June 6, 1933. R. HUFFORD 1,912,773

ENGINE GOVERNOR

Filed July 15, 1929 2 Sheets-Sheet 1

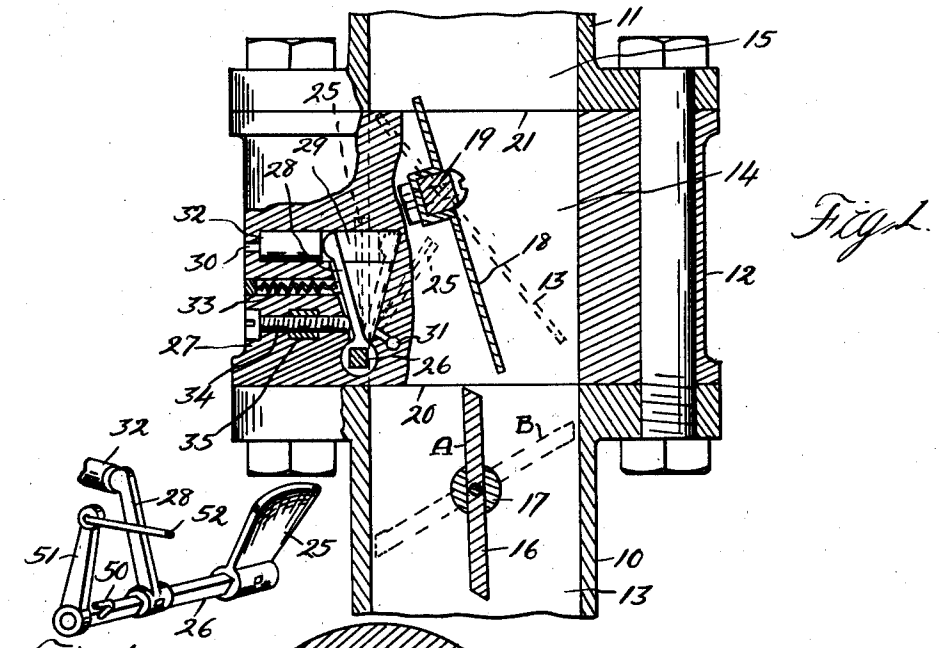


Fig. 1.

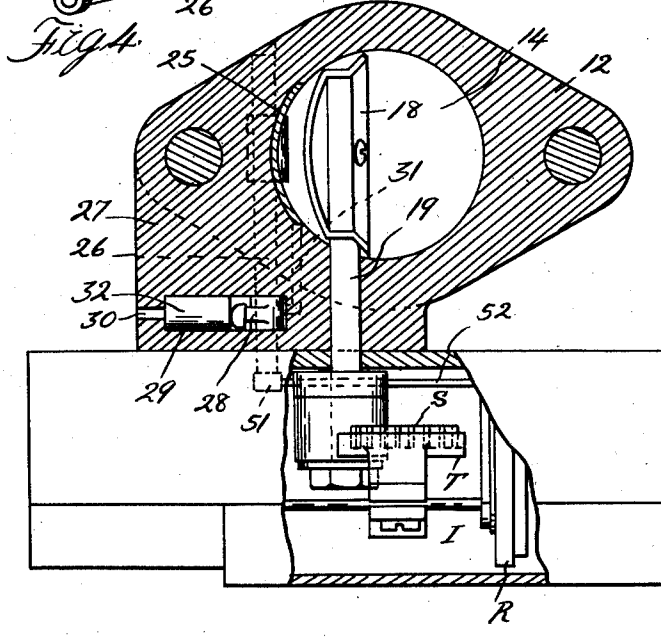


Fig. 4.

Fig. 2.

INVENTOR

Raymond. Hufford

BY

ATTORNEYS

June 6, 1933. R. HUFFORD 1,912,773

ENGINE GOVERNOR

Filed July 15, 1929 2 Sheets-Sheet 2

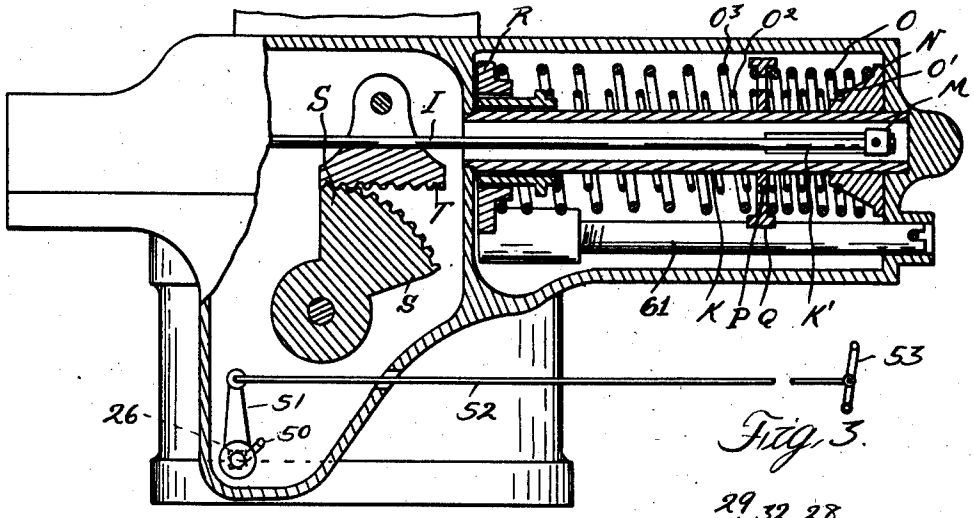


Fig. 3.

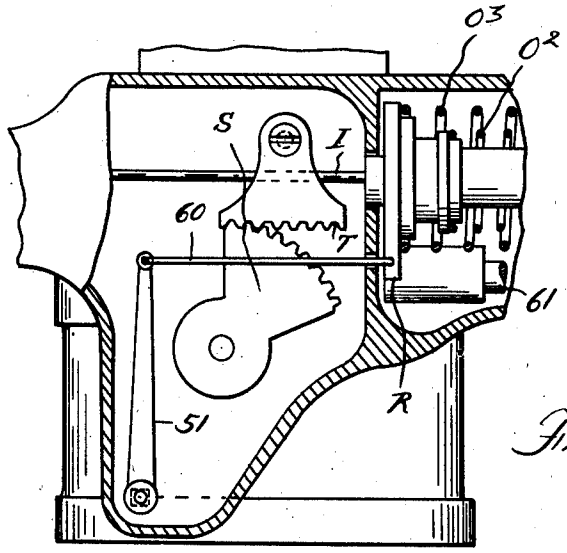


Fig. 6.

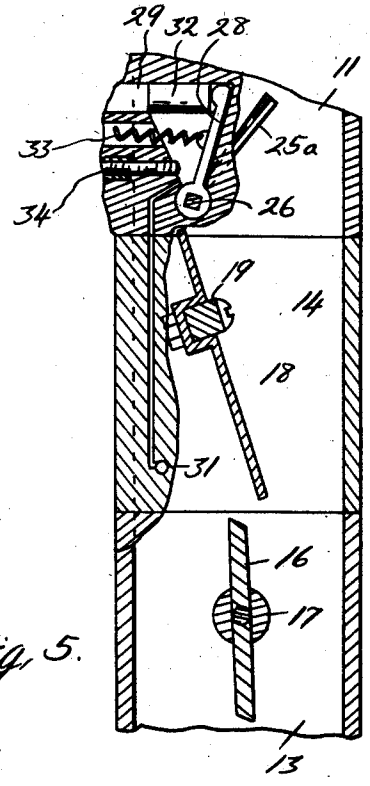


Fig. 5.

INVENTOR

Raymond Hufford

BY

ATTORNEYS

Patented June 6, 1933 1,912,773

UNITED STATES PATENT OFFICE

RAYMOND HUFFORD, OF DETROIT, MICHIGAN, ASSIGNOR TO MONARCH GOVERNOR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN

ENGINE GOVERNOR

Application filed July 15, 1929. Serial No. 378,440.

This invention relates to governors for internal combustion engines and has particular reference to a governor of the type in which a throttle is automatically actuated by the differential static pressure in the intake manifold of the engine.

In practice it has been found that the driver of a vehicle, the engine of which is equipped with a governor of the above mentioned type, may by properly manipulating the carburetor throttle or by some other means increase the speed of the engine beyond that at which the governor is set to operate, and accordingly the present invention has as a primary object the provision of auxiliary means associated with the governing throttle to positively limit the maximum speed at which the engine may be driven.

A further object of this invention is to provide means for permanently restricting the effective area of the intake manifold of an engine to a predetermined desired area and to further provide a means of this character which will also be automatically operable to limit the maximum speed of the engine in the manner above pointed out.

The invention also numbers among its objects the provision of means adjustable to reduce the speed at which the action of the automatic governor takes place and the provision of an auxiliary means associated with an automatically actuated governor for indirectly effecting the actuation of the governor to cause the same to more accurately limit the maximum speed of the engine.

Other objects and advantages of the invention will become more apparent as the following description proceeds, particularly when reference is had to the accompanying drawings, wherein

Figure 1 is an axial section through a manifold provided with the improved governor;

Figure 2 is a horizontal sectional view through the governor;

Figure 3 is a sectional view through the governor at right angles to Figure 2 showing the spring construction;

Figure 4 is a detail of the mechanism for manually controlling the governor;

Figure 5 is an axial section through a manifold wherein the invention is shown in modified form;

Figure 6 illustrates a modified arrangement wherein the governor spring and the auxiliary valve are simultaneously adjusted.

Referring now particularly to the drawings wherein like reference characters designate corresponding parts throughout all views, the numeral 10 designates the outlet conduit of a carburetor while the numeral 11 designates an intake manifold. Arranged between the conduit 10 and manifold 11 is a casing 12 in which the governor, hereinafter to be described, is mounted. The conduit, casing, and manifold have aligned passages 13, 14 and 15 respectively through which the fuel is supplied from the carburetor to the engine. (Not shown.)

For controlling the flow of fuel through the passage 13 there is provided an engine throttle valve 16 which is preferably of the balanced butterfly type and this valve is mounted on the shaft 17 adapted to be manually actuated in the usual manner by any suitable actuating lever.

Arranged within the passage 14 in the casing 12 is a governing throttle valve 18 eccentrically mounted on a square shaft 19. This governing valve is automatic in its operation, being moved toward closed position by the difference in pressure between the inlet 20 and outlet 21 of the passage 14, which movement is counteracted in the present instance by a compound spring mechanism.

While the invention may be applied to governors equipped with various arrangements of springs, the preferred construction employs a compound spring composed of a series of individual springs O, O^1, O^2, O^3,

each having a different characteristic. The throttle shaft 19 carries a gear segment S meshing with a rack T which in turn is connected to a stem I extending into a tubular guide K. This guide is longitudinally slotted at K′ for the passage of a pin or other connection M between the stem I and a sleeve or collar N slidable on the outside of the guide. The collar N forms an abutment for the springs O and O^1 while a collar P is arranged intermediate the springs O^1 and O^2, and a collar Q is placed between the springs O and O^3. R is an abutment adjustably mounted on the guide K for the opposite ends of the springs O^2 and O^3.

With the arrangement described the characteristics of the springs O, O^1, O^2 and O^3 may be so selected that the desired characteristic is imparted thereto. This is because the units operate successively, either individually or in combination so that the graph representing the characteristic is composed of a succession of straight line curves at different angles approximating a continuous curve.

With eccentrically mounted throttle governors it has been found that the driver of the vehicle may under certain circumstances increase the speed of the engine beyond that predetermined speed at which the governor is set to operate. Assuming the engine to be running at governing speed with the engine throttle in the position designated as position A in the drawings, and with governing valve 18 in position shown in dotted lines, the operator slowly closes the throttle 16 to, for example, the position marked B. This slow, partial closing of the throttle 16 tends to equalize the pressures on the governing valve with the result that the governing throttle valve starts to open thus increasing the flow of fuel to the engine and naturally the speed of the engine.

The present invention contemplates the provision of means designed to positively prevent this so-called cheating by providing an auxiliary valve responsive to the static pressure at the inlet 20 to decrease the effective area of the manifold. This auxiliary valve functions under conditions which normally would cause an increase in speed to reduce the area of the conduit and thereby maintain the equilibrium of the main governor valve and prevent increased speed. The valve also functions to cause a greater range of speed adjustment by providing mechanically operated and manually operated means for varying the effective area of the conduit.

Referring now particularly to Figure 1 of the drawings it will be noted that there is mounted in the side of the passage 14 and on the shorter side of the governing valve 18, an auxiliary valve 25. This auxiliary valve is mounted on a shaft 26 and is adapted to be moved by rotation of this shaft from a position within the side wall of the passage 14, such as shown in full lines in Fig. 2 of the drawings, outwardly to a position diagonally across the passage 14, such as shown in dotted lines in the drawings. To automatically actuate the valve 25, the shaft 26 is extended beyond one side of the casing 12 and is journaled in an auxiliary casing 27 projecting laterally from the casing 12. Secured to the projecting end of the shaft is a lever 28 having its free end projecting into a cylinder 29 formed in the auxiliary casing 27. This cylinder is in communication at its one end with the atmosphere by virtue of the passage 30 and is in communication at its other end with the inlet 20 of the passage 14 through the passage 31. Mounted within the cylinder 29 is a piston 32 adapted to reciprocate within the cylinder by reason of differential pressure between the inlet 20 and the atmosphere. A spring 33 within the casing 27 and secured to the lever 28 tends to hold the lever 28 and the piston or plunger 32 in the position shown in full lines in Figure 1 of the drawings. The spring 33 is adjustable in order to permit the valve to function at any predetermined engine speed.

When the governor is in operation the flow through the manifold places a pressure upon the governor throttle 18 thereby urging the shaft 19 against its bearings in the manifold. The force on the throttle is great enough to introduce a certain friction element between the shaft and its bearings tending to resist any turning effort of the shaft. The auxiliary valve 25 on the other hand is subjected to relatively little pressure and consequently there is practically no friction element action thereon.

When the engine is running at governing speed, the governor throttle is in equilibrium at a certain position where the closing forces, due to the flow through the manifold, balance the force of the compound spring. Now if the carburetor throttle valve 16 is moved toward closed position the static pressure in the manifold between the carburetor throttle and the governor throttle is reduced. Therefore the piston 32 is drawn toward the manifold moving the valve 25 into the conduit as shown in dotted lines in Figure 1. This decreases the effective area of the conduit and therefore again places the governor throttle valve in equilibrium without requiring any movement of the same. Thus the auxiliary valve device functions to prevent "stealing" when the operator manipulates the carburetor throttle. The lower frictional resistance of the auxiliary valve causes this element to respond to slight fluctuations of pressure in the manifold rather than the main governing valve.

Associated with the lever 28 is an adjusting screw 34 threadedly mounted in a bushing 35 arranged in the casing 27, this screw

having its end in abutting engagement with the lever 28. By properly manually adjusting the screw 34 the valve 25 may be moved to decrease the effective area of the passage 14 to any predetermined desired area, and the screw will then function to prevent further increase of effective area under any conditions. This reducing of the passage on the supply side of the governing throttle valve lowers the speed at which the governing action takes place so that the screw 34 provides a simple and effective means for adjusting the action of the governing valve 18. Further, the adjustment of the screw 34 varies the tension on the spring 33 and varies also the initial position of the plunger 32 and lever 28 thus regulating the automatic action of the auxiliary valve 25.

From the above it is believed that the structure and operation of the invention will be clearly apparent. The valve 25 is adapted for manual and automatic adjustment to reduce the effective area of the passage 14. This valve being located below or above the governing throttle valve indirectly regulates the automatic operation of the throttle valve and also functions to positively limit the quantity of fuel which may pass through the passage 14 at any given time, thus maintaining a constant maximum engine speed irrespective of the actuation of the carburetor throttle 16. The auxiliary valve is automatic in its operation and may be easily adjusted to obtain the predetermined desired governing action of the engine.

Provision may also be made for a manual adjustment of the auxiliary valve so that it may be set in a position to restrict the area of the manifold and at the same time be permitted to move further toward obstructing position to respond to variations of pressure in the manifold. Thus as shown in Figs. 3 and 4, the shaft 26 for the auxiliary valve carries a dog 50 adapted to be engaged by lever 51. The lever is coaxially mounted with the shaft 26 and has its free end connected by a flexible connection 52 with a hand adjustment 53 which may in some instances be located at a point on the vehicle where it is always under the control of the operator.

One of the features of the construction above described is that the governor may be adjusted to adapt the same to a wider variety of conditions. For example, a governor may be designed for a certain motor and the auxiliary valve so positioned as to be normally out of the manifold passageway except where it is moved thereinto to prevent cheating. This same governor may also be adapted for another motor by adjusting the screw 34, thereby obstructing the conduit and decreasing the effective area thereof while still permitting further movement into the conduit if cheating is attempted. Such adjustment increases the working forces on the governing throttle valve 18 and gives a better governing action.

Another advantage of the improved governor is that it may be manually adjusted by the operator to change the governing speed. For example, the operator by manipulating the member 53 may quickly change the speed at which the governor will function.

Another advantage of the governor is due to the fact that the adjustment of the governor, both by reason of the compound spring or the auxiliary valve 25, may be placed under lock to prevent unauthorized tampering therewith. It will be noted that both adjustments are within the housing 55 beneath the cover 56, which latter may be sealed in closed position.

Under certain conditions it may be desirable to adjust the governor for different maximum speeds by simultaneously operating the adjustments for the auxiliary valve 25 and the spring 22. Thus as shown in Figure 6 there is a flexible connection 60 between the lever 51 and the abutment R so that only the manipulation of the screw 61 need be undertaken to regulate both adjustments.

In the modification shown in Figure 5 the auxiliary valve 25*a* is placed above the governing throttle. The pressure for operating the valve is, however, derived from a point between the governor throttle and the carburetor throttle and as shown a duct or passage 31 is provided for this purpose.

What I claim as my invention is:

1. In a governor, the combination of a casing having a fuel intake passage therein, a governor throttle eccentrically mounted in said intake passage and a vacuum operated auxiliary valve mounted in said casing adapted to project into said intake passage, said auxiliary valve being movable independently of said governor throttle and having a lesser friction resistance than said governor throttle.

2. In a governor, the combintion of a casing having a fuel intake passage therein, a governor throttle in said casing mounted to close by the flow through said intake, spring means opposing the closing movement, a suction actuated auxiliary valve in said governor, and means for mechanically adjusting said auxiliary valve to reduce the effective area of said fuel passage.

3. In a governor for an internal combustion engine having an intake passage, a main governing valve in the passage adapted to be moved toward closing position by differential pressure, a supplementary governing valve subject to the difference between pressure in the intake passage and atmospheric pressure, and means whereby said supplementary valve is movable to restrict the intake passage in response to variations in pressure in the passage ineffective to move the main governing valve.

4. In a governor for an internal combus-

tion engine having an intake passage, a main governing valve in the passage adapted to be moved toward closing position by differential pressure, a supplementary governing valve of smaller area than the main valve subject to the difference between pressure in the intake passage and atmospheric pressure, said supplementary valve being movable to restrict the intake passage in response to lesser variations in pressure in the intake passage than responded to by the main governing valve.

5. In a governor for an internal combustion engine having an intake passage, a main governing valve in the passage adapted to be moved toward closing position by differential pressure in the intake passage at opposite sides thereof, a supplementary governing valve of smaller area than the main valve subject to the difference between pressure in the intake passage at the carburetor side of the main valve and atmospheric pressure, said supplementary valve being movable to restrict the intake passage in response to lesser variations in pressure in the intake passage than responded to by the main governing valve.

6. In a governor for an internal combustion engine having an intake passage, a main governing valve in the passage mounted on an eccentric axis to produce an unbalanced condition and adapted to be moved toward closing position by differential pressure, a supplementary govering valve of smaller area than the main valve mounted on an eccentric axis to produce an unbalanced condition and subject to the difference between pressure in the intake passage and atmospheric pressure, said supplementary valve being movable to restrict the intake passage in response to lesser variations in pressure in the intake passage than responded to by the main governing valve.

7. In a governor for an internal combustion engine having an intake passage, a main governing valve in the passage adapted to be moved toward closing position by differential pressure, a supplementary governing valve of smaller area than the main valve mounted on an eccentric axis to produce an unbalanced condition, a piston subject to the difference between the pressure in the intake passage and atmospheric pressure for moving said supplementary valve to restrict the intake passage in response to variations in the intake passage ineffective to move the main governing valve.

8. In a governor for an internal combustion engine having an intake passage, an unbalanced butterfly valve in said passage mounted on an eccentric axis and movable toward closing position by the difference in pressures within the passage on opposite sides thereof, a second valve movable to close only a portion of the passage and actuated independently of said first valve by the difference in the pressure within said passage and atmospheric pressure.

9. In a governor for an internal combustion engine having an intake passage, a main governing valve in said passage movable toward closing position by the difference in pressures within the passage, and a second governing valve more responsive to slight variations in pressure in the passage than the main valve and movable independently of the main valve to effect when closed a lesser restriction of the intake passage than the main valve when closed.

10. In a governor for an internal combustion engine having an intake passage, a main governing valve in said passage movable toward closing position by the difference in pressures within the passage, and a second vacuum responsive governing valve movable against less frictional resistance than the main valve and independently thereof for restricting said passage.

11. In a governor for an internal combustion engine having an intake passage, an unbalanced butterfly valve in said passage eccentrically mounted to move toward closing position by the difference in pressures within the intake passage, a second valve movable to close only a portion of the passage, a piston for actuating said second valve independently of the first valve, said piston actuated by the difference in the pressure within said passage and atmospheric pressure.

12. In a governor for an internal combustion engine having an intake passage, a main governing valve in said passage movable toward closing position by the difference in pressures within the passage, a second governing valve movable to close only a portion of the passage, a piston for actuating said second valve independently of the first valve, said piston being actuated by the difference between atmospheric pressure and the pressure within said passage at the carburetor side of said main governing valve.

In testimony whereof I affix my signature.

RAYMOND HUFFORD.