

April 25, 1939.

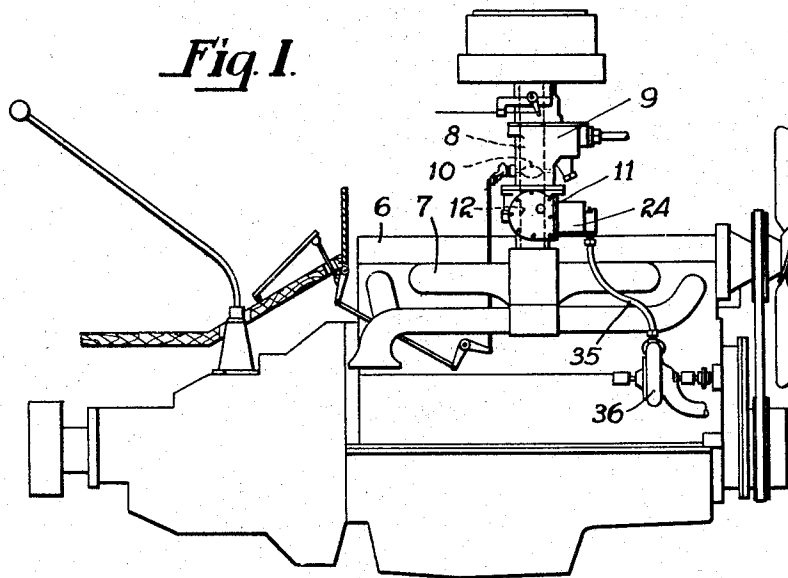
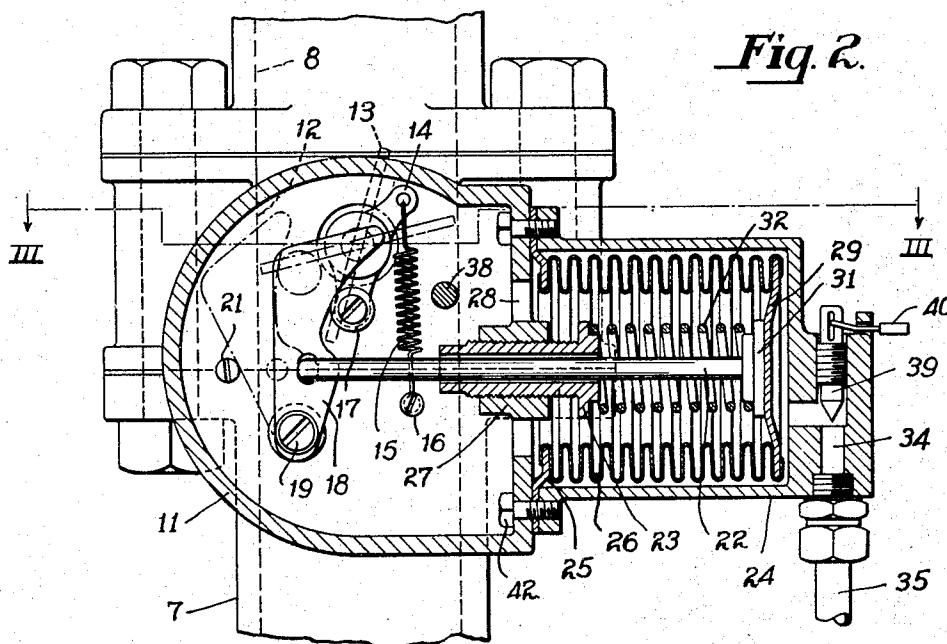
G. E. HOWARD

2,156,116

SPEED REGULATOR

Filed Nov. 3, 1938

2 Sheets-Sheet 1



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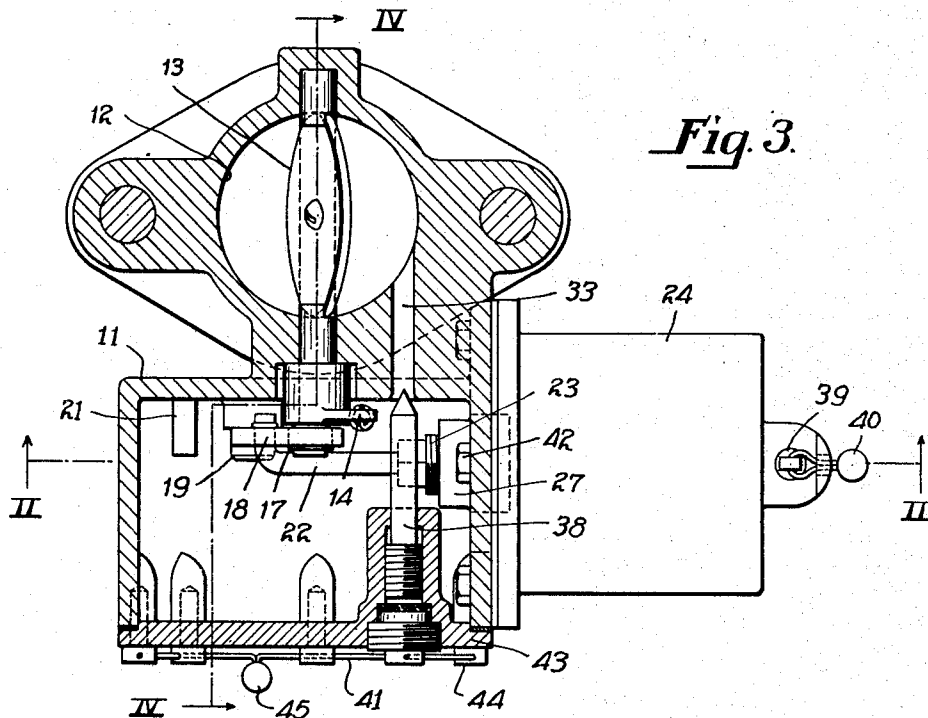
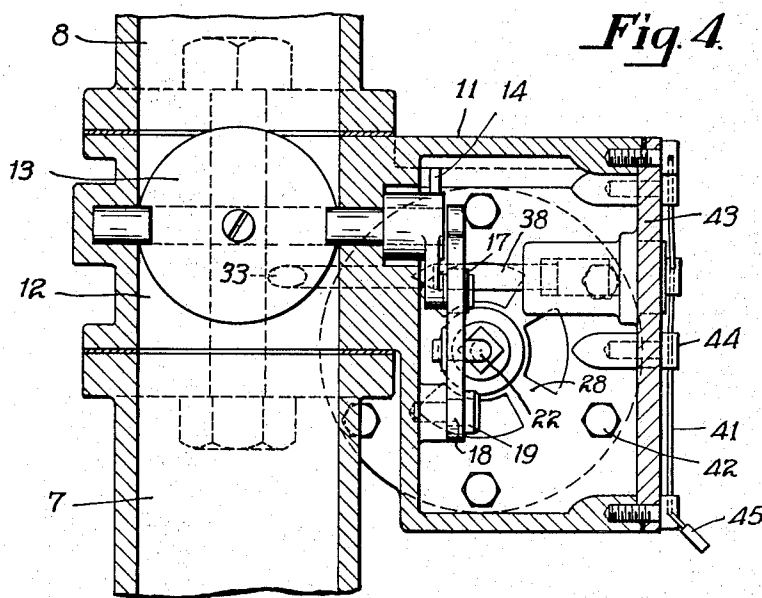
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SPEED REGULATOR

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,156,116

SPEED REGULATOR

George E. Howard, Butler, Pa.

Application November 3, 1938, Serial No. 238,594

9 Claims. (Cl. 123—103)

My invention relates to speed regulators of the type employed in regulating the movement of motor vehicles and their engines, and constitutes a modification of the structures disclosed in my application Serial No. 185,861, filed January, 20, 1938 (now Patent 2,138,100).

One object of my invention is to provide governing apparatus that will operate with greater accuracy than is possible with previous types of governors, and one wherein there is a minimum number of moving parts.

Another object of my invention is to provide means for governing engine and vehicle speeds both through variations in pressure within the fuel intake line, and through changes in fluid pressure produced by a pump which is driven from the vehicle motor.

As shown in the accompanying drawings, Figure 1 is a side view of a vehicle motor having my invention applied thereto; Fig. 2 is a vertical sectional view on an enlarged scale through a portion of the apparatus of Fig. 1, and taken on the line II—II of Fig. 3; Fig. 3 is a view taken on the line III—III of Fig. 2, and Fig. 4 is a view taken on the line IV—IV of Fig. 3.

An internal combustion motor is indicated by the numeral 6 and is provided with the usual intake manifold 7 to which an explosive mixture is supplied through an intake line 8 from a carburetor 9 and past a foot control throttle valve 10. The governing apparatus is contained within a casing 11 which has a passageway 12 that constitutes a portion of the intake line 8. Within the passageway 12 is a control valve 13 that is actuated by the governing apparatus, to automatically control the flow of mixture of fuel vapor and air to the engine.

To one trunnion of the valve 13 is secured an arm 14 to which is connected a spring 15 that is anchored at 16 to the casing 11, so that the valve is thereby yieldably urged toward its closed position. A second arm 17 of crank-like form is also connected to the valve trunnion and cooperates with the camming surface of a cam lever 18 which is pivoted at 19 to the casing, a stop lug or pin 21 being provided for limiting movement of the lever 18 in one direction. A pull rod 22 has jointed connection at one end with the lever 18 and extends loosely through a sleeve 23.

A cylinder 24 is secured to one side of the casing 11, which side has an opening or communication with the interior of the cylinder 24, a flanged ring 25 being interposed between the members 11 and 24. The flange of the ring 25

has sealed connection with the inner end of a bellows 26 that functions as a diaphragm or piston, as will be hereinafter explained. The sleeve 23 has threaded engagement with a hub or bushing 27 that is carried by arms 28 that are formed integrally with the casing 11. The outer end of the bellows 26 has sealed connection with a disc 29 which is connected to the head 31 of the rod 22. A spring 32 is interposed between the head 31 and the head of the adjustable sleeve 23 to normally maintain the bellows 26 in its expanded position. A passageway 33 affords communication between the fuel inlet line 8 and the interior of the casing 11, from a point between the valve 13 and the manifold 7, so that the interior surface of the bellows will be subjected to fluctuations of pressure within the manifold 7.

A port 34 in the end wall of the cylinder 24 affords communication between said cylinder and a fluid-pressure line 35, so that pressure within said line will be imposed against the outer side of the bellows 26, tending to move the same to contracted position against the pressure of the spring 32. As here shown, water under pressure is supplied through the pipe 35 from a pump 36 which is driven by the engine, and hence the water pressure in the pipe 35 varies with changes in engine speed. The pipe 35 could, of course, have connection with the usual pump that circulates the water through the cooling system, or the pump 36 could be utilized not only for supplying oil under pressure to the pipe 35, but also for the pressure lubrication system of the motor.

In those installations provided with the usual foot-control throttle valve and with a governor-control throttle valve, there frequently is too great delay in movement of the governor-controlled valve to a position where it will exercise a controlling effect. For example, if the foot throttle is half closed and the control throttle fully open, there will be considerable time consumed in movement of the control throttle by the governor to a position corresponding to approximately the position of the foot throttle, and the control throttle cannot become effective until it reaches such position.

A specific aspect of my invention concerns the shifting of the control valve in accordance with changes between full load (wide open foot throttle) and no load (closed foot throttle) conditions, and hence through changes in pressure or suction conditions within the manifold, so that normally the position of the control valve will approximate the position of the foot throttle

and the control valve will be fully effective under short ranges of movement of the governor, instead of becoming completely effective only after the governor has moved the valve to a position approximating the position of the foot throttle.

Assuming that the foot throttle valve 10 is at its half-closed position and the engine is rotating at a speed below that at which the pressure developed by the pump in the line 35 is sufficient to cause compression of the bellows against the pressure of the spring 32, the suctional or vacuum force created in the intake line between the valve 10 and the intake manifold will result in some contraction of the bellows with movement of the cam lever 16 counter-clockwise on its pivot, thus permitting the control valve 13 to be moved toward closed position by the spring 15. The valve 13 is thereby moved to a position corresponding to the position of the throttle 10, so that upon increase in pressure in the line 35, such as will result from increase in engine speed, there will be further movement of the control valve 13 toward closed position and consequent restriction in flow of fuel to the engine; and since such movement of the control valve will occur promptly upon increase in engine speed, the speed of the car can be held within a very close range, for example 49 to 50 miles per hour. The vacuum control just described functions in effect as a "finder" whereby the control valve 13 is automatically moved to such position that it will be given its control movements through short ranges of movement of the bellows 26 under the liquid pressure.

In movement of the valve 13 at points adjacent to its wide-open position, travel thereof through a given angular range will not give the same amount of restriction as in moving through said angular range at a point further toward its closed position. In order that for a given range of bellows movement the valve 13 will be moved through such range as to cause a proportionate amount of restriction, I provide for differential degrees of movement thereof relative to the bellows movements, and to this end, form the camming surface of the cam 18 of such curvature and angularity that at the start of a contracting movement of the bellows, the cam 18 will cause a relatively greater range of closing movement of the valve 13 than at points further toward its closed position, while as the bellows approaches the position at which the valve 13 will be nearly closed, the degree of valve movement with respect to the extent of bellows movement will be relatively less. Thus for any range of movement by the bellows, there will be a corresponding degree of restriction of fuel flow, by the valve 13.

While mention is made above of movement of the control valve 13 toward its closed position, it is never so tightly closed as to absolutely prevent flow of fuel vapor through the line 8.

The rate at which the bellows 26 will respond to changes in vacuum pressure and liquid pressure is controlled by restricting valves 38 and 39 respectively. Thus the valve 38 can be set at such position that fluttering or jerky movements of the bellows will not occur through minor fluctuations of pressure in the manifold. Similarly, the valve 39 can be set so that the bellows will not be unduly affected through sudden or temporary surges within the line 35, with the result that the engine will operate more smoothly than if the control valve 13 were moved a sub-

stantial distance through each momentary change in fluid pressure.

In order to prevent undetected tampering with the governor by unauthorized persons, I provide a seal 40 for maintaining the valve 39 in its adjusted positions, such seal passing through a hole in the stem in the valve and through a hole in the lug on the cylinder 24. The valve 38 is similarly fastened by a sealing wire 41. The bellows housing 24 is fastened to the casing 11 by screws 42 which are accessible only from the interior of the casing 11. The cover plate 43 for the casing 11 is held in place by screws 44 through the heads of which the wire 41 extends. The ends of the wire are connected by a seal 45. Also adjustment of the sleeve 23 to vary the tension of the spring 32 can be made only at the interior of the casing 11.

I claim as my invention:

1. The combination with an engine provided with an intake passageway having a throttle valve for controlling the flow of motive fluid to the engine, of a control valve for said passageway, an actuating device for the control valve, means for moving said device in response to changes in engine speed, and means operable through changes of pressure in the passageway, for moving the control valve in predetermined relation to changes in position of the throttle valve.

2. The combination with an engine having an intake passageway through which motive fluid is supplied thereto and a valve for controlling the flow of said fluid, of a pump driven by the engine, a governing device movable in response to changes in fluid pressure produced by the pump and having operative connection with said valve, and means for imparting supplementary movements to said device through changes in pressure in said passageway.

3. The combination with an internal combustion engine having a valve-controlled intake passageway through which motive fluid is supplied thereto and also provided with a cooling system through which water is circulated by a pump driven from the engine, of a governing device movable in response to changes in the water pressure, and having operative connection with said valve, and means for imparting supplementary movements to said device through changes in pressure in said passageway.

4. The combination with an engine having an intake passageway through which motive fluid is supplied thereto and a valve for controlling the flow of said fluid, of a pump driven by the engine, a pressure responsive governing device having operative connection with said valve and movable through pressure in excess of a predetermined degree applied to one side thereof by operation of the pump, and means for subjecting the opposite side of said device to suctional force produced in said passageway, for effecting supplementary movements of the device.

5. The combination with an engine having an intake passageway through which motive fluid is supplied thereto and a valve for controlling the flow of said fluid, of a pump driven by the engine, a pressure-responsive governing device having operative connection with said valve, means for yieldably maintaining the said device in a position at which the valve is held fully open, means for directing fluid pressure from the pump to one side of the said device, for moving it toward closed valve position when the pressure exceeds a predetermined degree, and means for subjecting

the opposite side of the said device to a suctional force produced in said passageway.

5 6. The combination with an engine having an intake passageway through which motive fluid is supplied thereto and a valve for controlling the
10 flow of said fluid, of a pump driven by the engine, a casing having communication with said passageway, a pressure-responsive governing device mounted within the casing and responsive to
15 fluctuations of pressure within the passageway, imposed at one side of the said device, a connection between said device and the valve, for imparting movements to the valve, and means for directing fluid pressure from the pump to the
20 other side of said device.

25 7. The combination with an engine having an intake passageway through which motive fluid is supplied thereto and a valve for controlling the flow of said fluid, of a crank extension carried by the valve, for rocking the same, a cam member cooperating with the said extension, a pressure-responsive governing device connected with said
30 cam member, means for subjecting one side of the said device to fluctuations of pressure within the said passageway, a pump driven by the engine, and means for subjecting the other side of said device to fluid pressure from said pump.

8. The combination with an engine having an intake passageway through which motive fluid is supplied thereto and a valve for controlling the flow of said fluid, of a pump driven by the engine, a bellows having operative connection with said
5 valve, means for yieldably maintaining the bellows in a position at which the valve is held fully open, means for directing fluid pressure from the pump to one side of the bellows, for moving it toward closed valve position when the pressure
10 exceeds a predetermined degree, and means for subjecting the opposite side of the bellows to suctional force produced in said passageway.

9. The combination with an engine having an intake passageway through which motive fluid
15 is supplied thereto and a valve for controlling the flow of said fluid, of a pump driven by the engine, a casing having communication with said passageway, a bellows mounted within the casing and responsive to fluctuations of pressure within
20 the passageway, imposed at one side of the bellows, a connection between said bellows and the valve, for imparting movements to the valve, and means for directing fluid pressure from the pump to the other side of said bellows.
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