J. B. BROCKHURST.

MEANS FOR FEEDING AND MIXING FLUIDS.

APPLICATION FILED JAN. 28, 1910.

1,014,945.

Patented Jan. 16, 1912.

3 SHEETS—SHEET 1.

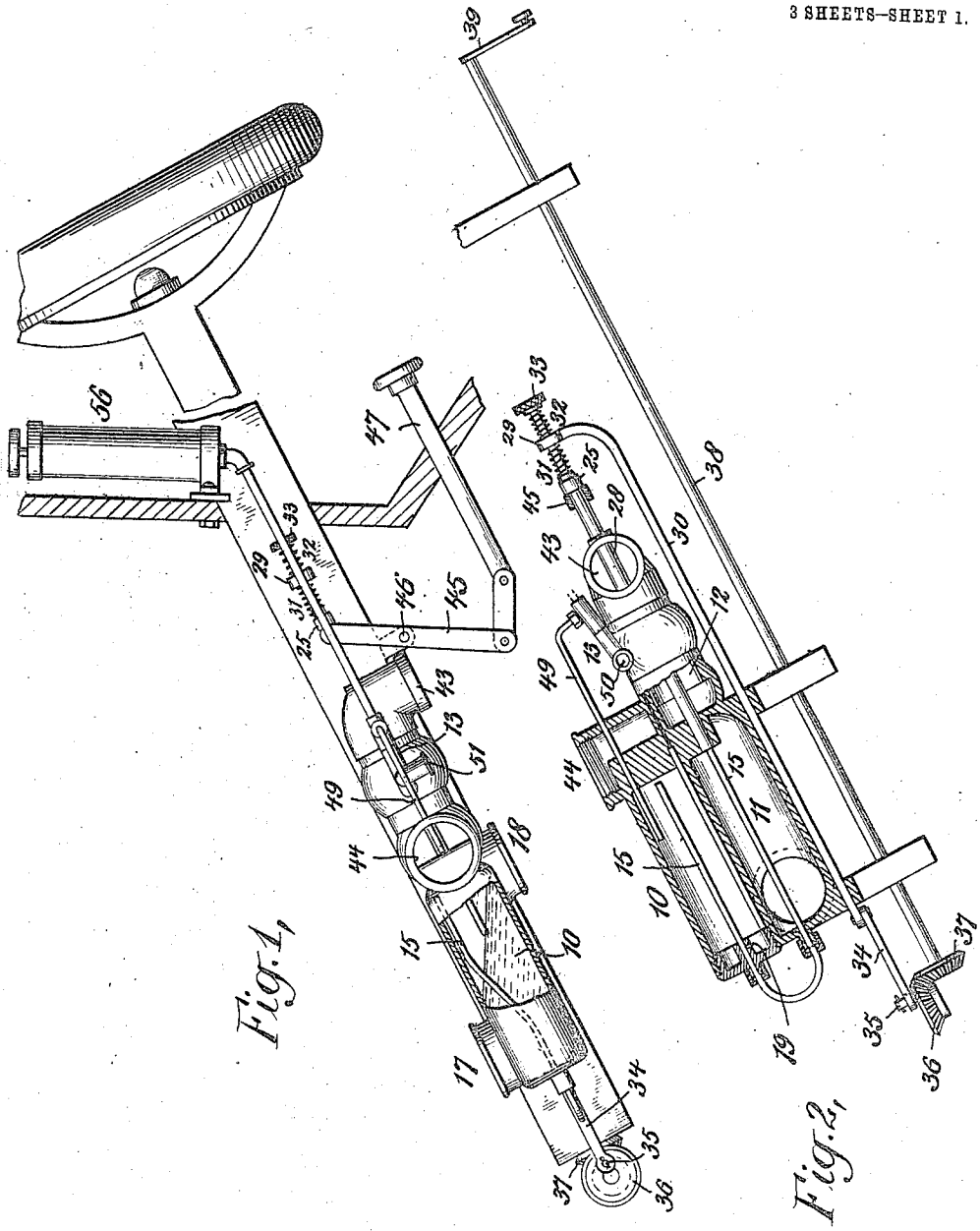

Fig. 1.

Fig. 2.

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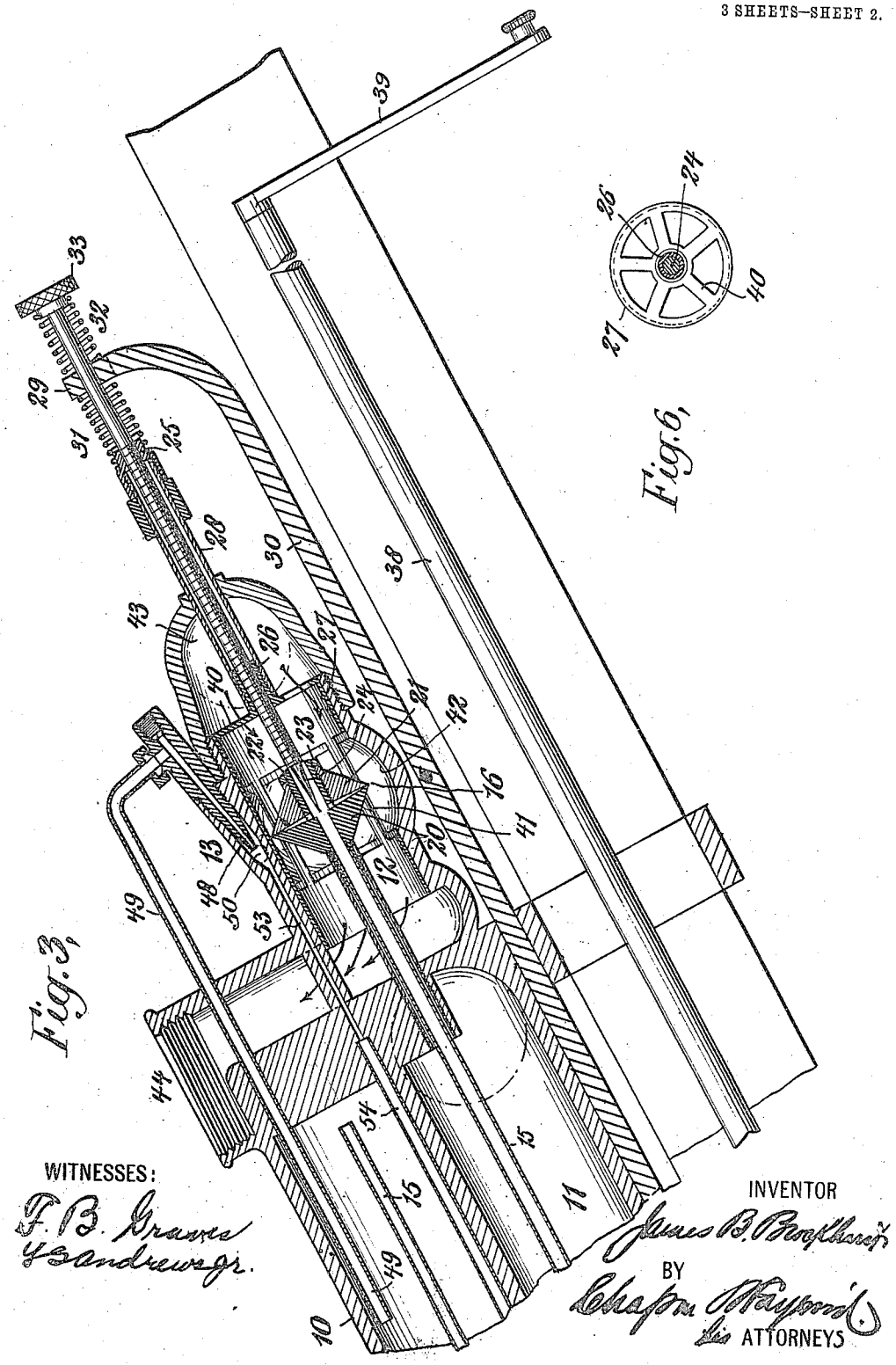

Fig. 3.

Fig. 6.

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Fig. 4.

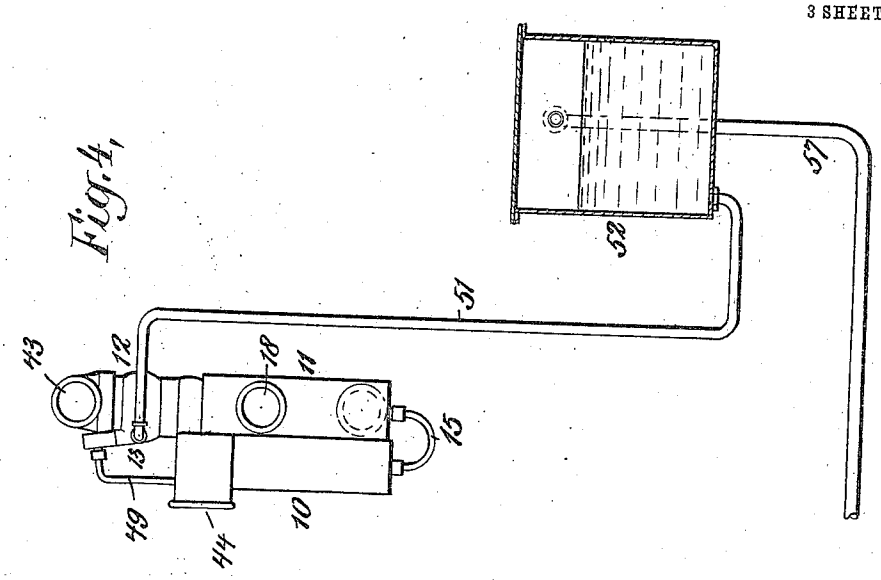
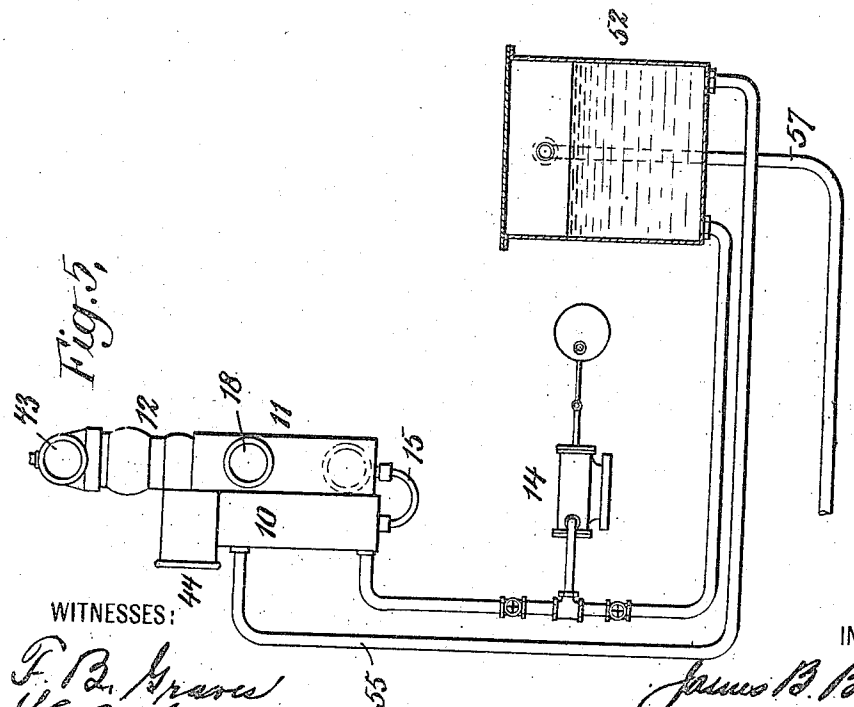


Fig. 5.



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MEANS FOR FEEDING AND MIXING FLUIDS.

1,014,945. Specification of Letters Patent. Patented Jan. 16, 1912.

Application filed January 28, 1910. Serial No. 540,601

To all whom it may concern:

Be it known that I, JAMES B. BROCKHURST, a citizen of the United States of America, and a resident of Red Bank, county of Monmouth, and State of New Jersey, have invented certain new and useful Improvements in Means for Feeding and Mixing Fluids, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in means for feeding and mixing fluids, and consists first, in a novel form and construction of apparatus for the generation of hydro-carbon gases and the carburization of air or other gas therewith whereby the same may be employed as a fuel for internal combustion engines and like purposes; second, in improved means for regulating the quality of the mixture and for feeding the same to an internal combustion engine, and for regulating the amount so fed; and third; in an improved form and construction of injector.

In carrying out the first part of my invention, I provide means for applying heat to the liquid hydro-carbons for the purpose of vaporizing and gasifying the same, the amount of such heat employed being preferably sufficient to generate the gases by destructive distillation whereby the gases so produced will be relatively fixed gases, and where the gases are to be employed as fuel in an internal combustion engine I conveniently and preferably employ the heat of the exhaust gases therefrom for this purpose. In the carbureting means I employ an improved form and construction of nozzle and mixing chamber, and means for adjusting the parts for regulating the mixture.

In carrying out the second part of my invention, I provide means for automatically regulating the supply of the carbureted mixture to the point of use, the apparatus being so arranged as to provide that the quantity supplied, beyond a certain point, be inversely proportioned to the amount used, whereby the apparatus will act as an effective governor. Thus when used with an internal combustion engine, the supply of fuel will be reduced as the speed of the engine increases beyond a desired limit, the increased speed at which the mixture is drawn through the apparatus being caused to throttle the admission. I also provide means under the direct control of an operator for regulating the normal supply of the mixture and for temporarily increasing the supply at will.

In carrying out the third feature of my invention, I provide a novel form, arrangement and construction of injector in which liquid is self fed to a closed vessel, against pressure therein, the amount so fed in being automatically regulated in accordance with the amount used, whereby a uniform level of the liquid will be maintained in the vessel.

My invention also consists in many novel details of construction and combinations of parts such as will be fully pointed out hereinafter, and in order that my invention may be thoroughly understood, I will now proceed to describe an embodiment thereof, having reference to the accompanying drawings illustrating the same, and will then point out the novel features in claims.

In the drawings: Figure 1 is a view in side elevation of a carbureter constructed in accordance with my invention, showing the same as connected to the steering post of a motor vehicle, wherein it may be employed in combination with an internal combustion engine employed for motive purposes therein. Fig. 2 is a view of the carbureter from beneath, showing the same partly in underside elevation and partly in central transverse section. Fig. 3 is an enlarged detail sectional view of certain parts thereof showing particularly the nozzle, the mixing chamber and the injector. Fig. 4 is a diagrammatic view showing the nozzle of the carbureter connected with a source of supply. Fig. 5 is a diagrammatic view of a modified form of the apparatus in which a pump is substituted for the injector, for the purpose of feeding liquid to the carbureter. Fig. 6 is a detail end view of a regulating sleeve employed.

The apparatus comprises generally a closed vessel 10 for containing the liquid hydro-carbon, a heating chamber 11, a mixing chamber 12, and means for supplying

liquid from a source of supply to the closed vessel, the said means comprising an injector 13 in the example of my invention shown in Figs. 1, 2, 3 and 4, and a pump 14 in the example of my invention shown in Fig. 5. In open communication with the upper end of the closed vessel 10 is an eduction tube 15 which passes down through the bottom of the vessel and then up through the heating chamber 11, to a nozzle 16. The heating chamber 11 is provided with a suitable inlet 17 and discharge 18 by which a heating medium, conveniently exhaust gases from the internal combustion engine, may be circulated therethrough, and in such circulation the portion of the tube 15 which passes through the chamber will be subjected directly to such heat. This tube is preferably made quite thin at this point and the amount of heat delivered thereto being considerable, the effect will be to generate hydro-carbon gases from the liquid in the vessel 10 by destructive distillation. The tube 15 has an opening 19 therein at the lower end of the vessel 10 whereby a certain amount of the liquid from the vessel will pass down through the tube and in addition gases generated in the chamber itself will pass down through the upper open end of the tube whereby to assist in the feeding of the fuel through the said tube toward the nozzle 16. It will be noted that the vessel 10 is itself in close proximity to the chamber, the said vessel 10 and the casing of the chamber 11 having a common wall between them: thus, the vessel 10 will itself be heated to a certain extent and a certain amount of the more volatile gas thereby liberated in the said chamber.

The nozzle 16 comprises two conical-shaped members 20—21 with their bases adjacently disposed, the conical member 20 being secured to the end of the tube 15 and the conical member 21 being mounted upon a projecting hub 22 of the said member. The member 21 is preferably screw-threaded upon the said hub whereby it may be adjusted thereon, and a lock nut 23 is provided for securing it in its adjusted position. The adjacent bases of the cone members 20—21 are dished so as to form a free passage from the center to the periphery of the nozzle, such an arrangement furthermore permitting an accurate adjustment of the parts at the peripheral point of discharge. A needle valve 24 is fitted to the interior bore of the nozzle, the said needle valve being adjustable for the purpose of controlling the amount of fluid discharged from the tube 15 to the channel between the dished portions of the nozzle member bases. The stem of this needle valve is mounted in screw-threaded relation, first with a collar 25 and second with the hub 26 of a sleeve 27, and the said hub and collar are likewise connected together by means of a tube 28. The tube 28 has a sliding engagement with the upper wall of a portion of the carbureter casing whereby the said valve and the parts carried thereby may be moved longitudinally, at will. The stem of the valve 24 is engaged near its upper end by the head 29 of a traveler 30, the said traveler being arranged to slide longitudinally in suitable stationary guides, and helical springs 31—32 surround the valve stem and are disposed respectively between one side of the head 29 and the collar 25, and the other side of the head 29 and a button 33 with which the extremity of the valve is provided. The lower end of the traveler 30 is connected by means of a pitman 34 with an eccentrically disposed pin 35 upon a bevel gear 36, and the said bevel gear is in engagement with a complementary gear 37 disposed upon the lower end of a controlling shaft 38, the upper end of which is provided with a manual operating member 39. The controlling shaft is mounted in suitable stationary bearings (not shown) and it will be readily seen that rocking movements imparted to the said shaft through the operation of the member 39 will move the said traveler 30 longitudinally in its bearings to thereby longitudinally adjust the position of the needle valve with respect to the nozzle and the sleeve 27 carried by the said needle valve The movements of the traveler will, of course, be imparted to the needle valve through the springs 31 and 32, which are stiff enough to impart such movements under ordinary conditions without material lost motion. The said sleeve 27 comprises a tubular portion fitted in sliding relation with the interior bore of the mixing chamber 12 and spider arms 40 which connect the said tubular portion with the hub 26. The inner diameter of the tube is but very little larger than the outer diameter of the nozzle 16, but the central portion of the sleeve where it surrounds the nozzle is largely cut away, only sufficient of the metal being left to form connecting portions 41, and the central portion of the mixing chamber surrounding the same is enlarged as is shown at 42, whereby the available cross sectional area throughout the chamber is maintained about uniform. The chamber is open at its upper end 43 to the atmosphere, and at its lower end it is provided with means 44 by which it may be connected with the intake of an internal combustion engine or other apparatus in which the fuel is to be employed

The operation of the apparatus is as follows: Suction being applied to the connection 44, air will be drawn through the inlet 43 and hydro-carbon vapor or gas, discharged in the form of a thin flat sheet,

transverse with respect to the path of the movement of the air from the nozzle 16, will be mingled therewith and the carbureted air will then pass through the connection 44 to the engine or other point of use. The amount of gas discharged through the nozzle will be initially adjusted by means of the permanent adjustment of the nozzle members, but it may also be adjusted by the operator at the time of use by manipulation of the manual member 39 of the controlling shaft 38 to operate the needle valve 24. At the same time as the needle valve 24 tends to shut off the supply of gas, the supply of air is also restricted by reason of the fact that the sleeve 27 will, in moving downward, partially close the enlarged portion 42 of the mixing chamber 12, and in addition thereto the lower end of the sleeve will, in moving downward, throttle the passage of carbureted air to the connection 44. In addition to this manual control there is also an automatic control which operates in the following manner. The inrushing air through the inlet 43 acts upon the surface of the spider arms 40 with a tendency to carry the sleeve and needle valve secured thereto, downward, against the pressure of the spring 31. This tendency varies in accordance with the speed at which the incoming air moves, and this speed is, of course, regulated by the quantity of fuel used in a given time. Thus, where the fuel is employed in an internal combustion engine, any tendency toward an increase of speed thereof beyond a certain limit will cause the sleeve and needle valve to move downward to throttle the admission, thereby forming an effective governor to prevent racing of the engine.

I conveniently provide an auxiliary means by which the supply may be automatically opened wide regardless of the manual adjustment of the parts, or regardless of the tendency of the parts to move to a partially closed position under the automatic control just stated, whereby the operator may provide for full supply temporarily without interfering with the normal adjustment or working of the parts. This means comprises an auxiliary lever 45 pivoted at 46 to a stationary portion of the device, the said lever being arranged to engage the collar 25 of the needle valve stem. An operating member 47 conveniently in the form of a pedal is arranged for the quick operation of the lever 45. By depression of the pedal 47 the needle valve and sleeve are instantly opened to their wide-open position against the tension of the spring 31, as will be readily understood, regardless of the position of the traveler 30.

The injector which I have above alluded to as one means I employ for maintaining liquid in the closed vessel 10, is provided with an injecting nozzle 48, a connection 49 thereto from a point in the closed vessel at the level at which it is desired to maintain the liquid, a condensing chamber 50 arranged in front of the nozzle, a connection 51 connecting the said condensing chamber with a source of supply,—as for instance, a reservoir 52, and a passage 53 of reduced cross sectional area which leads to the closed vessel 10 preferably connecting therewith through a pipe 54 leading to the bottom thereof. The injector acts as follows: As the level of liquid uncovers the lower parts of the pipe 49 volatile gases liberated from the liquid pass up through the pipe 49 to the injector nozzle 48. When they reach the chamber 50 they condense partly on account of the loss of heat due to their rapid expansion as they leave the nozzle and enter the chamber 50, and partly owing to the fact that the said condensing chamber is located in immediate proximity to the mixing chamber through which cold air is constantly circulating. The condensation of these gases lowers the pressure in the chamber 50 thereby inducing a flow of liquid from the source of supply through the connection 51. The fluids from the chamber 50 will then be discharged through the passage 53, and as the said passage 53 is of reduced cross sectional area, the speed of their passage therethrough will be accelerated to such an extent that the liquid will be fed into the closed vessel against the pressure therein. When the lower end of the pipe 49 is sealed by the liquid therein the foregoing action will cease and it will not start up again until the lower end of the pipe is again uncovered, whereby a constant level of liquid will be maintained in the said vessel. In first starting up it will, of course, be understood that the carbureter being cold, there will be no pressure in the closed vessel 10 or the said vessel may be entirely empty, and hence I provide a priming pump 56 for initially drawing liquid from the tank 52 through the connection 51 and delivering it to the vessel 10, and also for creating an initial pressure in the vessel 10 to feed fluid therefrom through the tube 15 to the nozzle 16.

It will be understood that while I have described the foregoing injector as employed for the purpose of feeding a liquid fuel to the liquid containing vessel of a carbureter while the same is under pressure, it will be evident that such means may be employed for other purposes practically without change, for obviously other liquids besides liquid hydro-carbons may be injected in the same manner.

As a substitute for the injector I may, if preferred, employ the circulating pump 14

of Fig. 5, the same being arranged to discharge to the lower end of the closed vessel 10, and an overflow pipe 55 being employed to return excess liquid to the tank 52 or other source of supply. In this means the pump may be constantly operating regardless of the amount of fuel used, the excess liquid being merely caused to circulate between the vessels 52 and 10.

The upper end of the vessel 52 may be connected with the exhaust of the engine by means of a pipe 57, if desired, as is common practice, and in the example of my invention shown in Fig. 4 such an arrangement would, of course, assist the injector action; in the example of my invention shown in Fig. 5 it will, be readily seen that in any event the pressure in the upper end of the vessel 52 will never be less than that in the upper end of the vessel 10.

What I claim is:

1. In a carbureter, the combination with two closed chambers having a common wall between them,—one containing liquid hydro-carbons and the other having connections by which the exhaust gases from the internal combustion engine may be circulated therethrough,—of an eduction pipe leading from the liquid chamber through the said heated gas circulating chamber.

2. In a carbureter, the combination with a casing provided with a channel for the passage of currents of air therethrough, and a nozzle located in the said passage, of a needle valve for controlling the discharge through the said nozzle, a valve in the said channel for regulating the passage of fluid therethrough, manually controlled means for simultaneously operating the two said valves, and means under the control of an operator for temporarily throwing both of the said valves open independently of the operation of the said manual operating means.

3. In a carbureter, the combination with a casing having a passage for air currents therethrough, and means for carbureting the air, of automatically controlled means for throttling the discharge of the carbureted air as the amount used increases.

4. In a carbureter, the combination with a casing having a passage for air currents therethrough, and means for carbureting the air, of automatically controlled means for throttling the admission of air as the speed at which the carbureted air is discharged, increases.

5. In a carbureter, the combination with a casing having a passage for air currents therethrough, and means for admitting hydro-carbon fluid to carburet the air, of automatically controlled means for throttling the admission of air and also for reducing the supply of hydro-carbon fluid admitted, as the speed at which the carbureted air is discharged, increases.

6. In a carbureter, the combination with a casing having a passage for air currents therethrough, and means for admitting hydro-carbon fluid to carburet the air, of automatically controlled means for proportionately reducing the amount of the hydro-carbon fluid, and of the air, admitted to the passage, as the speed at which the carbureted air is discharged, increases.

7. In a carbureter, the combination with a casing having a passage for air currents therethrough, and means for carbureting the air, of a valve in the said passage arranged to close in the direction in which the air currents travel, the said valve having portions located transversely in the path of the air currents, and a spring acting upon the valve to open the same in opposition to the action of the air currents.

8. In a carbureter, the combination with a casing having a tubular channel for the passage of air currents therethrough, and means for carbureting the air therein, of a tubular sleeve constituting a valve mounted in the said passage, and arranged to close in the direction in which the air currents travel, the said sleeve having portions arranged transverse of the passage in the path of the air currents, and a spring operating upon the valve sleeve to open the same in opposition to the movements of the air currents.

9. In a carbureter, the combination with a casing having a tubular channel therethrough for the passage of air currents, and means for carbureting the air therein, of a tubular sleeve constituting a valve mounted in the said channel and adapted to control the passage of air therethrough, a valve for the said carbureting means attached to the said sleeve, and manual operating means for the said sleeve and valve.

10. In a carbureter, the combination with a casing having a tubular channel therethrough for the passage of air currents, and means for carbureting the air therein, of a tubular sleeve constituting a valve mounted in the said channel and adapted to control the passage of air therethrough, a valve for the said carbureting means attached to the said sleeve, the said sleeve having portions arranged transversely in the path of the air currents, and a spring tending to move the sleeve in a direction opposite to the direction of movement of the air currents to open the said valves.

11. In a carbureter, the combination with a casing and a valve for controlling the passage of fluid therethrough, of manual adjusting means for adjusting the normal position of the said valve, and a spring operating to open the said valve, the said valve being arranged with a portion disposed

transverse with respect to the fluid currents through the casing, whereby the fluid currents impinging thereon will tend to close the said valve against the action of the said spring.

12. In a carbureter, the combination with a casing having a tubular channel therethrough for the passage of air currents, and means for carbureting the air therein, of a tubular sleeve mounted in the said channel and adapted to control the passage of air therethrough, a valve for the said carbureting means attached to the said sleeve, the said sleeve having portions arranged transversely in the path of the air currents, a spring tending to move the sleeve in a direction opposite to the direction of movement of the air currents, and independent means under the control of an operator for moving the said sleeve and valve.

13. An injecting means comprising a closed vessel, a nozzle whose inlet is connected to the said closed vessel at a point therein at the level of the liquid desired to be maintained, and having a condensing chamber at the point of discharge of the nozzle, and means to connect the said chamber with a source of supply, the said chamber being connected, in the direction of the discharge from the nozzle, with the said closed vessel.

14. An injecting means comprising a closed vessel, a nozzle whose inlet is connected to the said closed vessel at a point therein at the level of the liquid desired to be maintained, and having a condensing chamber at the point of discharge of the nozzle, and means to connect the said chamber with a source of supply, the said chamber being connected, in the direction of the discharge from the nozzle, with the said closed vessel through a passage of reduced cross sectional area.

15. An injecting means comprising a closed vessel, a nozzle whose inlet is connected to the said closed vessel at a point therein at the level of the liquid desired to be maintained, and having a condensing chamber at the point of discharge of the nozzle, and means to connect the said chamber with a source of supply, the said chamber being connected, in the direction of the discharge from the nozzle, with the said closed vessel, together with means located in proximity to the expansion chamber for reducing the temperature therein.

16. An injecting means comprising a closed vessel, a nozzle whose inlet is connected to the said closed vessel at a point therein at the level of the liquid desired to be maintained, and having a condensing chamber at the point of discharge of the nozzle, and means to connect the said chamber with a source of supply, the said chamber being connected, in the direction of the discharge from the nozzle, with the said closed vessel, together with a cooling chamber located in proximity with the said expansion chamber.

17. Carbureting means comprising a closed vessel for containing liquid, a chamber in proximity thereto for receiving a fluid heating medium, and an eduction pipe leading from the upper end of the said closed vessel, through the said chamber, the said pipe having a passage also connecting the lower end of the vessel therewith.

18. In a carbureter, the combination with two closed chambers having a common wall between them,—one containing liquid hydrocarbons and the other having connections by which the exhaust gases from the internal combustion engine may be circulated therethrough, of an eduction pipe leading from the upper end of the liquid containing chamber through the said heated gas circulating chamber, the said pipe having a passage of relatively small cross sectional area also connecting the lower end of the said liquid containing chamber therewith.

19. The combination with a casing containing a passage for fluid currents, of a throttle valve for reducing the flow of such currents through the passage, a spring operating to open the valve, the fluid currents operating against the spring in a direction to close the valve whereby the valve is proportionately closed as the speed of the current through the passage increases, and means for manually adjusting the spring.

20. The combination with a casing containing a passage for fluid currents, of a throttle valve for reducing the flow of such currents through the passage, a spring operating to open the valve, the fluid currents operating against the spring in a direction to close the valve whereby the valve is proportionately closed as the speed of the current through the passage increases, and means for adjusting the normal position of the valve while maintaining the same spring pressure thereon.

21. A speed governing device comprising a casing having a passage for fluid currents therethrough, means for governing the speed of the currents, adjustable tension means in opposition thereto, and a manual operating element for operating the governing means independently of the adjustable tension means.

22. In speed governing devices, the combination with a casing having a passage for fluid currents therethrough, means for governing the speed of the currents, an adjustable tension in opposition thereto, and manually operated means for throwing out such adjustment at the will of the operator.

23. Carbureting means including a closed

liquid fuel containing vessel, a vaporizing means for vaporizing liquid conveyed therefrom, and means for supplying liquid fuel to the closed vessel against the pressure therein.

24. In a carbureter, the combination with a casing having a passage for air currents therethrough, and means for carbureting the air, of automatically controlled means for throttling the discharge of the carbureted air as the amount used increases, and means operated simultaneously therewith for throttling the air admitted to the casing in a predetermined ratio.

Signed at New York, this 26 day of January, 1910.

JAMES B. BROCKHURST.

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