 and 32 because of the approach of these hinge connections to the longitudinal axis of the pipe 22 and consequently the speed of the air at this point is increased, and, moreover, as it passes the point of close approach to the central portions of the plates 31 and 32 the air then expands with a resultant production of subatmospheric pressure lower than would occur if the pipe 22 were freely open throughout. There is, therefore, an injector action on the gasolene within the pipe 45 and this gasolene is withdrawn from the pipe through the end of the pipe within the tube 22, and this gasolene is directed toward the plate 42 to be deflected thereby into the streams of air passing alongside of the plate 42, through the sleeve 35, with the result that the gasolene is finely divided and at once evaporated and absorbed by the air, to be ultimately drawn into the engine and utilized in the usual manner.

The relative proportions of gasolene and air are readily controlled by opening or closing the valve 40 to different extents, thus varying the quality and speed of air flow through the pipe 22, and, at the same time, correspondingly varying the effective area of the pipe at the middle or junction portions of the channel through the pipe as defined by the plates 31 and 32. Ordinarily as the valve 40 is opened the effective space at the hinges 33 is increased, to be decreased as the valve 40 is moved toward the closed position. The relation between the effective opening at the hinge portion 33 of the plates 31 and 32 and the relation thereto of the valve 40 is variable by means of the screw 24 acting on the sleeve 29 to move it longitudinally of the tube 22. Since the relation of the sleeve 35 to the arbor 39 is determined by the link 37 it follows that the sleeve 29 may be moved by the screw 24 toward and from the sleeve 35 and when the latter is moved by the arbor 39 controlling the valve 40 the effective opening through the tube 22 at the hinge-portion 33 of the plate 31 and plate 32 may be relatively greater or smaller depending upon the adjustment of the sleeve 29, so that the action of the stream of air upon the gasolene furnished through the tube 45 is in this respect controllable by the operator and the carbureter may be set by the operator in accordance with the conditions present in the particular engine furnished with fuel by the carbureter. Other adjustments of the carbureter which are desirable are effected through the connecting rod 44.

Difficulty is found in starting explosion engines using gasolene as a fuel, especially in very cold weather, but in the practical operation of the present invention it is found that the engine is readily started in the coldest weather without priming. The carbureter of the present invention in its practical operation is very flexible and may be adjusted until throttled down so that the engine speed may be reduced to a low minimum, but when the carbureter is opened up the power generated by the engine is markedly superior due to the close approach to the ideal explosive mixture. The carbureter of the present invention has a sufficiently wide range of adjustment to adapt it to any explosion engine, and when once adjusted to the engine no further change is necessary.

It will be observed that the two groups of plates 31 and 32 define substantially frusto-conical or frusto-pyramidal spaces with the bases remote one from the other and joined at the smaller ends, and that the slant or pitch of the walls of these spaces is variable in accordance with the movements of the sleeves 29 and 35 toward or from each other.

What is claimed is:—

1. In a carbureter, a chamber having means for the introduction of fuel thereinto, said chamber having its walls receding from a point adjacent to the point of entrance of the fuel, means for adjusting the degree of inclination of the walls with relation to the fuel inlet, and means other than the first-named means for also adjusting the degree of inclination of the walls with relation to the fuel inlet.

2. In a carbureter, a chamber having an inlet for fuel and provided with walls receding in both directions from the fuel inlet, means for adjusting the degree of inclination of the walls with relation to the fuel inlet, and other means independent of the first-named means for adjusting the degree of inclination of the walls with relation to the fuel inlet.

3. In a carbureter, a chamber having a fuel inlet and adjacent thereto series of plates hingedly connected together at their meeting ends and hingedly carried at their other ends, and means for causing the approach or recession of the connected ends of the plates of the said series toward or from the longitudinal axis of said series.

4. In a carbureter, a chamber provided with an inlet for fuel and two series of plates constituting the walls of the chamber adjacent the fuel inlet, the plates of one series being connected end to end with the plates of the other series, a valve in the chamber, and connections between the valve and the corresponding ends of one series of plates for causing a movement of said plates by the adjustment of the valve.

5. In a carbureter, a tubular chamber, a

valve therein, a sleeve in the chamber movable axially therein, a circular series of segmental plates hingedly connected at one end to the sleeve, another series of segmental plates hingedly connected end to end to the first named series and in turn hingedly supported in the chamber, means for the introduction of fuel into the chamber, and connections between the valve and the sleeve for causing movement of the latter on the adjustment of the valve.

6. In a carbureter, an elongated contractible and expansible throttling means responsive to an axial movement imparted thereto, and separate means connected to respective ends of said throttling means for imparting axial movement thereto.

7. In a carbureter, an elongated contractible and expansible throttling means responsive to axial movement imparted thereto, and separate means connected to respective ends of said throttling means for causing axial movement thereof, one of said separate means including a valve and connections therefrom to said throttling means.

8. In a carbureter, an elongated throttling means contractible and expansible toward and from the longitudinal axis thereof, means for the introduction of fuel into the space defined by the throttling means, and a valve for regulating the flow of air through the throttling means and connected to said throttling means for causing a movement thereof in accordance with movements of the valve.

9. In a carbureter, a tubular member, spaced sleeves therein, a throttling means composed of plates connected at opposite ends to the sleeves and joined intermediately, said plates being movable toward and from the longitudinal axis of the tubular member by the axial movement of the plates, a valve in the tubular member beyond one of the sleeves, and connections between the valve and corresponding sleeve for imparting axial movement to the sleeve on the opening and closing movements of the valve.

10. In a carbureter, a tubular member, spaced sleeves therein, a valve in said tubular member, connections between the valve and one of the sleeves for imparting movement to the sleeve on movements of the valve, adjusting means for the other sleeve, yieldable wall members connecting the two sleeves and movable by said sleeves to contract or enlarge the effective area of the space between the sleeves, and means for the introduction of fuel in the space defined by the yieldable walls.

11. In a carbureter, a tubular member, spaced sleeves therein, a valve in said tubular member, connections between the valve and one of the sleeves for imparting movement to the sleeve on movements of the valve, adjusting means for the other sleeve, yieldable wall members connecting the two sleeves and movable by said sleeves to contract or enlarge the effective area of the space between the sleeves, and means for the introduction of fuel in the space defined by the yieldable walls, and a spreader in the path of fuel entering the space defined by the yieldable walls.

12. In a carbureter, a tubular member, spaced sleeves therein, a valve in said tubular member, connections between the valve and one of the sleeves for imparting movement to the sleeve on movements of the valve, adjusting means for the other sleeve, yieldable wall members connecting the two sleeves and movable by said sleeves to contract or enlarge the effective area of the space between the sleeves, means for the introduction of fuel in the space defined by the yieldable walls, and a spreader carried by the sleeve controlled by the valve in the path of fuel entering the space defined by the yieldable walls.

13. A carbureter comprising a tubular member, a rotatable valve mounted therein, a sleeve movable axially in the tubular member and connected to the valve for participation in movements of the valve, another sleeve also movable axially in the tube and in spaced relation to the first sleeve, a series of segmental plates each hinged at one end to the first named sleeve, another series of like segmental plates each hinged at one end to the other sleeve, the two series of plates having their narrower ends hingedly connected one to the other, a spreader carried by the first named sleeve, an adjusting screw connected to and controlling the second named sleeve, a holder for liquid fuel provided with means for maintaining a predetermined level of fuel therein, and a pipe leading from the fuel holder to the interior of the tubular member to and terminating within the tubular member in the space defined by the segmental plates in position to direct fuel toward the spreader.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WILSON ROSS VOORHEES.

Witnesses:

PETER CLAUSEN,

JACOB B. JOSELSON.