

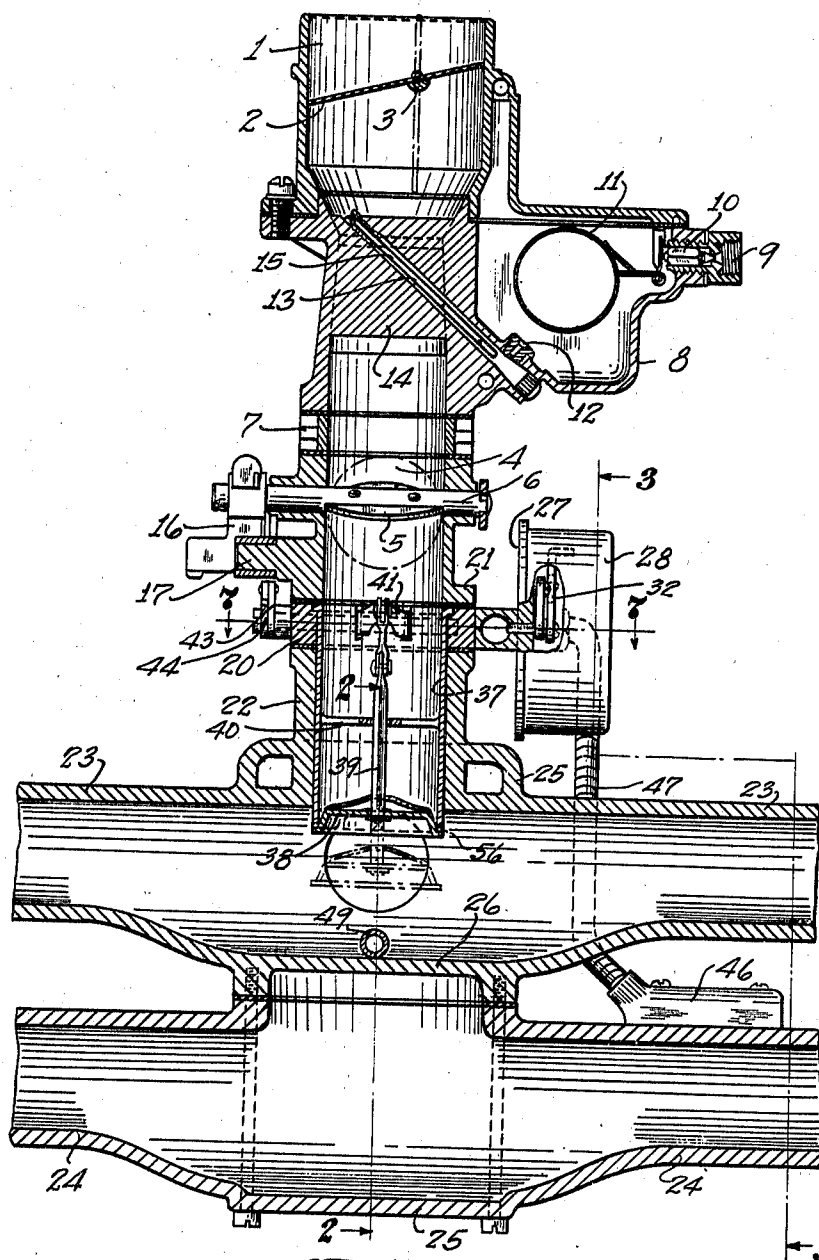
Aug. 9, 1938.

G. R. ERICSON
CARBURETING DEVICE

Filed June 21, 1937

2,125,899

4 Sheets-Sheet 1



INVENTOR
George R. Ericson.
BY *Donald H. Rich*
ATTORNEY

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4 Sheets-Sheet 2

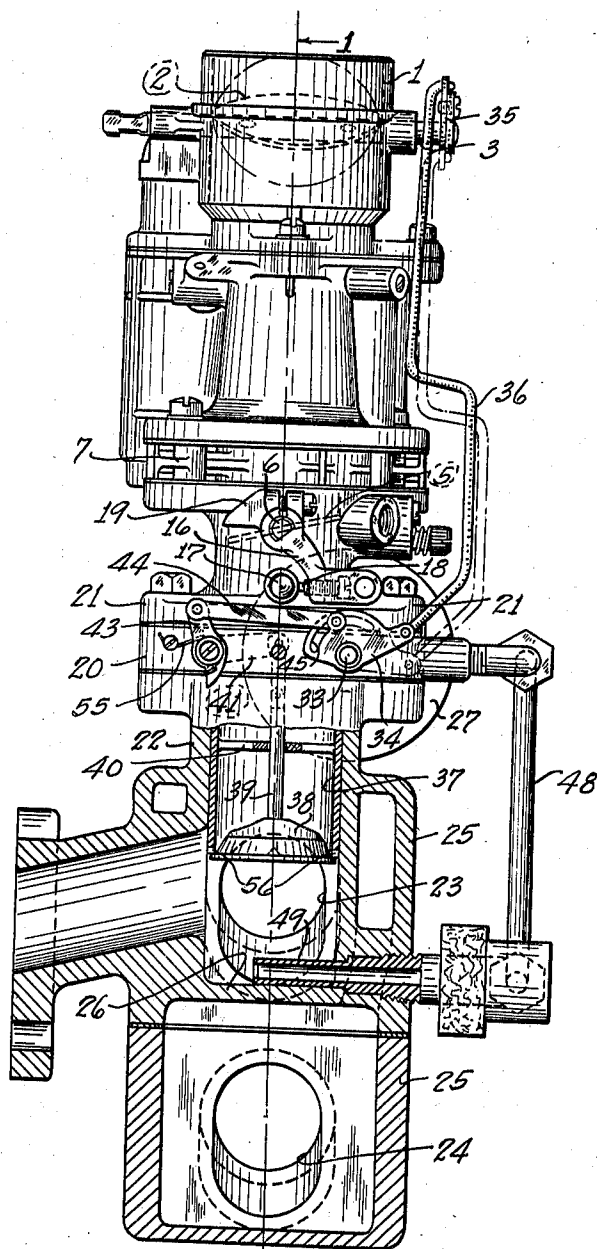


Fig. 2.

INVENTOR
George R. Ericson.
BY *Donald U. Rich*
ATTORNEY

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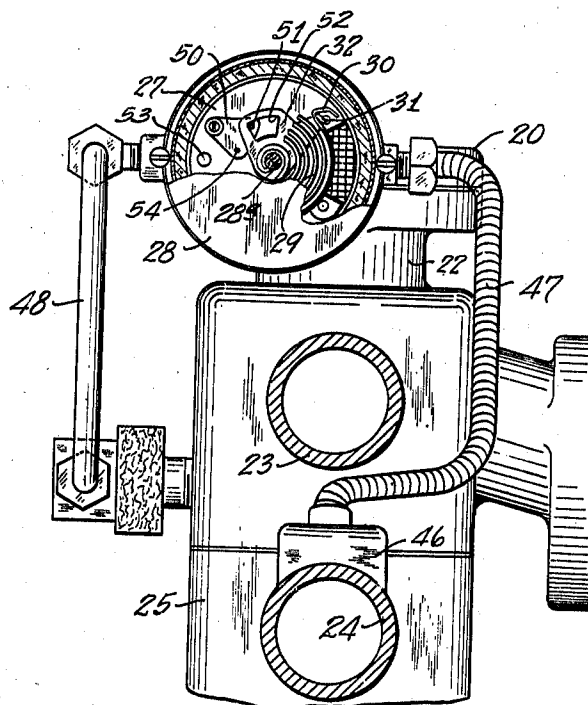
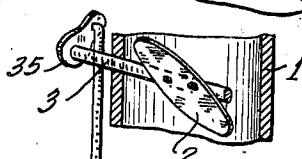
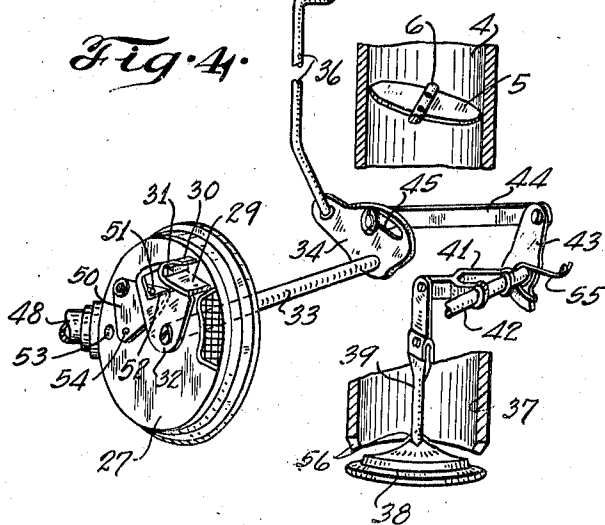


Fig. 3.

Fig. 4.



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By *Donald U. Rich*
ATTORNEY

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4 Sheets-Sheet 4

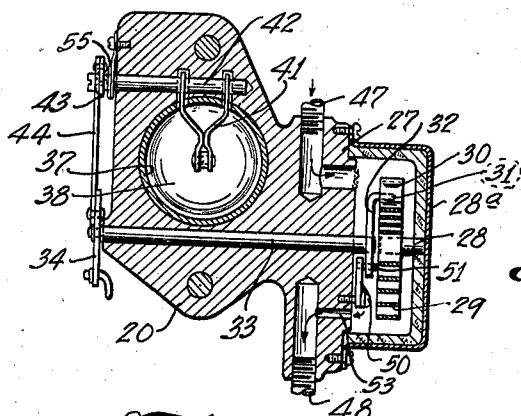


Fig. 7.

Fig. 5.

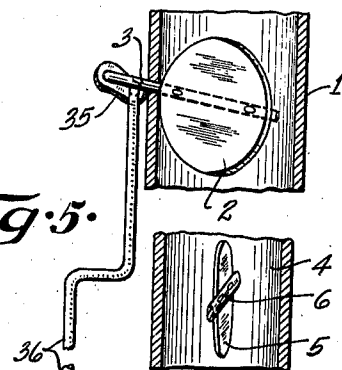
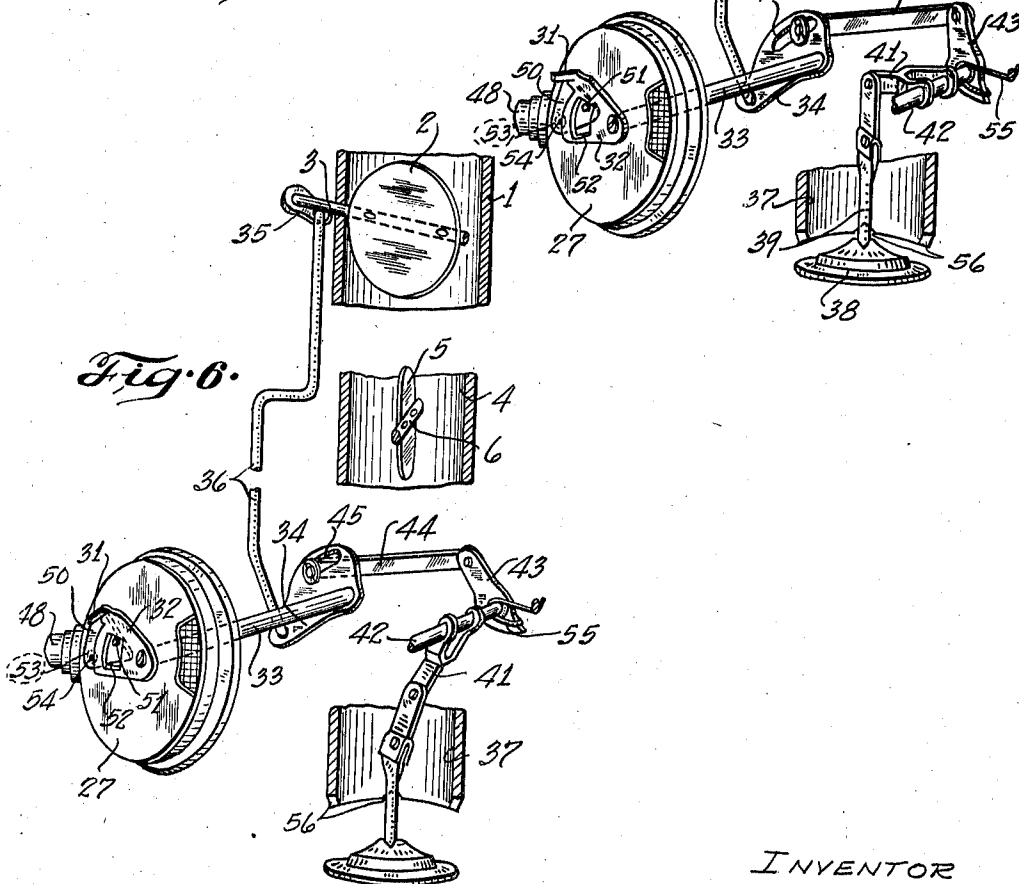


Fig. 6.



INVENTOR
George R. Ericson.
By *Donald H. Rich*
ATTORNEY

UNITED STATES PATENT OFFICE

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CARBURETING DEVICE

George R. Ericson, Kirkwood, Mo.

Application June 21, 1937, Serial No. 149,480

10 Claims. (Cl. 123-119)

This invention relates to carbureting devices for internal combustion engines and consists in novel means for varying and controlling the quality of the fuel mixture supplied by the carburetor both as to richness and vaporization, particularly during the starting and warm up periods and when the intake suction is subnormal.

A co-pending application, Serial No. 679,201, filed July 6th, 1933 in the name of Irven E. Coffey, now Patent No. 2,085,351, discloses and claims automatic choke mechanism which operates similarly in some respects to the choke control mechanism herein illustrated and which attains many of the advantages thereof. Other co-pending applications, Serial No. 663,431, filed March 30th, 1933, which has matured to Patent No. 2,093,959, granted September 21, 1937, and Serial No. 676,087, filed June 16th, 1933, which has matured to Patent 2,093,960, granted September 21, 1937 and Serial No. 19,842, filed May 4th, 1935, all in the name of the present inventor, disclose devices also similar in certain respects to the device of the present invention, particularly with respect to the means for improving vaporization of the fuel and tending to prevent the suction in the intake manifold from dropping below a predetermined minimum. Reference is here made to the above-mentioned applications for more detailed disclosure of and claims covering certain features not fully covered herein.

An object of the present invention is to provide automatic choke mechanism and a vaporizing or flow restricting device in the intake conduit of an internal combustion engine and so interconnected that the choke valve will be positively opened a substantial amount as soon as the engine begins to run after a cold start.

Another object is to provide novel means for causing the engine to idle faster during the warm up period.

These objects and other more detailed objects hereafter appearing are attained substantially by the structure illustrated in the accompanying drawings in which:

Fig. 1 is a sectional view of an internal combustion engine carburetor and portions of the intake and exhaust manifold thereof.

Fig. 2 is a side view of the structure in Figure 1 and shown partly in section on line 2-2 of Figure 1.

Fig. 3 is a partial sectional view taken substantially on line 3-3 of Figure 1.

Figs. 4, 5 and 6 are diagrammatic views representing various functional parts in different operative positions.

Fig. 7 is a horizontal section on line 7-7 of Figure 1.

The carburetor, best shown in Fig. 1, is of a well known downdraft type including air inlet horn 1 pivotally mounting unbalanced choke valve 2 on shaft 3, and outlet portion 4 within which is pivotally supported a butterfly throttle valve 5 on shaft 6. Heat insulating structure 7 separates the upper and lower portions of the mixture conduit. Float bowl 8 adjacent the mixture conduit receives fuel from a remote fuel tank through threaded fitting 9 and fuel is maintained in the bowl at a substantially constant level by needle valve 10 operated by float 11. Fuel is supplied to the mixture conduit through calibrated metering orifice 12 and main nozzle 13 extending through jet bar 14. An air bleed tube 15 extends downwardly through the main nozzle and communicates at the top with air in the mixture conduit. A crank 16 rigid with shaft 6 provides for manual operation of the throttle valve, the normal idling position being determined by engagement between stop 17 and screw 18 carried by the throttle crank. A toe 19 on the throttle crank engages stop 17 to limit the throttle valve to its 90° or wide open position.

A spacer element 20 separates the carburetor bolting flanges 21 from the riser portion 22 of intake manifold 23. Exhaust manifold 24 includes a "hot spot" portion 25 for heating the intake gases. Intake manifold 23 includes a sump or depression 26 directly beneath riser 22, which sump serves to collect or trap an accumulation of liquid gasoline, particularly, during starting of the engine when the choke valve is closed so as to apply a high suction to the main nozzle.

Carried by spacer element 20 is a thermostat housing including base portion 27 and insulated, removable cover 28. A coiled, bi-metal thermostat 29, shown in part in Fig. 3, is secured at its inner end to a pintle 28a projecting from cover 28 and has a hooked outer extremity 30 receiving a lateral finger 31 on pivoted segment 32, rigid with a shaft 33 extending through spacer element 20. At the opposite end of shaft 33 is rigidly secured a segmental plate 34 and this plate is connected to lever 35 rigid with choke shaft 3 by means of a link 36. Thermostat 29, when cold, tends to unwind so as to urge shaft 33 and segment 34 in a clockwise direction with reference to Figures 3, 4, 5 and 6 which closes the choke valve preparatory to cold starting of the engine.

Secured to spacer element 20 and depending downwardly through riser 22 is a sleeve 37 which,

at its lower extremity, forms an annular seat for a cupped poppet valve member 38 having a valve stem 39 guided by spider 40. Stem 39 is pinned at its upper end to a clevis arm 41 which is rigid with a shaft 42 spaced from shaft 33 but also rotatably mounted in spacer element 20. Rigid with the end of shaft 42 adjacent segmental plate 34 is an arm 43 which is connected by a link 44 with slot 45 in plate 34.

A sheet metal stove 46 mounted on exhaust manifold 24 is connected to the thermostat housing by means of flexible tubing 47. The interior of stove 46 is open to the atmosphere. Also communicating with the thermostat housing is a suction connection 48 which communicates with the intake manifold as at 49 adjacent sump structure 26. As is more fully described in the above mentioned Coffey patent, the connections 47 and 48 serve for drawing exhaust heated air from stove 46 through the housing 27-28 for heating the thermostat and thence into the intake manifold.

A small plate 50 pivoted to the housing base has a finger 51 received by slot 52 in pivoted segment 32 so as to be controlled thereby to restrict the suction communication 53 into the thermostat housing when the choke valve has fully opened as shown in Figures 5 and 6. In this position of the parts a small hole 54 in part 50 insures a continued but substantially reduced flow of hot air through the thermostat housing to maintain the thermostat in its wound up or heated condition permitting full opening of the choke valve without resulting in excessive heating of the thermostatic coils.

The device operates as follows: When the engine is relatively cold, usually below a temperature of 70° Fahrenheit, thermostat 29 will be unwound sufficiently to fully close the choke valve, further reduction of temperature serving to increase the thermostatic tension applied to the choke. During cranking, the throttle valve is preferably opened part way and the resulting high suction applied to the main nozzle causes a substantial flow of fuel therefrom, part of which accumulates in sump 26 beneath the intake riser and part of which mixes with air drawn through the idle system and past the choke valve to supply a rich starting mixture to the engine cylinders. During cranking, poppet valve 38 will be held substantially against its seat by the thermostat and also by the small constant resistance spring 55 which urges shaft 42 in a clockwise direction with reference to Figures 4, 5 and 6. A series of small notches 56 in sleeve 37 accommodate the relatively small flow through the mixture conduit during cranking and the valve is accordingly not moved from its seat.

When the engine fires and begins to run, the intake suction is increased substantially and the poppet valve is forced downwardly sufficiently to withdraw the cupped portion thereof from sleeve 31, as shown in Figure 4. This movement of the valve forces link 44 against the left hand extremity of slot 45 (Figs. 4, 5, and 6) which, in turn, rotates plate 34 counterclockwise drawing link 36 downwardly and opening the choke valve, approximately as shown in Fig. 4 to lean out the mixture sufficiently to prevent stalling of the engine. During the warm up period, the tension of spring 55 tends to close the poppet valve, aided by the thermostat and, in case the engine is subjected to an abnormal load before the thermostat has become heated, poppet 38 will be drawn upwardly toward its seat so as to insure proper

vaporization of the mixture. Such movement of the poppet will also be accompanied by partial closing of the choke valve under the influence of the thermostat since link 44 will be moved to the right in slot 45, still with reference to Fig. 4.

Also during the warm up period, warm air drawn through the atmosphere by-pass formed by suction connection 48, housing 27-28, and hot air tube 47 substantially assists in vaporizing liquid fuel accumulated in sump structure 26 to supply additional combustible mixture to the cylinders for fast idling.

As the thermostat becomes heated, it winds upon itself and eventually permits the unbalanced choke valve to be fully opened under the influence of the air stream applied directly thereto and poppet 38. In this position of the parts, see Fig. 5, the end of link 44 is free to move substantially in either direction in slot 45 to permit fluctuation of poppet 38 under the influence of the varying rates of flow through the mixture conduit, movement of the poppet being constantly resisted by spring 55. Fig. 5 shows the choke valve fully open and poppet 38 drawn partially upwardly towards its valve seat, as in case of a substantial reduction of suction in the intake manifold, this movement being effected independently of the choke valve.

Figure 6 shows the choke and throttle valves and the poppet all fully opened, a condition which prevails when the engine is fully heated and is traveling at a fairly high rate of speed. In this position, the poppet constitutes a minimum restriction to the flow whereby the maximum capacity of the carburetor is only slightly affected.

The mechanisms above described result in the attainment of advantages of improved vaporization of the fuel, effectiveness of the choke action for starting and warm up, and simplicity, both in installation and operation. The automatic choke and vaporizing valve feature are constructed substantially in a unit which may be readily sold and applied as an accessory or may be conveniently installed when the manifold and carburetor are initially assembled in the factory. The invention is adapted for application to substantially any type of manifold and carburetor construction although particularly adapted for use with downdraft carburetors. Various features of the invention may be modified as will occur to those skilled in the art and the exclusive use of all such modifications as come within the scope of the appended claims is contemplated.

I claim:

1. In combination, an intake conduit for an internal combustion engine, said conduit having an inlet and an outlet, choke and throttle valves in said conduit, flow-responsive means in said conduit between said inlet and said outlet, a spring device connected to said choke valve so as to urge the same toward closed position for cold starting, and a non-yielding connection between said choke valve and said flow-responsive means under cold starting conditions for opening said choke valve against said spring device when the associated engine starts to run.

2. Structure as specified in claim 1 in which a lost motion connection is provided between said choke valve and said flow responsive means whereby said choke valve can open without necessarily affecting said flow responsive means.

3. Structure as specified in claim 1 in which both said choke valve and said flow-responsive means are adapted when closed or partially closed

to restrict flow through said intake conduit and are thermostatically controlled so as to be urged thereby toward their most flow restricting positions when the engine temperature is relatively low.

4. Structure as specified in claim 1 in which said flow-responsive means is adapted to restrict flow through said intake conduit and is thermally controlled so as to be urged toward its most flow-restricting position when the temperature is low, there being an additional spring provided for constantly urging said means toward said position.

5. Structure as specified in claim 1 in which said flow responsive means is adapted to resist flow through said intake conduit and further including spring means for urging said flow-responsive means toward its most flow-restricting position, there being a lost motion connection between said choke valve and said flow-responsive means whereby the position of said flow-responsive means may be varied under the influence of flow in said conduit without necessarily affecting said choke valve.

6. Structure as specified in claim 1 in which said flow-responsive means is provided with bypass structure whereby fuel mixture can flow through said conduit during cranking of the associated engine without substantially affecting said means.

7. In combination, an internal combustion engine intake conduit, choke and throttle valves therein, a valve seat in said conduit, a valve member movable axially toward and from said seat, spring means for urging said valve member toward said seat, means for closing said choke valve for cold starting, and a non-yielding connection between said valve member and said choke valve under cold starting conditions for opening said choke valve when the associated engine starts to run, said valve member being cupped and

extending within said seat so as to insure substantial axial movement thereof under minimum flow conditions while the engine is running.

8. In combination, an internal combustion engine intake conduit including structure for receiving an accumulation of liquid fuel, valve means in said conduit, a thermostat connected to said means for urging the same toward closed position when the temperature is low, a housing for said thermostat, a stove having a connection with said housing for supplying heated gases thereto, and a suction connection between said housing and said intake conduit adjacent said structure for drawing said heated gases past said thermostat, said gases upon entering said conduit, serving to vaporize liquid fuel accumulated in said structure to supply additional combustible mixture to the engine cylinders.

9. The combination of elements specified in claim 8 further including an element operable with said valve means for at least partially restricting said suction connection when said valve means is opened.

10. In combination, an internal combustion engine, an intake conduit having sump structure for receiving an accumulation of unvaporized fuel, a choke valve and a fuel nozzle anterior to said structure, flow responsive valve means in said conduit, a choke control device for closing said choke valve for starting, an air inlet communicating with said conduit adjacent said sump structure for supplying extra air to vaporize fuel therein, and an element movable with said choke valve to restrict said inlet when said choke valve is opened, said inlet having maximum capacity when said choke valve is closed to substantially increase the mixture flowing through said conduit for fast idling during the warm-up period.

GEORGE R. ERICSON. 40