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L. T. THURBER

CARBURETING DEVICE

Filed June 23, 1921

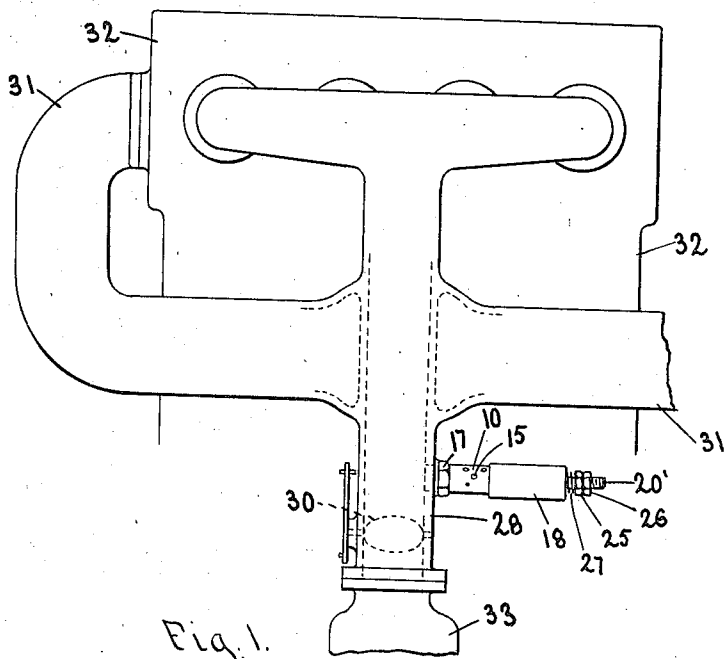


Fig. 1.

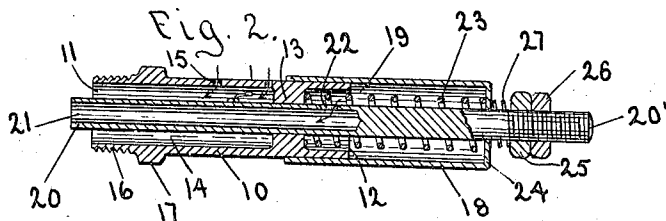


Fig. 2.

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UNITED STATES PATENT OFFICE.

LUMAN T. THURBER, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO THE MANUFACTURING ENGINEERS, INC., OF BROOKLINE, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

CARBURETING DEVICE.

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To all whom it may concern:

Be it known that I, LUMAN T. THURBER, a citizen of the United States of America, and resident of Brookline, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Carbureting Devices, of which the following is a specification.

This invention relates to the production of gaseous fuel mixtures and more particularly to an automatically adjustable auxiliary air port device applicable for use in operating internal combustion engines under variable load conditions, but the invention is not limited thereto as it may be used generally with internal combustion engines where it is desired to obtain a variable auxiliary air supply under different conditions.

Objects of the invention are to produce an efficient fuel mixture throughout varying load and to produce means for regulating the fuel mixture which is adjustable independently of the carburetor to control the fuel efficiency at various loads or to attain maximum efficiency, at any particular load, which produces more complete combustion, which reduces the deposit of carbon in the engine, and which generally compensates for improper mixtures produced by carburetors. Other objects are to provide an auxiliary air intake device automatic in action which is small, compact and simple in construction and inexpensive to manufacture, which may be readily applied to engines already in use and be readily adjusted, and which has relatively few parts so constructed and arranged as to be readily inspected, replaced or repaired.

The invention involves an auxiliary inlet device communicating with the inlet manifold in advance of the throttle to vary the auxiliary air supply in direct proportion to the throttle opening and in inverse proportion to the pressure in the manifold, thereby to admit more air at higher loads and consequently to increase the fuel efficiency at higher loads when employing certain types of carburetors.

An example of the invention is shown for illustrative purposes in the drawing hereto annexed, in which—

Fig. 1 is a diagrammatic view showing one application of the device applied to an intake manifold between the throttle and intake valve; and

Fig. 2 is a longitudinal section of the device.

The device comprises in general a casing having a chamber adapted to be connected with the intake manifold, preferably at a point between the throttle and the intake valve of an internal combustion engine, which chamber is provided with air ports normally open to the atmosphere, and a means responsive to the varying vacuum in the passage of the manifold so as to automatically reduce or cut off the air supply to the first mentioned chamber under certain conditions, such for example as those existing during relatively low loads when the throttle is more or less entirely closed.

As shown in Fig. 2, the device comprises a tubular member 10 open at opposite ends 11, 12 thereof, and having a transverse wall or partition 13 preferably arranged adjacent one end 12 so as to form a chamber 14 between said wall 13 and the open end 11. The wall of the chamber 14 is provided with a series of apertures or air ports 15, said air ports being disposed adjacent to the transverse wall 13 and preferably being disposed longitudinally of the tube and also extending around the periphery thereof. It is understood however, that the size, arrangement and disposition of the air ports may be varied as desired to meet the particular conditions of use. Means are provided adjacent the end 11 for securing the device in position. The outer surface of the tube is threaded at 16 adjacent the end 11, and a shoulder 17 preferably formed as a nut, is arranged adjacent thereto so that a wrench may be used for screwing the device in position. It is understood however, that other suitable means may be employed for securing the device in position.

As shown in Fig. 2, a cap 18 is provided which telescopically fits or slides over the end 12 of the tube 10, and forms a substantially closed chamber 19 which communicates directly with the passage of the intake manifold, so as to be subject to the partial vacuum therein. Preferably, a tubular rod 20 is provided for this purpose, which rod passes through the wall 13 and is fixed in said wall, said rod having a passage 21 therein which extends inwardly from the end thereof to a point beyond said wall. A port 22 connects the chamber 19 with the passage 21. A spring 23 is interposed be-

tween the wall 13 of the tube and the head 24 of the cap 18, said spring normally tending to urge the cap outwardly so that the air ports 15 are normally open. Preferably, the rod 20 extends through the head 24 of the cap, the projecting end 20' of said rod preferably being threaded and adapted to receive a nut 25 which serves as an adjustable stop for limiting the outward movement of the cap 18. Another nut 26 is provided for holding the stop nut 25 in proper adjusted position. A spring 27 or other suitable yielding means may be interposed between the cap 24 and the stop 25 for cushioning the outward movement of the cap 18.

The intake manifold 28 is preferably passed through an exhaust manifold 31 coming from the motor 32. Such an arrangement is of particular advantage in using kerosen or other heavy fuel because the heat of the exhaust gases may be utilized to raise the temperature of the mixture in the intake manifold and so facilitate vaporization of the fuel.

In operating the engine at relatively low loads, the throttle 30 will be almost closed, and reciprocation of the pistons will produce a partial vacuum within the passage of the manifold. The partial vacuum formed therein will be sufficient to overcome the action of the spring 23 and will move the cap 18 inwardly upon the casing 10, so that the air ports 15 will be closed by the cap 18, thus reducing the supply of air to the mixture passing through the intake manifold from the carburetor 32. It is to be noted that the auxiliary air supply is automatically varied inversely to the vacuum. This will enable a richer mixture to be provided at low loads. However, as soon as the throttle 30 is opened at increasing loads, the vacuum will be reduced and the reduced vacuum will permit the cap 18 to be moved outward, thus uncovering the air ports 15 so as to furnish the additional air supply necessary to form an efficient combustible mixture at the higher loads.

My improvement is not only useful in operating on heavy fuel, but I have found that it improves the operation when operating with light fuel inasmuch as it varies the auxiliary air supply directly (i. e. not inversely) in proportion to the throttle opening.

I claim:

1. In a device of the character described, the combination of a tubular casing having a chamber with an air port therein, a movable cap telescoping one end of the casing and adapted to close the air port, a spring interposed between the cap and casing urging said cap outward to normally maintain said air port open, and means for limiting and cushioning the outward movement of the cap, said means including a rod fixed to

the casing and extending through the cap, a stop on the rod outside of the cap and a spring on the rod between the cap and the stop.

2. The combination with the intake manifold of an internal combustion engine of a casing having a chamber with an air port therein, a second casing telescoping said first casing and forming a chamber therewith, said second casing being relatively movable and adapted to close the air port in the first casing, resilient means engaging said second casing to normally maintain the air port open, and a connection between the second chamber and the intake manifold, said second chamber being otherwise closed, whereby a strong suction in the intake manifold produced when the engine is being started or is running at a low speed automatically causes the second casing to advance over the air port.

3. In a device of the character described the combination of a tubular casing having a chamber, a normally open air port for the chamber formed in the side of the casing, a second relatively movable tubular casing telescoping the first casing and forming a chamber therewith, a spring co-operating with the casings to maintain the air port normally open, a connection from said second chamber to a source of negative pressure, said second chamber being otherwise closed, whereby said second casing is moved automatically and selectively to control the opening and closing of the air port in response to variations in the negative pressure.

4. In a device of the character described, the combination of a tubular casing having a chamber, a normally open air port for the chamber formed in the side of the casing, a second relatively movable tubular casing telescoping the first casing and forming a substantially closed chamber therewith, said chambers communicating independently with a source of negative pressure, said second casing being arranged to close the normally open air port upon formation of a vacuum in the closed chamber, and a spring within the substantially closed chamber interposed between the two casings so as to keep the air port normally open, but to permit the air port to be closed upon the formation of a vacuum in the substantially closed chamber.

5. In a device of the character described, for attachment to the intake manifold of an internal combustion engine, the combination of a casing having a chamber adapted to be connected to an intake manifold, said chamber having an air port in the wall of the casing, a second casing movable relative to the first casing and adapted to form a substantially closed chamber therewith, and to vary the air port of the first chamber, said sub-

stantially closed chamber having a port communicating directly with the intake manifold and independently of the connection of the first chamber thereto, and a spring interposed between the two casings normally holding the air port open, whereby upon formation of a sufficient vacuum in the intake manifold the spring will be compressed to permit the air port in the first chamber to be reduced.

6. An auxiliary air mixing device adapted to be connected to an intake manifold comprising a casing having a plurality of relatively movable parts arranged to form a plurality of chambers, each of said chambers communicating by separate passageways with the intake manifold so as to be subject to the vacuum therein, one of said chambers having air ports therein, and the other chamber having a movable portion associated therewith arranged to vary the air supply inversely to the pressure in the manifold.

7. An auxiliary air mixing device adapted to be connected to an intake manifold, comprising a tubular member open at one end, a cap telescoping one end of said tubular member and adapted to form a substantially closed chamber therewith, means arranged to form a passage between said closed chamber and the intake manifold, and resilient means interposed between the tubular member and cap, said tubular member having an air inlet port adapted to be varied by relative movement between the cap and the tubular member.

8. In a device of the character described the combination of a cylindrical casing having a chamber with an air port therein, said chamber being open at one end and closed at the other, a movable cylindrical cap adapted to telescope said cylindrical casing to form a substantially closed chamber with the closed end of the cylindrical casing said cap being adapted to close the air port, a spring between the cap and casing maintaining the air ports normally open, and a rod extending axially through the casing and cap, said rod being fixed in the head of the cylindrical casing and having a passage extending inward from one end communicating with the substantially closed chamber, and a stop on

the other end adapted to limit the outward movement of the cap.

9. An auxiliary air mixing device adapted to be connected to an intake manifold comprising a fixed air chamber and a movable air chamber telescoping together, the fixed chamber communicating with the intake manifold and having a plurality of air ports adapted to be closed by the telescoping movement of the movable chamber, and means connecting said movable chamber directly to the intake manifold so as to have a partial vacuum produced therein by suction of the engine thereby to telescope with the fixed chamber to close one or more of said air ports.

10. An auxiliary air mixing device adapted to be connected to an intake manifold comprising a fixed air chamber and a movable air chamber telescoping together, the fixed chamber communicating with the intake manifold and having a plurality of air ports adapted to be closed by the telescoping movement of the movable chamber, and a direct communication between said movable chamber and the intake manifold comprising a hollow guide rod extending from the fixed chamber and forming a guide for the movable chamber in its telescoping movement with the fixed chamber.

11. An auxiliary air mixing device adapted to be connected to an intake manifold comprising a fixed air chamber and a movable air chamber telescoping together, the fixed chamber communicating with the intake manifold and having a plurality of air ports adapted to be closed by the telescoping movement of the movable chamber, and a hollow guide rod extending from the fixed chamber and forming a guide for the movable chamber in its telescoping movement with the fixed chamber, said movable chamber communicating directly with the intake manifold through said rod, said rod extending beyond said movable chamber and having an adjustable stop thereon to limit the outward movement of the latter.

Signed by me at Boston, Massachusetts, this fifteenth day of June, 1921.

LUMAN T. THURBER.