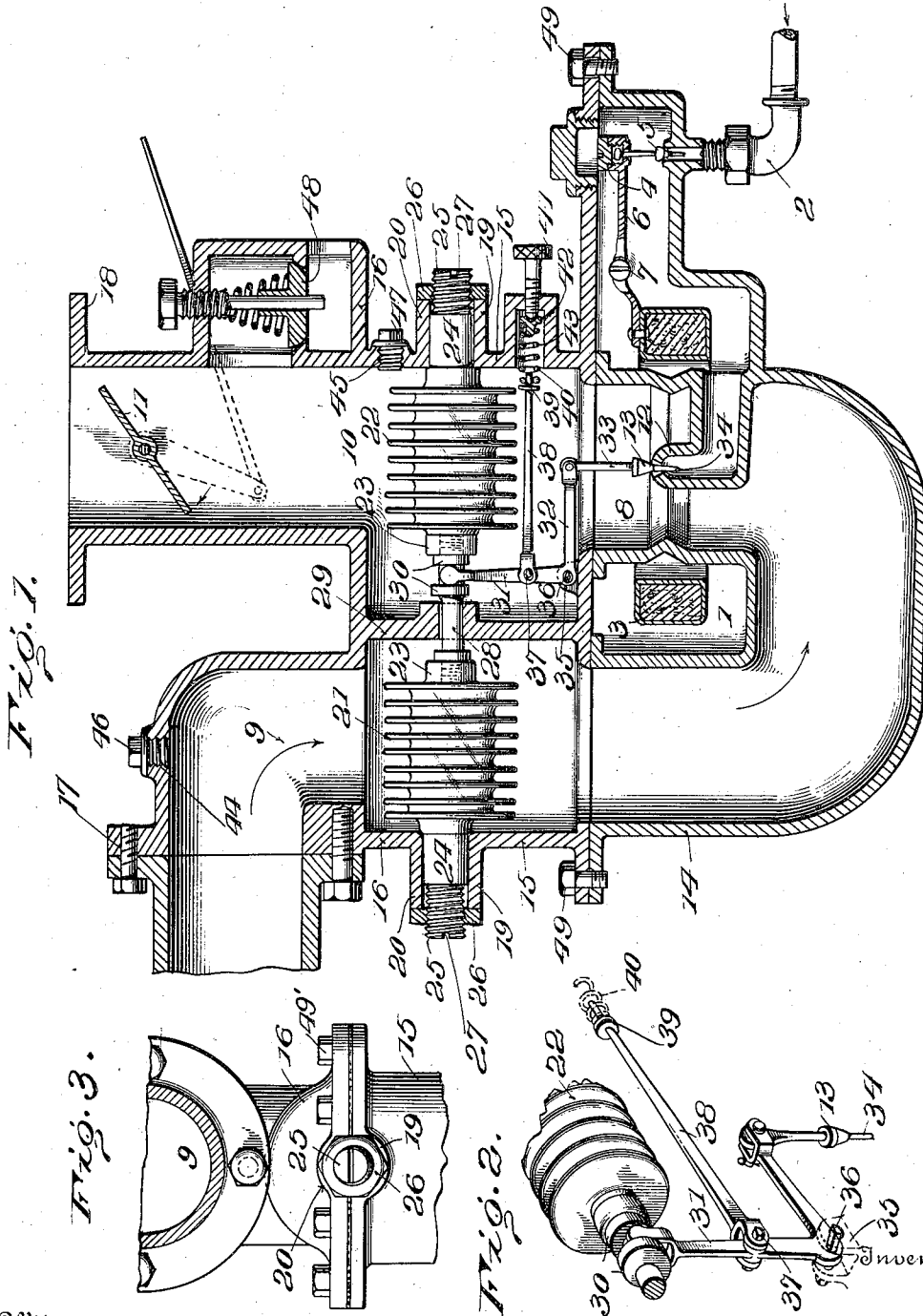


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CARBURETER.
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1,165,087.

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CARBURETER.

1,165,087.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WESTON M. FULTON, of Knoxville, Tennessee, have invented a new and useful Improvement in Carbureters, which invention is fully set forth in the following specification.

This invention relates to carbureters, and particularly to that class of carbureters adapted to be used in connection with explosive engines, and has for its primary object to provide means subject to temperature variations in the carbureter for regulating the supply of liquid fuel to the air to be carbureted, whereby the proper proportions of air and fuel for the maximum or approximately the maximum explosive effect may be automatically maintained.

A further object of my invention is to dispense with manual regulation of the fuel supply and thereby relieve the operator of the inconvenience and annoyance of an act which heretofore has required considerable attention and to economize the use of fuel while at all times securing the maximum or approximately the maximum amount of energy from the explosive mixture.

These and other objects will be fully explained in the detailed description.

Heretofore carbureters for engines have usually depended on manual adjustments for regulating the relative quantities of air and vapor delivered by the carbureter. For various reasons manual adjustments are objectionable. Owing to the varying demands made upon the carbureter by the engine, adjustments must be frequent. This demands considerable attention and is inconvenient and annoying to the operator. Accurate regulation of the proportions of air and vapor is essential to secure the best working results. Too large proportion of vapor causes waste of fuel and cylinder troubles. Too small a proportion causes weak explosions and sometimes stopping of the engine.

My invention overcomes the above objections and secures the objects herein stated by providing a carbureter with temperature controlled means for automatically regulating the supply of fuel to the carbureter, whereby any predetermined proportion of air and fuel vapor may be maintained in the explosive mixture delivered by the carbureter.

Heretofore air has been supplied to the carbureter either at variable temperature or at constant temperature. My invention is applicable to either case, and in applying my invention I provide a thermosensitive element subject both to the temperature of the air entering the carbureter and also to the variable temperature of the mixture of air and fuel vapor in the carbureter and by means of this element, control the supply of fuel to the carbureter. Thus the explosive mixture of air and vapor is made constant in composition by automatically maintaining a constant difference of temperature between the incoming air and the outgoing mixture of air and fuel vapor.

In order that the invention may be readily understood, certain mechanical expressions of the inventive idea involved are shown in the accompanying drawings which are designed merely as illustrations to assist the description of the invention and not as defining the limits thereof.

In the drawings:—Figure 1 is a central, vertical sectional view with interior parts in elevation showing a carbureter provided with my improvements. Fig. 2 is a perspective detail view, and Fig. 3 is a side elevational detail view.

Referring to Fig. 1, there is illustrated a carbureter having a float chamber 1, supplied with liquid fuel through supply pipe 2. An annular float 3 maintains the liquid in the chamber 1 at a predetermined level by controlling the liquid fuel supply entering through pipe 2 by means of a needle valve 5 connected through securing means 4 to the float by a lever 6 pivoted at 7. Through the float chamber 1 is an air passage 8 open to an air supply conduit 9 and to a carbureting chamber 10 which connects beyond a throttle valve 11 through a manifold pipe to the engine not shown. A spray nozzle 12 delivers fuel from the float chamber 1 into the air passage 8 and its opening is controlled by a needle valve 13.

The parts so far described are those of an old carbureter and no invention is claimed for them.

For the purpose of housing the working parts of my improvements and to facilitate convenient assembling of these parts, I provide three tubular castings: a casting 14

which includes the float chamber for the fuel; a central casting 15 in which the thermosensitive element and its parts are supported; and a top casting 16 provided with a flange air inlet connection 17 and a flanged outlet connection 18. The several sections of castings 14, 15 and 16, when assembled, are secured together by flanges and bolts in the usual manner. For the purpose of supporting the thermosensitive elements, to be described, semi-circular bearings or supports 19, 19 are formed in the wall of casting 15 and correspondingly shaped caps 20, 20, are formed in the wall of casting 16. In Fig. 1, two such supports are shown.

Referring to Fig. 1, I have shown two similar thermosensitive elements 21, 22, preferably of the construction shown and described in my U. S. Patents 729,926, 729,927 and 760,443. The opposite end walls of each vessel are non-flexible and are provided with hubs 23, 24, centrally located. Hubs 24 are adapted to fit in supports 19, 19, and are provided with threaded extensions 25, 25, for receiving fastening nuts 26, 26. To facilitate the application of the nuts, a slot 27 is cut in the threaded end of each hub 24. The movable ends of the vessels 21, 22 are connected by a rod 28 which is adapted to be screwed into threaded sockets in hubs 23, 23. The connecting rod 28 works loosely through an opening in the wall 29 separating the carbureter chamber 10 from the air supply conduit 9, and is provided with annular shoulders 30 between which is held the forked end of one arm 31 of a bell-crank lever, the companion arm 32 of which is also forked and pivotally supports the valve stem 33 carrying needle valve 13. The valve 13 is preferably provided with a slender guide pin 34 for centering the valve on its seat. Lugs 35, Fig. 2, formed on the casting 15 contain a knife-edge pivot 36 which is received in a slotted opening in the elbow of the bell-crank lever and forms an anti-friction fulcrum for the lever. The arm 31 is provided with knife-edge pivots 37 on which bear the forked ends of a spring-pressed adjusting rod 38. This rod has a shoulder 39 against which a spring 40 is pressed by means of a thumb-screw 41 working in a threaded opening in the wall of the casting 15 and bearing on an adjusting plate 42. The spring is preferably housed in a recess 43 formed in the wall. Openings 44 and 45 are provided in the casting 16 for receiving thermometers when the carbureter is adjusted and are afterward closed by screw plugs 46 and 47 when the adjustment is completed.

The casting 16 may be and sometimes is provided with a spring pressed valve 48 normally closing a passage between the atmosphere and the space in the mixing chamber and is adapted to admit air and relieve any

material difference of pressure in the mixing chamber and the air conduit which latter is open to the atmosphere.

By reason of the peculiar design of the castings, the parts are readily assembled. In casting 14, the float 3 and its parts are secured. Casting 15 is then placed on casting 14 and secured thereto by clamping bolts 49. Bell crank-lever 31, 32 with its valve 13 and adjusting rod 38 are positioned in casting 15. The two thermostatic elements 21 and 22 having previously been connected by rod 28 are placed with their hubs 24 resting in the semi-circular bearings 19, 19, and with the portion of rod 28 between shoulders 30 resting in the forked end of lever arm 31. Casting 16 is then placed in position and secured to section 15 by bolts 49'.

In describing the operation of the carbureter, the parts are assumed to have been assembled in the manner described and that the discharge end of the same is connected to an internal combustion engine through a suitable connection.

Adjusting the carbureter: The liquid fuel is admitted to the float chamber 1 and maintained at proper level by float 3 acting on needle valve 5 which has been properly adjusted for this purpose. The throttle valve 11 is set partly open and the engine is started, thermometers having previously been introduced through openings 44 and 45. The engine creates a draft of air through conduit 9 in the direction of the arrows, past the spray nozzle 12, through the mixing chamber 10 and past the throttle valve 11. Thermosensitive element 21 is thus subjected to the temperature of the incoming air and thermosensitive element 22 to the temperature of the mixture of vapor and air in the mixing chamber 10. In the act of spraying the volatile liquid fuel into the current of air, the vaporization resulting abstracts heat from the air in a manner well understood, and lowers the temperature of the mixture. The thermosensitive elements 21 and 22 are therefore subjected to different temperatures while the engine is in operation. This difference of temperature between the incoming air and the mixture of air and vapor passing through the mixing chamber depends upon the relative quantity of air and liquid fuel vaporized into the air and is a measure of the ratio of the quantity of vapor to that of the air in the mixing chamber. Therefore a gaseous mixture of practically any predetermined composition may be maintained in the mixing chamber by keeping a constant difference of temperature between the incoming air and the outgoing mixture of air and vapor. It has heretofore been determined that between certain limiting proportions air and inflammable gases and vapors produce explosive mixtures which burn with complete combustion. It

is, therefore, only necessary to determine by experiment the difference in temperature which must exist between the incoming air and the out-going mixture for a given explosive combination of air and vapor and then to maintain as near as practicable this difference of temperature by means of the thermostatic control device. This is accomplished in the following manner: The engine being in operation, a current of air and vapor passes through the apparatus. Previous tests have indicated for example that a satisfactory explosive mixture of air and gasoline is obtained when there is a difference of about 14° C. between the incoming air and out-going mixture. The temperatures of the incoming air and the air and vapor mixture are noted on the two thermometers above referred to and their difference taken. Should this difference be less than the one selected for standardizing the carbureter the temperature of the mixture in the carbureter is evidently too high and therefore more fuel needs to be sprayed into the chamber to increase the difference. Thumb-screw 41 is therefore turned in a direction to compress spring 40 and thrust lever arm 31 to the left to overcome somewhat the force exerted by the expansion of vessel 21 on vessel 22. This opens needle valve 13 and permits increase spraying and evaporation of the fuel into the mixing chamber thereby reducing the temperature of the mixture or air and vapor. When the predetermined difference of temperatures is secured, the device will maintain this difference, whatever may be the temperature of the incoming air, and therefore maintain constant the composition of the explosive mixture. The thermometers are removed and the plugs 46, 47 are inserted to close the openings. It is now evident if throttle valve 11 is open wider so as to create a greater demand on the carbureter, causing a more rapid flow of air through the same, the amount of liquid fuel passing valve 13, just previous to the opening of the throttle valve, will not be sufficient to bring this increased amount of air up to the proper content of combustible vapor. The result is that the temperature of the mixture passing thermosensitive element 22 rises while that passing element 21 remains constant. This causes element 22 and spring 40 to overcome the expansion force of element 21, thereby thrusting rod 28 to the left as viewed in Fig. 1, rocking lever arm 31 to the left and lifting needle valve 13 to admit more fuel to the mixing chamber. This action continues until the content of vapor again reaches normal when the balance is restored between the opposing forces and the predetermined difference of temperature between the incoming air and out-going mixture is restored. Owing to the multiplicity of corrugations in the thermo-

sensitive elements a slight variation of temperature about either vessel causes an appreciable traverse of the rod 28 and quick response to such variations. The composition of the mixture is therefore held between very narrow limits and is practically constant for all variations of the flow of air through the carbureter. The reverse movement of the throttle 11 to reduce the demand on the carbureter causes element 21 to overcome the combined action of element 22 and spring 40, and thereby reduce the supply of vapor to the reduced supply of air.

In order to overcome the differential effects of pressure on the thermosensitive elements the air conduit inclosing the thermosensitive element 21 is enlarged as shown in the drawings to substantially equal that of the mixing chamber, while the mouth of the air conduit is somewhat restricted in size where it opens to the atmosphere above element 21. Hence any vacuum which may form in the carbureter will exist to an equal degree around both elements 21, 22.

It is to be understood that I do not desire to be limited to any particular form or size of thermostat nor to the particular location of the connections between the same and the fuel supply valve as the latter may be external to the air conduit.

What I claim is:—

1. In a carbureter, a conduit for conducting air subject to fluctuations of flow, means delivering vaporizable liquid fuel into said conduit, thermosensitive means operable by the difference in temperature between the incoming air and outgoing mixture of air and vapor and adapted to control said supply means whereby the proportion of vapor to air delivered by the carbureter is maintained constant under varying demands on the carbureter.

2. In a carbureter, a conduit for conducting air subject to fluctuations of flow, means delivering vaporizable liquid fuel into said conduit, thermosensitive means operable by the difference in temperature between the incoming air and outgoing mixture of air and vapor and adapted to control said supply means, and means for regulating said thermosensitive means whereby a predetermined proportion of vapor and air is delivered by the carbureter under varying demands on the carbureter.

3. In combination, a carbureter provided with a mixing chamber, an air induction conduit, and liquid fuel supply means, thermosensitive means exposed to the air in said conduit and to the contents of the mixing chamber for automatically regulating said supply means to control the composition of the explosive mixture delivered by the carbureter.

4. In combination, a carbureter provided with a mixing chamber, an air supply con-

- duit and liquid fuel supply means and thermostatic elements one of which is exposed to the incoming air and one exposed to the contents of the mixing chamber, non-flexible connections between said elements, and means operated by the differential movements of said elements to regulate the fuel supply for maintaining a constant composition of the explosive mixture.
5. In combination, a carbureter provided with a mixing chamber, an air supply conduit and liquid fuel supply means, and thermostatic elements one of which is exposed to the incoming air and one exposed to the contents of said mixing chamber, non-flexible connections between said elements, means operated by the differential movements of said elements to regulate the fuel supply and adjusting means for said last-named means whereby a predetermined proportion of air and fuel is maintained in the fuel mixture.
6. In combination, a carbureter provided with liquid fuel supply means and having an air supply conduit and a valved discharge conduit for connecting with an engine cylinder, a collapsible and expansible vessel in said air conduit and a collapsible and expansible vessel in said discharge conduit, a non-flexible connection between said vessels and connecting means between said vessels and supply means for automatically regulating said supply means and to control the composition of the explosive mixture delivered by said carbureter to the engine.
7. In combination, a conduit open to the atmosphere at one end and adapted to open into a combustion chamber at the opposite end, liquid fuel supply means delivering into the conduit intermediate its ends, thermostatic elements one of which is exposed to the incoming air and one exposed to the outgoing air and vapor mixture, a connection between the movable ends of said thermostatic elements, means transmitting the movements of said connection to control the fuel supply means and adjustable resilient means acting in opposition to one of said elements.
8. In combination, a conduit open to the atmosphere at one end and adapted to open into a combustion chamber at the opposite end, a valve controlled spray nozzle opening into said conduit delivering vaporizable fuel therein, thermostatic elements one of which is exposed to the incoming air and one to the outgoing air and vapor mixture, means connected to the movable ends of said thermostatic elements and to said valve and adapted to transmit the resultant movement of said elements to said valve for regulating the supply of fuel to said conduit and to maintain a constant composition of the air and vapor mixture.
9. In combination, a conduit open to the atmosphere at one end and adapted to open into a combustion chamber at the opposite end, a valve controlled spray nozzle opening into said conduit delivering vaporizable fuel therein, thermostatic elements one of which is exposed to the incoming air and one to the out-going air and vapor mixture, means connected to the movable ends of said thermostatic elements and to said valve and adapted to transmit the resultant movement of said elements to said valve for regulating the supply of fuel to said conduit, and resilient adjustable means adapted to regulate said supply regulating means to maintain a predetermined proportion of air and vapor constant in the fuel mixture.
10. In combination, a carbureter, liquid fuel supply means for the same and thermostatic means subject to changes of temperature of the fluid passing through said carbureter associated with said supply means and other means associated with the said thermostatic means and supply means for adjusting said devices to automatically maintain a predetermined composition of the explosive mixture as discharged from the carbureter.
11. In combination, a carbureter provided with a mixing chamber, an air induction conduit and valve-controlled liquid fuel supply means, thermostatic means exposed to the air in said conduit and to the contents of said mixing chamber and having connections with said valve means, and means for adjusting said devices whereby a predetermined composition of the explosive mixture is maintained as discharged from said carbureter.
12. A carbureter comprising a casing in three separable sections in form of a U-shaped conduit, an annular fuel supply chamber in the base section surrounding one leg of the conduit and having a valve-controlled spray nozzle opening into said conduit, a collapsible and expansible vessel having one end supported by a hub in a semi-circular bearing formed in the top of the wall of the intermediate section and means connecting said vessel with the valve of said spray nozzle, the top section having an air inlet and an air and vapor outlet and forming a closure for the whole.
13. In a device for mixing vapor and gas to maintain a constant proportion of vapor in said gas, a conduit open to a gas supply, means for introducing vaporizable liquid into said conduit, and thermostatic means operated by the difference in temperature between said gas supply and said mixture of gas and vapor and controlling said liquid supply to maintain a constant proportion of gas and vapor in said mixture.
14. In a device for mixing the vapor of a liquid with a gas, means for introducing

vaporizable liquid into a stream of gas and
thermosensitive means actuated by the dif-
ference in temperature between said gas
and mixture for automatically controlling
5 the liquid supply as the flow of said stream
varies to maintain the relative proportions
of gas and vapor in the mixture.

In testimony whereof I have signed this
specification in the presence of two sub-
scribing witnesses.

WESTON M. FULTON.

Witnesses:

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C. H. BROWN, Jr.