

1,319,166.

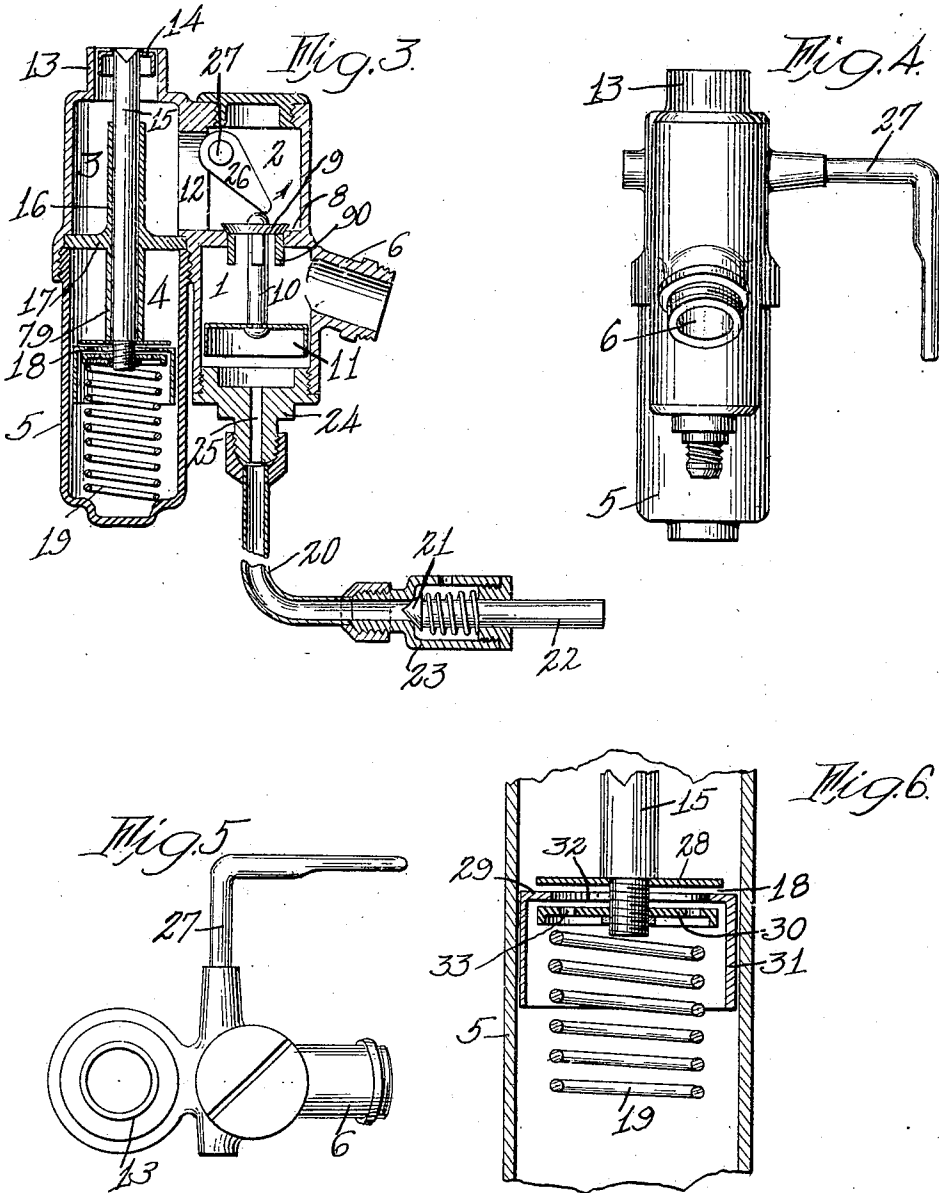


Attorney

V. E. MORRISON.
FUEL ECONOMIZER.
APPLICATION FILED AUG. 2, 1917.

1,319,166.

Patented Oct. 21, 1919.
2 SHEETS—SHEET 2.



Inventor
VAUGHN E. MORRISON.

Witness
Emanuel B. Wiener

By *Charles E. Wiener*
Attorney

UNITED STATES PATENT OFFICE.

VAUGHN E. MORRISON, OF DETROIT, MICHIGAN, ASSIGNOR OF ONE-HALF TO CARL F. BECKWITH, OF DETROIT, MICHIGAN.

FUEL-ECONOMIZER.

1,319,166.

Specification of Letters Patent.

Patented Oct. 21, 1919.

Application filed August 2, 1917. Serial No. 184,136.

To all whom it may concern:

Be it known that I, VAUGHN E. MORRISON, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Fuel-Economizers, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to fuel economizers of a type or character adapted to be mounted on the intake manifolds of internal combustion engines between the carbureter and inlet valves of the engine. The object of the invention is a device adapted to introduce air in variable volume into the fuel charge passing through the manifold. With the usual internal combustion engines as applied for use in the propulsion of an automobile, it is usual to set the carbureter to give an engine maximum power for accelerating from low to higher speeds while the car is being operated on what is known as the high speed gear. The usual carbureter when so set is productive of a richer mixture than is necessary to maintain the higher speeds. Consequently additional air may be introduced into the manifold while the car is being operated at the higher speeds resulting in economy in the use of fuel. The primary object of this invention, therefore, is a device producing economization of the fuel during operation of the car on the high speed gear as mentioned.

A further object is an apparatus adapted to reduce the percentage of fuel to air during operation of the engine, and to vary the degree to which the mixture is reduced to correspond with the throttle variations. The device is particularly adaptable for use with the automobile, and in order that the proportion of fuel to air may not be reduced during the initial operation of the engine and the operation of the engine and car on what is known as first or second speeds, means is provided whereby the device is held from operation during initial starting and operation of the first and second speeds and is brought into operation by the shifting of the high speed gear.

Another object of the invention is a fuel economizer operable and controlled after the

manner stated, having a spring controlled valve controlling the flow of air through the device into the manifold, whereby air may enter the manifold through the economizer only under certain degrees of vacuum produced in the manifold whereby the quantity of air flowing into the manifold (and consequently the extent to which the fuel charge is reduced in richness) is variable in accordance with the variations in degree of vacuum in the manifold.

Another object of the invention is a fuel economizer of the character stated, provided with such spring controlled valve and further provided with a control valve the position of which is made to correspond with the position of the throttle valve of the carbureter whereby the possible flow of air through the economizer is proportionate to the fuel charge as determined by the position of the throttle. These and other objects and the several novel features of the invention in its preferred form are hereinafter more fully described and claimed and shown in the accompanying drawings in which—

Figure 1 is an elevation showing my improved device as applied to the manifold of an engine and indicating the manner of control of the same.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a vertical section of my improved fuel economizer.

Fig. 4 is a side elevation thereof.

Fig. 5 is a plan view thereof.

Fig. 6 is a detail showing the means employed in controlling the opening of the air inlet valve.

The economizer proper is shown in section in Fig. 3 and consists of a body formed with connected cylindrical chambers 1, 2 and 3, and a chamber 4 preferably formed by the cylindrical shell 5 attached to the body. The chamber 1 is provided with an outlet channel 6 threaded at the end to enable it to be connected with the manifold 7 of an internal combustion engine into which it opens as indicated in Figs. 1 and 2. The chambers 1 and 2 are separated by a wall 8 apertured to provide a seat for a valve 9 seating on the upper face thereof. The valve 9 is provided with a stem 10 attached thereto the lower end of which is provided with a valve 11 fitting the chamber wall and reciprocable therewithin.

The chamber 2 is open to the chamber 3

by means of the passageway 12, and the upper end of the chamber 3 is provided with a cylindrical extension 13 open at the upper end controlled by a valve 14 having a stem 15 extending downward into the chamber 4 through a guide member 16. The guide member is formed of the cylindrical portion carrying the stem and the base portion 17 forming the closure between the chambers 3 and 4. This guide 16 and 17 is preferably formed of a separate piece held in place by the shell 5 as indicated in the drawing. In the chamber 4 the valve stem 15 is provided with a valve member 18, the construction of which is described hereinafter, and a spring 19 is provided in the lower part of the shell member 5 tending to hold the valves 18 and 14 in the uppermost position as shown in the drawing. In use the shell 5 is practically filled with oil to retard movement of the valve member 18. As is shown in Fig. 3 the part 17 is provided with a lower extension 79 similar to the extension 16 to limit upward movement of the valve member 18 by actuation of the spring 19.

Beneath the valve 11, the chamber 1 is open to atmosphere through a tube 20, which is controlled by the spring closed valve 21. The valve 21 is provided with a stem 22 and is supported in a casting 23 carrying the end of the tube 20 and stem of the valve. The tube 20 is attached to a cap 24 closing the end of the cylindrical chamber 1, which is provided with a channel 25 opening into the tube and the chamber 1.

The valves 9 and 11 are vertically movable in the chambers 1 and 2 and the extent of movement is limited by a lever 26 mounted on a stem 27 extending out through the side of the body as indicated in Fig. 5, which stem is connected, as hereinafter described with the throttle valve of the carbureter, whereby the position of the lever 26 relative to the valve 9 enables the valve 9 to open in proportion to the opening of the throttle. The connection of the lever 26 with the throttle valve lever is hereinafter more fully described. The valve 21 is also connected with the transmission set of an automobile so that the valve is opened upon the high gear being put into operation. One manner in which this valve 21 may be opened at the time the high speed gear is moved is shown in the drawings and described hereinafter.

With this understanding of the control of the valves 9 and 21, the operation of the economizer will be readily understood as follows: With the position of the lever 26 relative to the valve 9 and the valve in closed position as shown in the drawing, no operation of the fuel economizer may occur. The position of the lever 26 shown in the drawing is its position when the throttle valve of the carbureter is closed. The position of

the valve 21 is the position of the valve at all times except when the high speed gear is brought into action. On operation of the engine under all speeds with the valve 21 closed no operation of the economizer may take place for the reason that the valve 11 is held in the position shown irrespective as to whether the lever 26 is raised from contact with the valve 9 or not as the vacuum produced in the chamber 1 by operation of the engine is the same on both sides of the valve 11. The vacuum on the lower side of the valve 9, therefore would hold the valve 9 closed and prevent any flow of air through the channel 6 to the manifold. If the valve 21 be opened, however, the vacuum on the lower side of the valve 11 is broken and the valve 11 is lifted in the chamber 1 by reason of the greater area thereof in comparison with the area of the lower face of the valve 9 and the valves 9 and 11 will, therefore, move upward in the respective chambers to the extent allowed by the position of the lever 26. It is to be noted that the valve 9 is provided with wings 90 forming guides for the valve during its movement. If the lever 26 be moved up in the direction shown by the arrow, the valve 9 will lift to the allowed extent and the vacuum produced in the chamber 1 will also be produced in the chambers 2 and 3 and the lower side of the valve 14. The valve 14 is held in its uppermost position by the spring 19 and will, therefore, not be compressed until a sufficient degree of vacuum is produced in the chamber 3 to compress the spring. Furthermore on first opening of the throttle and lifting of the lever 26, the air will not immediately be introduced through the channel into the manifold due to the time required for the valve 14 to traverse the cylindrical portion 13 prior to the opening of the chamber 3 to atmosphere. A time limit is thus provided to allow the engine to speed up under the first opening of the throttle and subsequently the mixture is reduced in richness.

With the majority of fuel economizers with which I am acquainted the manifold is continuously open to atmosphere through the economizer during operation of the engine and consequent production of vacuum within the manifold at all engine speeds and irrespective of throttle position and work performed by the engine in operation. As is well known, with the automobile the greatest power is applied on first and second speeds and a richer mixture is required for such operation. The engine speed is also higher under such conditions than when the high speed gear is in mesh at which time the engine speed is slower and movement of the vehicle more rapid. By the arrangement herein shown, it is during this latter condition only, that the mixture is

reduced in richness and, as the greater amount of travel of an automobile is with the use of the "high" gear, the greater saving in fuel is secured by reducing the percentage of oil to air at such times. With the well known Ford automobile the described apparatus has shown a great saving, it being possible of securing as much as ten miles per gallon in excess of the mileage secured without the use of this device. As the trials productive of the above stated result continued over a considerable period of time, the efficiency and utility of the device will be readily realized by those familiar with the operation of an automobile.

In order that slow operation of the valve 14 may be produced, the valve member 18 is provided operating in the oil chamber 4 provided by the shell 5. The valve member 18, shown in detail in Fig. 6, consists of three parts, 28, 29 and 30. The part 28 is screwed onto the end of the valve stem 15 seating against a shoulder formed thereon. The member 30 is spaced therefrom and the member 29 is interposed therebetween being unattached to the stem or to the members 28 and 30. The member 29 is provided with a skirt 31 fairly closely engaging the walls of the shell 5 and has a comparatively large central aperture 32 about the valve stem and is supported between the walls of the shell 5. The member 30 has a series of apertures 33 about and quite close to the supporting stem 15. It is to be noted that the distance of the outer edge of these apertures from the center is slightly less than the radius of the aperture 32 in the member 29. When the member 29 rests on the member 30, therefore, these apertures 33 provide a passageway from beneath the valve through the central aperture 32 beneath the member 28 into the upper part of the chamber. It is to be further noted that the valve plate 28 is not apertured. Therefore, when the valve member 29 is in contact with the valve member 28, no flow of oil through the valve may occur. The skirt 31 of the member 29 is sufficiently loose to allow a leakage of oil between the skirt and chamber wall. The operation of this valve is as follows—The first movement of the valve 14 downward forces the valve 29 into engagement with the valve plate 28 preventing a ready flow of the oil from the lower to the upper side of the valve member, allowing it to move only as may be allowed by such leakage as may occur between the skirt 31 of the member 29 and chamber wall. Thus the downward movement of the valve 14 is retarded and, from the time the high speed gear is operated and the valve 21 opened, a time period elapses before air may flow past the valve 9 and through the channel 6 into the manifold thus allowing the engine to pick up speed under the condition

of operation imposed by the engaging of the high speed gear. This time interval is produced by the distance necessarily traveled by the valve 14 in the cylindrical extension 13 and the retarding effect above described.

There is a great variety of speed changing power transmission devices in common use, with any one of which it is possible to connect the valve member 21 in a manner to open the valve when the high speed gear is brought into operation, and it is to be understood to be within the spirit of this invention to mechanically connect the valve 21 with the transmission mechanism in such manner that the said valve will be opened upon actuation of the necessary parts to bring the high speed gear into operation. The principle is illustrated clearly in Figs. 1 and 2, the drawings being diagrammatic in form. The lever indicated at 40 controlling the speed changing gears is the usual foot lever of the Ford automobile. As is well known the transmission mechanism of the Ford automobile is controlled by this foot lever which is moved forward in the direction of the arrow shown in Fig. 1 for first speed and is released to normally occupy the position shown in the drawings to bring the high speed gear into engagement. For this character of construction therefore, I mount the casting 23 carrying the valve member 21 on the transmission case or other convenient position with the stem 22 extending outwardly therefrom as shown. This stem is engaged by a pivoted lever 41 mounted in any convenient manner having the opposite end extending to the rear of the lever 40. On release of the lever 40 to allow the high speed gear to be brought into engagement, the lever 41 is moved in the direction shown by the arrow in Fig. 2, and the valve stem is moved in the opposite direction lifting the valve 21 from its seat and opening the tube to atmosphere. This allows the vacuum produced in the manifold and in the chamber 1 to raise the valves 11 and 9 resulting in the operation of the device as hereinbefore described.

Many mechanical arrangements may be made, as heretofore, stated, to open the valve 21 and I do not confine myself to the particular mechanism here shown for such purpose or to the mode of control of the high speed gear, it being within the skill of the mechanic familiar with devices of this character to connect the stem 22 with the transmission mechanism of various types to be operated only on movement of the parts to bring the high speed gear into operation.

The carbureter 50 is indicated diagrammatically in Figs. 1 and 2, and a lever 51 is there shown which is to be understood as controlling the position of the throttle and the flow of air through the carbureter

into the intake manifold. This lever 51, as will be readily understood, may be operated with devices of various natures as, for instance, by the link 52 connected with the throttle rod 53 rotatable to vary the throttle position. In order that the rod 27 may be operated to correspond with the operation of the throttle, I have formed the said rod with a lever 54 on the end thereof, which lever is connected by means of a link 55 with the link 52 whereby movement of the link operates both the throttle lever 51 and the rod 27, whereby the lever 26 in the chamber 2 of the economizer proper is raised from engagement with the valve 9 directly in proportion to the opening of the throttle valve. Therefore, the flow of air from the economizer into the manifold is proportioned directly to the flow of air through the carbureter. The added percentage of air by the economizer is therefore, at all times proportional to the volume of flow through the carbureter and the resultant fuel charge is at all times of the proper degree of air and fuel for the desired operation.

From the foregoing description it becomes evident that the economizer is comparatively simple in form and that by controlling the same in conjunction with the throttle valve of the carbureter to vary the percentage of air added by the economizer to agree with variations in the fuel charge produced by the throttle variations and further, in connecting the device in such manner that it is brought into operation only when the high speed gear is engaged, a highly efficient device is produced and the fuel charge is affected only at such times as the result desired may be achieved.

Having thus briefly described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is—

1. The combination with an internal combustion engine provided with an intake manifold, a carbureter for introducing a fuel charge therein and a speed changing power transmission device, of a fuel economizer adapted to introduce air into the manifold between the carbureter and inlet to the engine, a valve for regulating the volume of flow of air through the economizer, said valve being normally held closed by the vacuum produced in the manifold, and means for breaking the vacuum to permit operation of the valve operable only at a time when the high speed gear is placed in operation.
2. The combination with an internal combustion engine provided with an intake manifold and a carbureter for introducing a fuel charge therein, of a fuel economizer adapted to introduce air into the manifold between the carbureter and inlet to the en-

gine, a valve for regulating the volume of flow of air therethrough, said valve being normally held closed by the vacuum produced in the manifold, and means for breaking the vacuum to allow operation of the regulating valve.

3. The combination with an internal combustion engine provided with an intake manifold and a carbureter for introducing a fuel charge therein, of a fuel economizer adapted to introduce air into the manifold between the carbureter and inlet to the engine, a valve controllable by the degree of vacuum produced in the manifold and regulating the volume of flow of air therethrough in accord with the vacuum, the valve being normally held closed by the vacuum produced, and means for opening one side of the valve to atmosphere to release the valve to operation by influence of the vacuum.

4. The combination with an internal combustion engine provided with an intake manifold and carbureter for introducing a fuel charge therein and speed changing power transmission device having "low" and "high" speed gears, of a fuel economizer adapted to introduce air into the manifold between the carbureter and inlet to the engine, a valve for regulating the volume of flow of air through the economizer operable jointly with the throttle valve of the carbureter to vary the volume of flow of air through the economizer in proportion to the volume of flow through the carbureter, said valve being held closed by the degree of vacuum produced in the manifold, and means for breaking the vacuum to allow operation of the regulating valve by influence of the vacuum, said means being operable only at the time when the high speed gear is placed in operation.

5. A fuel economizer for internal combustion engines provided with a carbureter having a throttle valve and an intake manifold, comprising a hollow body adapted to be connected with the intake manifold between the carbureter and inlet to the engine, a valve regulating the volume of flow of air through the economizer, and a control valve connected therewith of greater surface area than the regulating valve, the vacuum produced within the manifold tending to hold the regulating valve normally closed, an air inlet valve adapted to introduce air on one side of the control valve whereby influence of the vacuum may open the regulating valve, means limiting the opening of the regulating valve to correspond with the opening of the throttle valve of the carbureter, and means for opening the air inlet valve.

6. A fuel economizer for internal combustion engines, having a carbureter and speed changing power transmission device consisting of a hollow body adapted to be con-

5 nected with the intake manifold thereof, a
valve regulating the volume of flow of air
through the economizer, a control valve con-
nected therewith of greater surface area
than the regulating valve, the vacuum pro-
duced by engine operation on both sides of
the said control valve tending to hold the
regulating valve normally closed, an air inlet
valve adapted to allow air to flow in and
10 break the vacuum on one side of the control
valve whereby influence of vacuum in the
manifold may open the regulating valve,
means connected with the speed changing

power transmission device of the engine
whereby upon engagement of the high speed 15
gear the said inlet valve is opened, means
limiting the opening of the regulating valve
to correspond with the opening of the
throttle valve of the carbureter, an air inlet
valve opening into the interior of the hol- 20
low body, and means for retarding the open-
ing of the said air inlet valve.

In testimony whereof, I sign this specifi-
cation.

VAUGHN E. MORRISON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."