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E. G. SHORTT.

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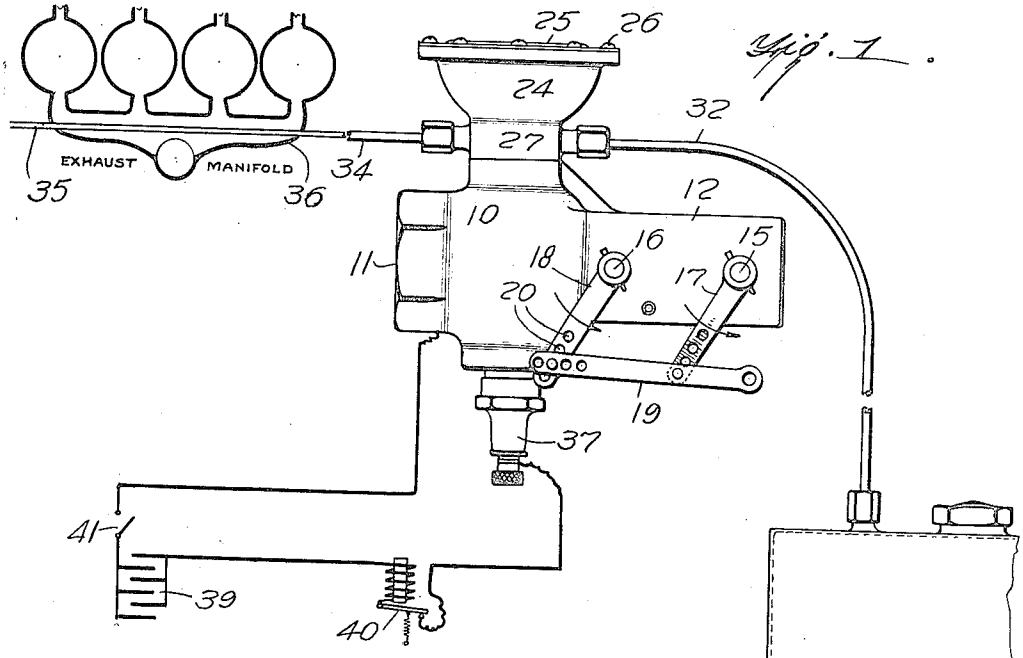



Fig. 1.

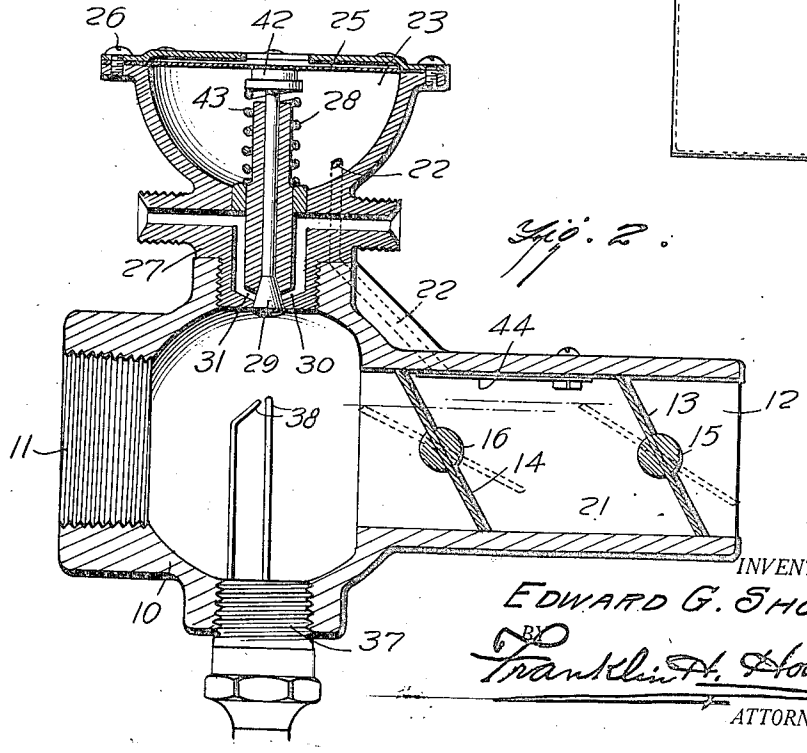



Fig. 2.

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# UNITED STATES PATENT OFFICE.

EDWARD G. SHORTT, OF CARTHAGE, NEW YORK, ASSIGNOR OF ONE-HALF TO ALEXANDER E. GEBBIE AND IDA T. GEBBIE, BOTH OF LOWVILLE, NEW YORK.

## MECHANISM FOR AIR AND FUEL CONTROL.

Application filed January 12, 1921. Serial No. 436,853.

*To all whom it may concern:*

Be it known that I, EDWARD G. SHORTT, a citizen of the United States, residing at Carthage, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Mechanism for Air and Fuel Control, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to mechanism for air and fuel control, and has for its object to provide a device for vaporizing hydrocarbon fuel by means of an air jet, commingling the same with air and fuel in proportions and igniting to form a burning mixture on the way to a vacuum space, initially heating the motor for starting purposes.

A further object of the invention is to provide a vaporizer, wherein heated air is provided to commingle with hydrocarbon fuel, to convert the same by heat into a permanent gas, and with means for automatically combining and controlling the flow of fuel and air in proper portions, thus forming a perfect burning mixture.

A further object of the invention is to provide means whereby when starting, hydrocarbon fuel and air are introduced and ignited and in such ignited and, therefore, heated condition, are supplied to the cylinders for initially heating the same, preliminary to the introduction of the explosive charge, by means of an independent switch and vibrating coil, which makes a continuous series of sparks, so long as the switch is "turned on". When cylinders are sufficiently heated, the independent switch is "turned off" and the charge is ignited in the cylinders in the regular way.

With these and other objects in view, the device comprises certain novel units, combinations, arrangements, functions and inter-connections as will be hereinafter more fully described and claimed.

In the drawings:

Figure 1 is a view of the air and fuel controller in side elevation, diagrammatically connected with a heating unit, a source of electrical energy and a fuel supply unit, and

Figure 2 is a side view of the air and fuel controller in longitudinal diametrical section.

Like characters of reference indicate corresponding parts throughout the several views.

The improved air and fuel controller, which forms in part the subject matter of this application, comprises a housing 10 adapted to be connected to the intake manifold of an internal combustion engine through the connection 11. The housing combines a passage 12 in alinement with the connection 11, so that air passing through such opening 12 into the intake manifold, is controlled by the valves 13 and 14, located therein and journaled upon shafts 15 and 16 respectively. The shafts 15 and 16 carry arms 17 and 18, pivoted in spaced relation upon a link 19 connected with any appropriate manual control. As it is desired that the valve 14 shall open more rapidly and therefore provide a greater inlet of air than the valve 13, the link 19 is connected normally with the arm 18 nearer the shaft 16 than its connection with the arm 17, thus producing a differential movement. Other adjusting holes 20 in the arm 18 are provided for a differential adjustment so that the valve 14 may open or close still more rapidly as the occasion may require.

Between the valves 13 and 14 a chamber 21 is formed which will be hereinafter referred to as the expansion chamber. Communicating with the expansion chamber is a passage 22 leading to a chamber 23 formed in the head 24. The chamber 23 is closed by a diaphragm 25 secured thereto in any approved manner, as by the screws 26. The neck 27 intermediate the head 24 and the body 10 accommodates a valve stem 28 carrying a conical valve 29 simultaneously closing the fuel inlet passage 30 and the air inlet passage 31. The fuel inlet passage 30 communicates through any convenient conduit 32 with a source of fuel supply, indicated as the tank 33 at Figure 1, while the air inlet 31 communicates through the conduit 34 with a pipe 35 passing through the exhaust manifold 36 of the engine, and, therefore, supplying heated air to said air inlet 31. Within the housing 10 a spark plug 37 is located, having the usual spaced terminals 38 adjacent the air and fuel inlets 30 and 31 respectively. The spark plug 37 is in circuit with the battery 39, shown conventionally at Figure 1, being supplied from a source of electrical energy 39 to a separate switch 40 and vibrating coil located at 41. In starting, therefore the supplying of current to the spark plug 37 will cause a spark at the ter-

minals 38 to ignite the incoming fuel mixture, which, by the action of the starter is drawn into the cylinders in a heated condition. As soon as the cylinders and manifold have become sufficiently heated, which will follow a few revolutions of the starter, the motor is in condition to operate without further ignition from the spark plug 37, which is then cut out, the engine continuing to operate by the introduction of fuel in the usual manner.

The reason for having the valve 14 open faster and to a greater degree than the valve 13 is to reduce the density of the air in the expansion chamber 21, by reason of the operation of the vacuum the expansion in this chamber following Mariott's law. "The volume of gas is inversely proportional to the pressure."

The underside of the diaphragm 25 bears upon the adjustable head 42 of the valve stem 28 and a spring 43 is located to hold the valve 29 normally yieldingly seated. The attenuation of the tension within the chamber 21 is communicated through the passage 22 to the chamber 23, a check valve 44 being provided to prevent pulsations from effecting chamber 23 but allowing the passage of sufficient air to maintain the general uniformity of pressure in the chambers 21 and 23. The density of the air in chamber 23 is equal to that in chamber 21. Whatever difference there is between the density of the air in expansion chamber 21 and chamber 23, causes the diaphragm 25 to vary the movement of valve 29 independent of atmospheric conditions and to correspond to such increase or decrease of pressure in chambers 21 and 23 in accordance with Marriott's law. The valves 13 and 14 perform, therefore, not only the function of the ordinary throttle of an internal combustion engine, but, by reason of their differential amplitude of movement, produce between such valves an attenuation which in itself also controls the feed of fuel, such supply being controlled directly by the pressure of the external atmosphere upon the diaphragm 25, overbalancing the attenuation of the air within the chamber 23, combined with the resiliency of the spring 43. In addition to the above control, it is well known that barometric variations of the air under certain conditions result in very considerable variations of efficiency in burning mixtures.

The diaphragm 25 is practically a platform scale, the atmospheric column resting on said diaphragm. The underside of diaphragm 25 is supported by a calibrated spring 43, to suit the expansion required. Therefore any change that takes place in the atmospheric column, either by having greater or less weight, which makes it plain that the atmospheric column is balanced by the tension of the spring 43 and any fluctuation in the atmosphere is practically and positively weighed by the diaphragm 25, which is a true weighing mechanism, whichever way the fluctuation tends to act. This density is established to act in unison with the spring 43 and also to the movement of the valves 13 and 14 in exact accordance with Marriott's law.

When the engine is stopped, air passes the valve 44 and releases the tension within the chamber 23, whereupon the diaphragm controlled air and fuel valve 29 automatically closes.

What I claim to be new is:

1. An air and fuel control comprising an air inlet conduit and a fuel inlet conduit, a valve controlling both conduits, a spring tending to hold the valve normally closed, a diaphragm bearing upon the spring and one side open to the atmosphere, the other side open to a chamber inclosing said spring, an expansion chamber having communication with the diaphragm chamber, and means to manually regulate the degree of expansion within the expansion chamber.

2. An air and fuel control comprising an inlet housing, air and fuel conduits communicating with the housing, a valve positioned to close the air and fuel conduits, a spring tending normally to hold the valve closed, a diaphragm bearing upon the spring and enclosed in a chamber surrounding said spring, one side of said diaphragm open to the atmosphere the other side within the chamber, an expansion chamber, valves located within the expansion chamber, means to simultaneously manually actuate the valves, said means providing for the opening of the valves to different amplitudes, a conduit leading from the expansion chamber to the diaphragm chamber, and means for obstructing flow from the expansion chamber to the diaphragm chamber through said conduit.

3. An air and fuel control comprising an inlet housing, air and fuel conduits communicating with said housing, a diaphragm chamber located adjacent said conduits, a valve adapted to close said conduits, a valve stem extending from said valve into said diaphragm chamber, a spring tending to normally hold the said valve in closed position, a diaphragm closing the diaphragm chamber and bearing upon the valve stem, an inlet conduit, spaced valves located in said inlet conduit forming an expansion chamber therebetween, a conduit extending from said expansion chamber to the diaphragm chamber, means obstructing flow from the expansion chamber to the diaphragm chamber, manual means for simultaneously opening the said spaced valves, said means embodying structures for opening one of said valves through a greater arc of movement than the other differentially,

and means to ignite the combined fuel and air from the conduits in the inlet chamber.

4. In an air and fuel control, an air passage provided with spaced differentially opening valves, a chamber communicating with the space intermediate the valves, a diaphragm covering the chamber, and an inlet valve controlled by the flexing of the diaphragm.

5. In an air and fuel control, an air passage provided with spaced differentially opening valves, a chamber in communication with the space intermediate the valves, a diaphragm covering the chamber, a valve controlled by the flexing of the diaphragm and fuel and air inlet ports controlled by the valve.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

EDWARD G. SHORTT.

Witnesses:
W. W. SWEET,
MARY E. SWEET.