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FUEL ECONOMIZER FOR INTERNAL COMBUSTION ENGINES

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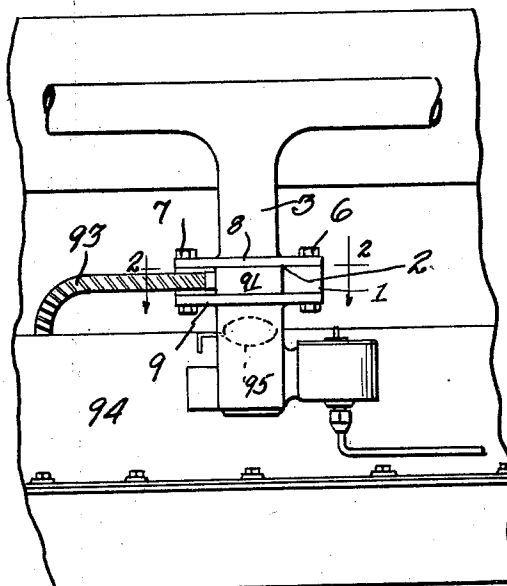


Fig. 1

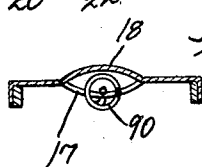
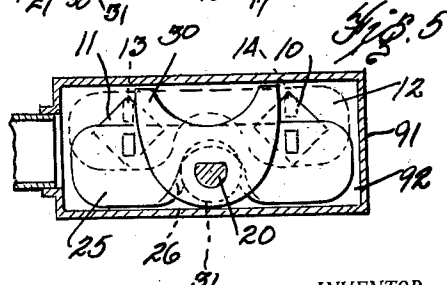
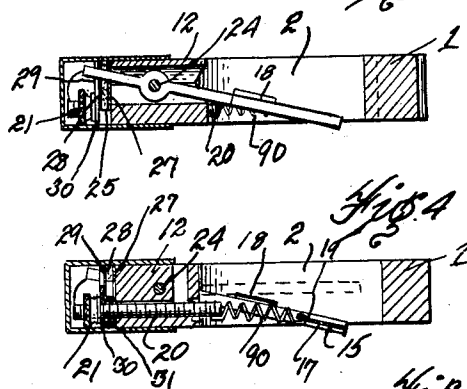
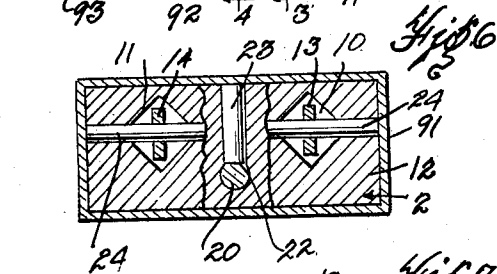
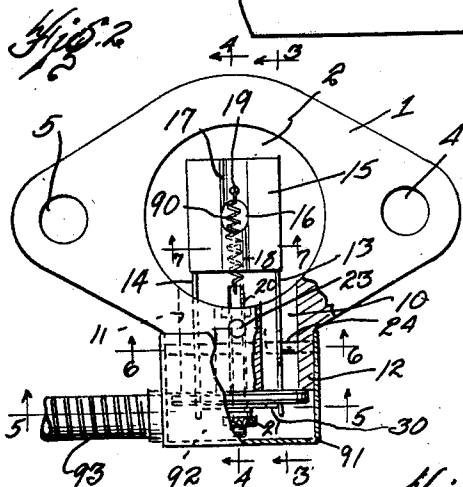


Fig. 6

Fig. 7

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FUEL ECONOMIZER FOR INTERNAL COMBUSTION ENGINES

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This invention relates to a fuel economizing device for internal combustion engines, and the object is to provide a simple and inexpensive device, adapted to be placed either in the intake manifold or between the outlet of the carburetor and the intake end of the intake manifold, of a character to automatically vary the percentage of air to fuel in accordance with the variation in piston displacement per unit of time.

A further object is to provide in conjunction with such apparatus means for causing an injection of oil vapor to the intake manifold whereby the upper ends of the pistons and cylinder walls are more efficiently lubricated.

The usual internal combustion engines of today have a certain adjustment of the carburetor providing a fixed percentage of fuel and air and an increase in velocity of the air stream due to the increased piston displacement per unit of time through the increased speed of the engine tends to provide an overrich mixture for these higher speeds—that is, with the carburetor adjusted to provide the proper fuel supply at low engine speeds (which is the usual method of adjustment of the carburetor) any material increase in engine speed tends to provide an overrich mixture and if the carburetor be adjusted to operate efficiently at the high engine speeds then, upon the engine being throttled to cause the same to idle, the mixture is too lean.

This invention seeks to provide a novel arrangement of parts by which the volume of air per unit of time flowing into the intake manifold is automatically varied and thus reduces the percentage of fuel to air at the higher engine speeds and increases the percentage of fuel to air as the engine speed decreases and in increasing the air flow through the intake conduit to provide such increased air flow with the oil vapor of the crank case of the engine.

These several objects and the various novel features of the invention are hereinafter more fully described and claimed, and the preferred form of construction of a fuel economizing device embodying our inven-

tion is shown in the accompanying drawings in which—

Fig. 1 is an elevation showing the device as arranged in the intake manifold of an engine, part only of which is here shown.

Fig. 2 is a section of the air intake manifold on line 2—2 of Fig. 1 showing our improved fuel economizer in detail.

Fig. 3 is an enlarged section taken on line 3—3 of Fig. 2.

Fig. 4 is a similar section taken on line 4—4 of Fig. 2.

Fig. 5 is an enlarged section taken on line 5—5 of Fig. 2.

Fig. 6 is an enlarged section taken on line 6—6 of Fig. 2.

Fig. 7 is an enlarged section taken on line 7—7 of Fig. 2.

The device consists of a casting 1 having a central aperture 2 of the same diameter as the internal diameter of the intake manifold 3. It is also provided with the apertures 4 and 5 to receive the bolts 6 and 7 which pass through the upper and lower flanges 8 and 9 of the intake manifold between which the device is secured. This casting in one of its sides is provided with two apertures 10 and 11 which open through the outer face of the casting 1 which at this point is formed with an outwardly projecting part 12 practically rectangular in cross section as will be understood from Fig. 5. These apertures 10 and 11 are preferably rectangular in cross section and are so positioned that two opposite points are in a vertical plane and the other two opposite points lie in a horizontal plane. Through these apertures project the levers 13 and 14 which have at their inner ends a plate or vane 15 secured thereto. This vane as will be understood from Fig. 2, lies in the air passage 2 of the casting and is preferably formed with a central aperture 16 at its outer end and from this aperture towards its free end the vane 15 is in-pressed longitudinally of its central portion as indicated at 17 and from the aperture in the opposite direction the vane has a central raised portion as indicated at 18. This form of the vane facilitates the introduction of a spring 19 beneath the vane as will be understood from

Figs. 3, 4 and 7 and the ready attachment of the end of the spring in an aperture 19 provided therefor.

The opposite end of the spring is attached
5 to a screw 20 which extends through an aperture of greatest diameter in the portion 12 of the casting and the outer end thereof, as shown in Figs. 2, 3 and 4, is provided with a nut 21. This screw 20 has a flattened side
10 22 and a pin 23 is inserted in an aperture provided therefor in the part 12 of the casting with its lower end practically in engagement with the flat face 22 of the screw. This pin
15 23 prevents rotation of the screw in adjusting the nut 21 thereon to increase or decrease the tension of the spring. The levers 13 and 14 are pivoted on a cross pin or rod 24 in the part 12 of the casting and the short ends of the levers engage in apertures in a plate 25
20 contacting the end face of the part 12. When the vane 15 is in the position indicated in Fig. 4 the plate 25 occupies the position shown by dotted lines in Fig. 5 and as the vane 15 is raised from the position shown in full lines
25 in Fig. 4 to a more nearly horizontal position indicated by dotted lines therein the plate 25 is moved downwardly toward the position shown in full lines in Fig. 5 thereby opening the apertures 10 and 11 to air flow.

30 It is to be noted that the plate is formed with an incurved portion 26 into which space the screw 20 projects. The plate 25 may be of any desired construction but we prefer to form the same of an inner metal plate 27
35 and an intermediate felt washer 28 of the same form and an outer metal plate 29 likewise of the same form as shown in full lines in Fig. 5.

The composite plate 25 is retained in place
40 by the U shaped plate 30 which has an aperture formed with a flattened side to engage the flat sides of the screw 20 as will be understood from Fig. 5 and a felt or other form of washer 31 is positioned on the screw 20 be-
45 tween the plate 30 and the end of the casting in the reentrant portion 26 with the plate 25. This washer serves the purpose of closing the aperture through which the screw 20 extends and holds the plate 30 from too
50 great frictional engagement with the plate 25. In other words—this felt washer 31 is slightly greater in thickness than the composite plate 25 permitting a freedom of sliding movement of the plate 25 on the end of
55 the portion 12 of the casting 2. Therefore the only restriction to movement of the vane 15 is the spring 90 the tension of which tends to hold the plate at an angle to the horizontal as shown by full lines in Fig. 4.

60 The operation of this device is as follows—When the engine is idling and the velocity of flow of air produced in the intake manifold is low, the resistance of the vane 15 to such
65 flow is sufficiently great to prevent its movement. Thus at these periods, the apertures

10 and 11 are maintained closed by the plate 25 and a comparatively rich slow burning fuel charge is provided. As the engine speed is increased by the opening of the throttle, and therefore the velocity of air flow in-
70 creased, the tension of the spring is overcome and the vane tends to lift toward the horizontal position as shown by dotted lines in Fig. 4, and this position, which is the full open position for the apertures 10 and 11
75 is assumed under the highest engine speeds.

The position of the vane 15 between the two extremes stated in Fig. 4 varies the extent of the opening of the apertures 10 or 11 to a flow of air therethrough. The reason
80 for forming said apertures of the shape in cross section heretofore stated is to secure a graduation of the air flow it being very little on the first step of the movement of the vane 15 toward the horizontal and in-
85 creases rapidly in succeeding positions due to the triangular form of that portion of the apertures 10 and 11 opened to air flow by the downward movement of the plate 25. Thus, on the idling periods and up to a certain
90 engine speed the only air taken into the intake manifold is through the carburetor but as the higher engine speeds are attained and the apertures 10 and 11 are opened to a gradu-
95 ally increased degree as the engine speed increases, additional air proportionate to the engine speed is injected into the intake manifold from a source outside the carburetor and thus tends to provide a fuel charge hav-
100 ing a decreased percentage of liquid fuel. By this arrangement therefore the fault of operation of an internal combustion engine is obviated and the fuel charge automatically
105 varied in its liquid fuel content. Thus, it is only necessary to adjust the carburetor for the idling speeds and to adjust the tension of the spring 90 to secure the most efficient fuel charge at the higher speeds instead of trying to find a "happy medium" between
110 these two extremes of engine speeds as is commonly the practice.

For the most effective result this device should be introduced on the engine side of the throttle valve indicated by dotted lines
115 at 95. This throttle valve may be variously located sometimes in conjunction with the carburetor casting but in any case this device should be positioned between the engine and the throttle valve.

The reason for this is that the device should
120 be introduced at such point in the manifold as to be influenced by the air velocity alone and at the point of greatest suction so that when the valve plate 25 opens there is sufficient reduced pressure in the portion of the
125 manifold in which the device lies to cause a full flow of air through the apertures 10 and 11. This will be apparent from the following—Under a throttled condition and a low engine speed, the greatest reduction in
130

pressure exists in that part of the manifold on the engine side of the throttle valve and the least volume of flow of air per unit of time. At low engine speeds, as previously stated, a richer fuel mixture gives the most efficient result and to add air to the fuel charge in this period of the engine operation would result in causing too lean a mixture. Inasmuch as at this time the least quantity of air is flowing past the vane 15, the vane will not be affected by the air flow and consequently the fuel and air charge as provided by the carburetor proper is delivered to the cylinders of the engine.

As the throttle valve is opened and the volume of flow of air through the carburetor per unit of time is increased sufficiently to cause a movement of the vane, the plate 25 is moved to open the apertures 10 and 11 and introduce additional air thereto and introduction of air into the intake manifold at this period of operation of the engine, in view of the quantity being small in comparison to the volume passing through the intake manifold, does not produce an overlean mixture for such engine speed but does produce a leaner mixture than would be provided by the carburetor proper at the same engine speed. Thus, by the arrangement described an automatic control of the fuel charge in respect to the percentage of air to fuel is automatically varied through a certain comparatively low speed of the engine to the highest speeds and below such comparatively low engine speeds is prevented from operation.

The vane 15 is comparatively small in area to prevent choking the air flow and still is of an area sufficient to be affected by the velocity of air flow through the intake conduit. We have found in practice that in an intake manifold having an internal diameter of one and seven-sixteenths inches the vane may be five-eighths of an inch wide by seven-eighths of an inch long with a central aperture approximately one-fourth of an inch in diameter.

It is commonly the practice with internal combustion engines when new at least and with marine engines of this type to place a small quantity of oil in the gasoline to secure proper lubrication of the upper ends of the piston and cylinder walls.

Such precaution, however, is more often neglected than otherwise by users of engines of this type and our improved economizer has been designed to automatically secure this lubrication of the upper end of the cylinder. We accomplish this result through the provision of a casing 91 of a size adapted to comparatively tightly fit over the portion 12 of the casting 2 and enclosing the plate 25 and the other parts supported on or extending beyond the end of the member 12. This casing provides a space 92 into which

air may flow through the tube 93 to the apertures 10 and 11. As shown in Fig. 1 this tube extends into the crank case 94 of the engine above the possible oil level therein and thus air that is drawn through the apertures 10 and 11 is the oil saturated air from the upper part of the crank case. This air in the usual cases at least does not contain sufficient gasoline in suspension to any material extent detrimentally affect the operation of the economizer. It is possibly true that a slight amount of gasoline vapor may by this arrangement be discharged into the air intake manifold above the carburetor but, as fresh air is being continuously drawn into the crank case through the breather port, the percentage of fuel to air in the crank case is materially below that required to provide a combustible mixture. Therefore by utilization of this air space in the crank case as a source of supply of air for the economizer the beneficial effects of causing a leaner mixture to be provided at higher engine speeds is secured and those further desired benefits arising through lubrication of the upper part of the cylinder walls and the piston are also secured.

From the foregoing description it is believed evident that the device is simple and of inexpensive construction and is of a character to be readily installed in a carburetor and intake manifold or between two component parts of the intake manifold, and that the various objects of the invention are secured by the construction described.

Having thus briefly described our invention, what we claim and desire to secure by Letters Patent of the United States is—

1. A device of the character described for use in the intake manifold of an internal combustion engine comprising an apertured casting, a vane in the said aperture, said casting having an air intake aperture opening to the first named aperture of the casting, the wall of the casting about the air intake aperture having a vertical face, a lever in the said aperture on the inner end of which the vane is mounted, a pin on which said lever is pivotally mounted to turn on a horizontal axis, a valve plate for the said aperture connected with the end of the said lever and movable vertically in contact with said vertical face, a spring tending to hold the vane in position to close the valve, and means for adjusting the tension of the spring to predetermine the extent of movement of the vane relative to the velocity of flow of the fuel charge.

2. A device of the character described for use in the intake manifold of an internal combustion engine, comprising a centrally apertured casting positioned in the intake manifold, a plate in the said central aperture providing a vane subject to influence of flow of fuel charge therethrough, the said casting having a pair of apertures therein leading

to the central aperture, a lever in each of the
said apertures in substantially parallel rela-
tion to the inner end of which the plate is at-
tached, a pivotal support for the levers, said
5 levers extending through the face of the cast-
ing, a valve plate on the said face of the cast-
ing connected with the projecting end of the
levers and so arranged that movement of the
vane by velocity of flow of fuel charge causes
10 movement of the plate to open the apertures to
air flow, a spring connected with the plate, a
threaded rod to which the spring is attached,
said rod extending through an aperture pro-
vided therefor in the casting and projecting
15 between the said levers, means for preventing
flow of air through said rod aperture, a nut on
the outer end of the said threaded rod by
means of which it may be moved to increase
or decrease the tension of the spring, means
20 for preventing rotation of the rod through
rotation of the nut, and a casing supported by
the casting and covering the said valve plate
and screw and having an opening for admis-
sion of air.
25 In testimony whereof we sign this speci-
fication.

EARL P. OSWALD.
FRANK X. BONEM.

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