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INTERNAL-COMBUSTION ENGINE GOVERNOR

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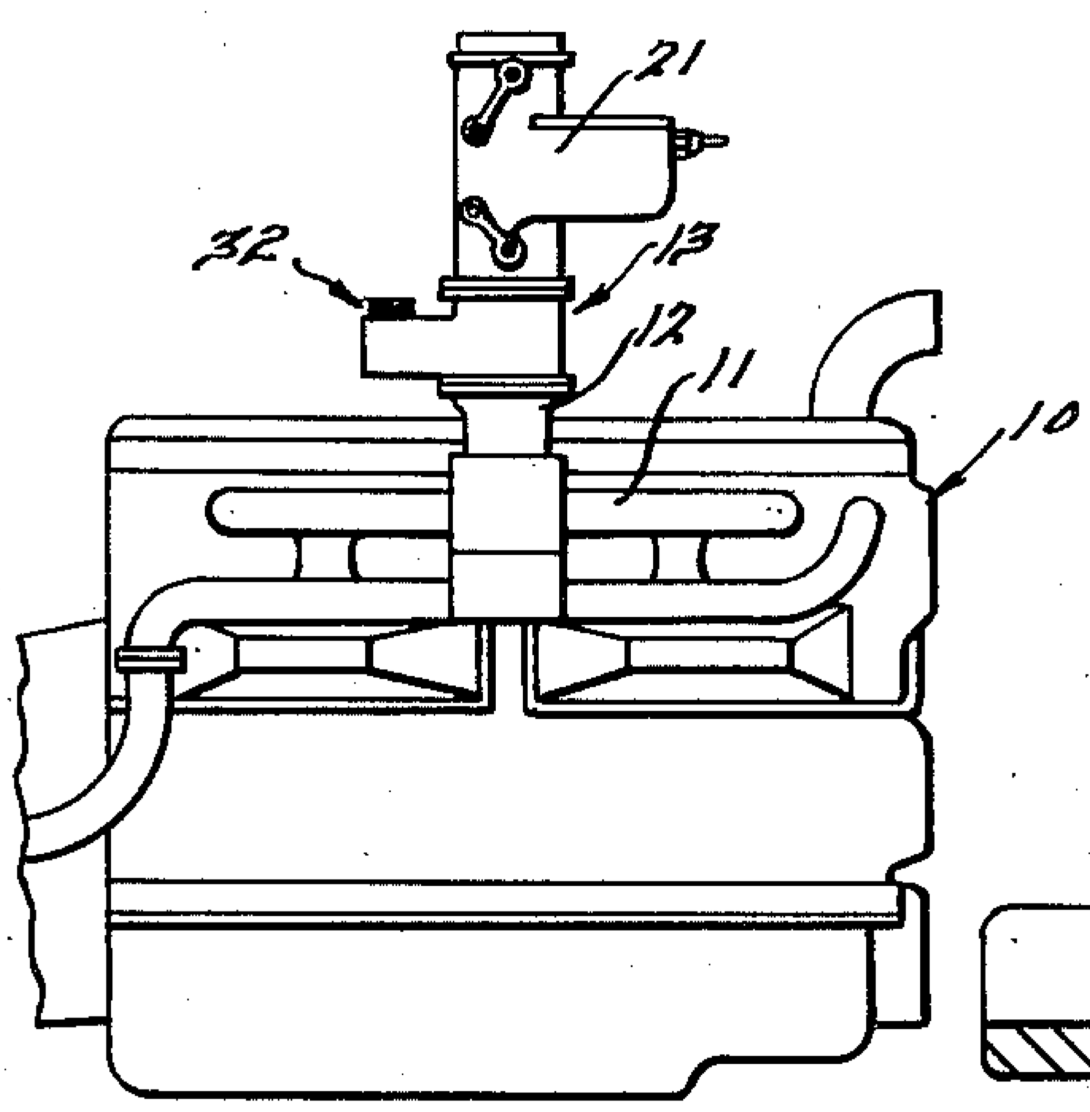

Fig. 1.

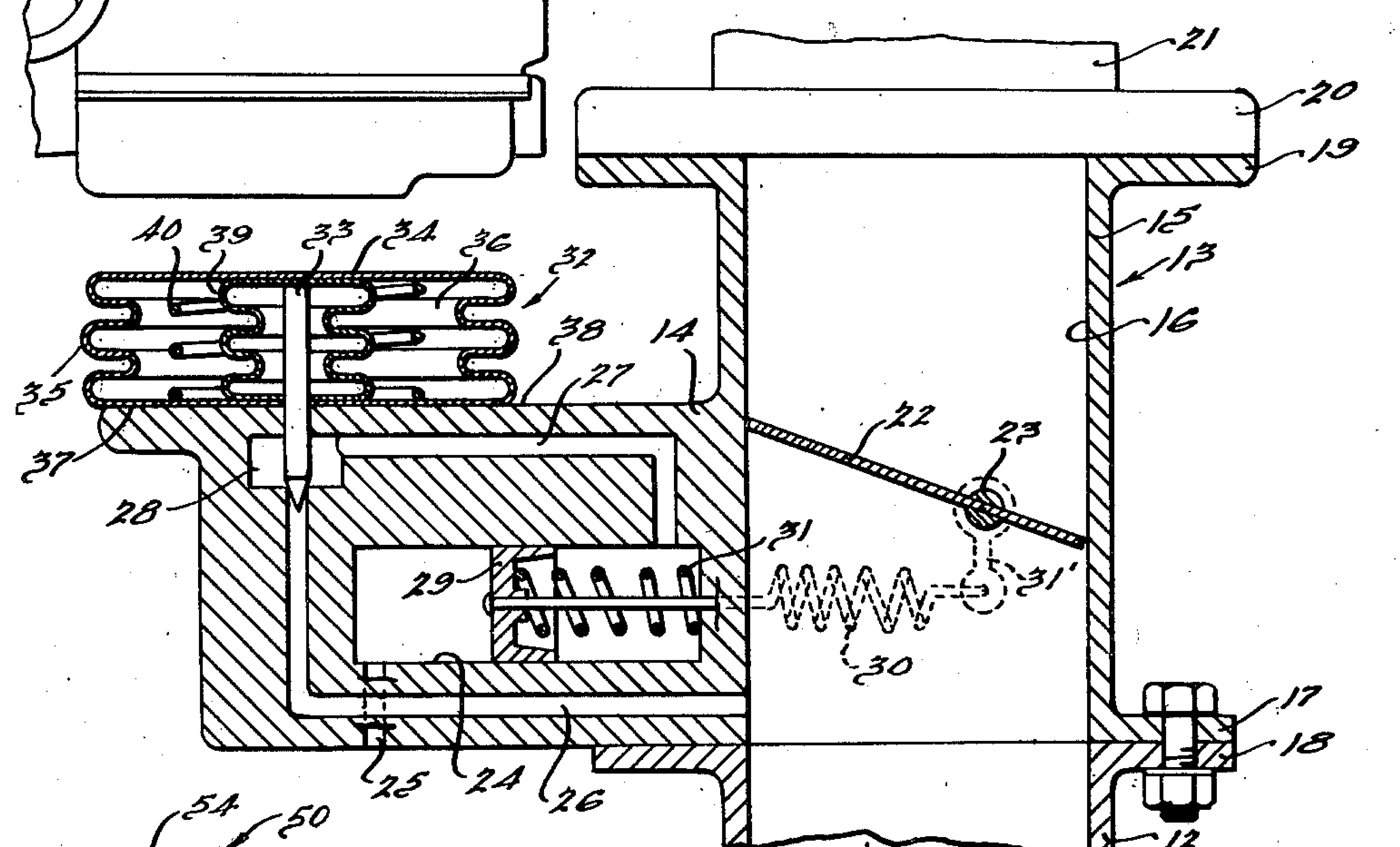

Fig. 2.

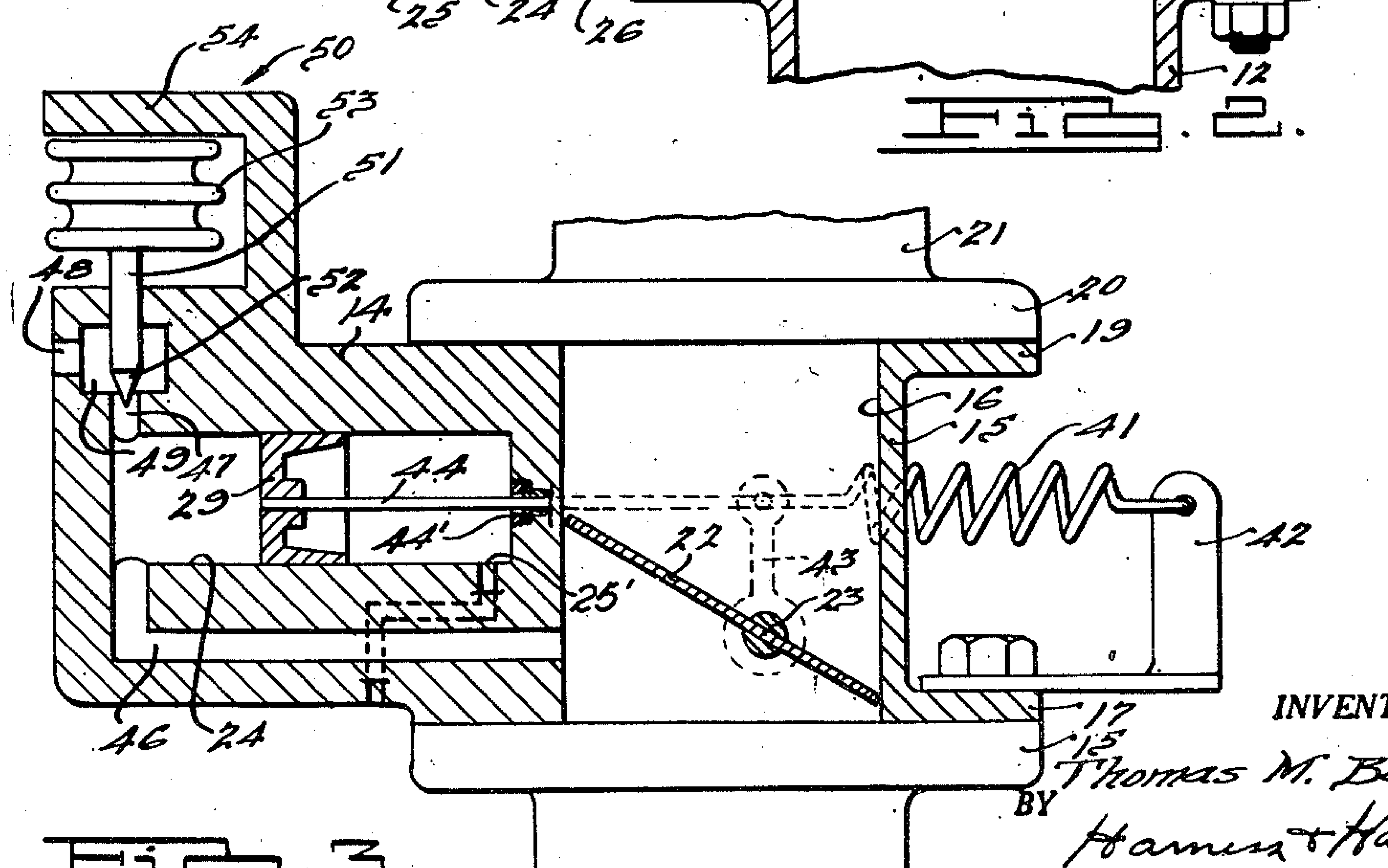

Fig. 3.

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INTERNAL-COMBUSTION ENGINE GOVERNOR

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8 Claims. (Cl. 137—153)

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This invention relates to an improved governor for internal combustion engine carburetors.

More particularly, the invention pertains to the provision in a velocity type governor of this kind of compensating mechanism which is responsive to changes in altitude.

Velocity type carburetor governors generally include an offset throttle or other equivalent means which is normally yieldably urged toward open position by a spring or other suitable throttle opening means. The velocity of the fuel mixture flowing from the carburetor opposes the opening action of the spring.

The spring or other yielding throttle-opening means is so calibrated with respect to the action of the velocity of fuel mixture flow as to limit the speed of operation of an engine, and accordingly the speed of a vehicle driven thereby, to a predetermined value. For any one calibration of the throttle opening means, the limiting speed value varies with changes of altitude in accordance with atmospheric pressure changes at diverse elevations.

One of the main objects of the invention is to compensate in a velocity type governor of this character for the effect thereon of changes in altitude in order to limit the speed of operation of an engine and the mechanism driven by it to substantially the same value at diverse altitudes.

Another object of the invention is to automatically effect such compensation in a governor of this type in response to atmospheric pressure changes at different altitudes.

A further object of the invention is to provide means for automatically effectively weakening the spring or other yielding throttle closing means of a velocity type governor as the atmospheric pressure decreases at elevated altitudes and effectively strengthening it as the atmospheric pressure increases.

Another object of the invention is to provide spring tension varying mechanism in a governor of this character which is activated by the manifold suction of the engine with which the governor is associated.

An additional object of the invention is to provide spring tension varying mechanism of this kind which acts directly upon the spring of a governor to predetermine its tension.

A still further object of the invention is to provide spring tension varying mechanism of this character which variably opposes the spring of the governor with a force proportional to changes in atmospheric pressure.

An illustrative embodiment of the invention is shown in the accompanying drawing, in which

Fig. 1 is a side elevational view of an internal combustion engine which is provided with a governor having altitude compensating mechanism embodying the invention.

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Fig. 2 is a vertical sectional view of the governor shown in Fig. 1.

Fig. 3 is a vertical sectional view similar to Fig. 2 but showing a governor having altitude compensating mechanism which embodies a modified form of the invention.

In the form of the invention illustrated in Figs. 1 and 2 of the drawings, my improved governor is shown as applied to an internal combustion engine, generally designated by the numeral **10**, having an intake manifold **11** provided with a riser **12**. The governor, which is generally designated by the numeral **13**, includes a main body portion **14** having a tubular part **15** through which extends a fuel mixture passage **16**. The tubular part **15** is provided at its lower end with an outwardly extending radial flange **17** by which it may be conveniently mounted on a correspondingly mounted flange **18** provided on the upper extremity of the riser **12**. A radial flange **19** is provided on the upper end portion of the tubular section **15** of the governor for receiving a corresponding flange **20** of a carburetor **21** from which fuel mixture is supplied to the fuel mixture passage **16** of the governor. The flanges **17** and **18** and the flanges **19** and **20** are bolted or otherwise suitably secured together in a conventional manner.

A throttle valve **22** is carried by a shaft **23** which is journalled in the wall of the tubular section **15** of the governor. The shaft **23** is pivotally mounted in the tubular section **15** at a location off center and the shaft is also off center with respect to the throttle valve **22**. As a result of this construction, downward flow of fuel mixture through the passageway **16** normally tends to urge the throttle valve **22** towards its closed position.

Provided in the body portion **14** of the governor is a cylinder **24** having its left end, as viewed in Fig. 2, vented to atmosphere through a passage **25**. The right end of the cylinder **24** is connected to the fuel mixture passage **16** at a location below the throttle valve **22** by a passage comprising sections **26** and **27** and an intermediate series-related valve chamber **28**. The axis of the cylinder **24** is disposed substantially perpendicular to the axis of the fuel passage **15** and in it is provided a reciprocable piston **29** which is connected by a spring **30** with an operating lever **31'** fixed to the external end portion of the throttle shaft **23**. The piston **29** is yieldably urged leftwardly, as viewed in Fig. 2, by a spring **31** which bears at one end against the piston and at its opposite end against the wall of the fuel mixture passage **16**. The spring **31** tensions the spring **30** to predetermine the force by which the throttle valve **22** is urged toward its open position against the action of fuel mixture flowing downwardly through the fuel mixture passage 16.

The action of the spring 31 is variably opposed by engine suction applied on the right side of the piston 29 through the passage sections 26 and 27 and the intermediate valve chamber 28. The amplitude of the force of the engine suction applied on the right side of the piston 29 is predetermined by atmospheric pressure responsive valve mechanism, generally designated by the numeral 32. This mechanism includes a needle valve 33 having a relatively gradually tapered lower extremity extending into the passage section 26 at the location where it joins the valve chamber 28. The needle valve stem is carried by a movable wall 34 of an expansible bellows 35 which has a sealed annular compartment 36. The bellows 35 has a lower wall 37 which is mounted upon and fixed to a substantially horizontal surface 38 of the body portion 14 of the governor, and a central portion of the interior of the bellows is sealed from the annular chamber 36 by an inner bellows 39 through which the valve stem 33 extends. A coil spring 40 bears between the upper and lower sides 34 and 37 of the bellows 35 normally tending to expand the bellows.

In the operation of the form of the invention shown in Figs. 1 and 2, the throttle valve 22 serves to limit the amount of fuel mixture supplied to the engine with which the governor is associated and thus it functions to limit the speed of operation of the engine. At any fixed atmospheric pressure which would correspond to a selected uniform altitude, the tension of the spring 30 which is predetermined by the action of the spring 31, remains constant, and thus the force by which the throttle valve 22 is biased toward open position against the action of the flow of fuel mixture through the fuel mixture passage 16 is also fixed. When the atmospheric pressure decreases, as for example, as a result of operation of the engine at an increased altitude, the bellows 35 expands and shifts the tapered end of the valve element 33 upwardly to either increase the effective opening between the tapered end of the valve element and the passage 26, or to open it from a fully closed position. This action of the valve element 33 increases the force of engine suction applied on the right side of the piston 29, thus shifting it rightwardly against the action of the spring 31, and decreasing the tension of the spring 30 in proportion to the decrease in atmospheric pressure which is reflected in the closing action of the flow of fuel mixture upon the throttle 22. The bellows 35, valve mechanism, piston 29, and springs 30 and 31 are all so calibrated as to maintain the resultant operation of the governor constant during operation of the engine at varying altitudes.

The governor and its altitude-compensating mechanism, shown in the form of the invention illustrated in Fig. 3, is similar to that shown in Figs. 1 and 2, but in the form shown in Fig. 3, the throttle valve is yieldably urged towards open position by a spring and engine suction actuated mechanism is relied upon to variably oppose the action of the governor spring rather than to vary its tension, as in the structure shown in Fig. 2. Corresponding parts of the structure shown in Figs. 2 and 3 are designated by the same numerals. The throttle valve 22 which is so offset as to be urged by the flow of fuel mixture toward its closed position, is yieldably urged toward open position by a spring 41 having its right end attached to a bracket 42 carried by the governor and its left end attached to a crank arm 43, extending upwardly from the external end of the throttle shaft 23. A piston 29 reciprocably mounted in the cylinder 24 is connected by a piston rod 44 with the crank arm 43. As shown in Fig. 3, the right end of the cylinder 24 is closed to the fuel mixture passageway 16 and a suitable seal 44' is provided in the wall of the passageway 16 for reciprocatively accommodating the piston rod 44. Engine suction is applied on the left side of the piston 29 through a passage 46 which communicates with the fuel mixture passage 16 and atmospheric pressure is applied on the right side of the piston through a passage 25'. The left end of the cylinder 24 is also vented to atmosphere. This vent comprises passage sections 47 and 48 and an intermediate valve chamber 49. The amplitude of engine suction applied on the left side of the piston 29 is predetermined by valve mechanism, generally designated by the numeral 50, which includes a valve stem 51 having a tapered valve element 52 on its lower end which extends through the valve chamber 49 and into the passage section 47 leading from the left end of the cylinder 24. The valve stem 51 is carried by the lower wall of the bellows 53 which has an opposite end supported by a bracket 54 mounted on the body portion 14 of the governor.

In the operation of the form of the invention shown in Fig. 3, the throttle 22 serves to limit the quantity of fuel mixture delivered to the engine. This is accomplished by the balance established between the force of the flow of fuel mixture tending to close the throttle valve 22 and the action of the spring 41 which tends to open it. The relationship between these opposing forces can be readily established at a fixed altitude or a fixed atmospheric pressure and by variably opposing the action of the spring 41, the governor is automatically compensated for changes in atmospheric pressure such as result from changes in altitude. In this form of the invention, as the atmospheric pressure decreases, for example as a result of increase in altitude, the bellows 53 expands and works the valve element 51 downwardly so as to obstruct the vent passage at the upper end of the passage section 47, thus increasing the extent of engine suction applied upon the left side of the piston 29, thereby moving it leftwardly so as to oppose the throttle valve opening action from the spring 41. Leftward movement of the piston 29 which occurs in response to a decrease in atmospheric pressure, thus effectively weakens the spring 41 and reduces its throttle valve opening action in proportion to the decrease in atmospheric pressure, which is reflected in the throttle valve closing action of the flow of fuel mixture through the fuel mixture passage 16. By suitably predetermining the action of the bellows 53, the valve 51, piston 29 and spring 41, the governor is compensated against changes in altitude and atmospheric pressure changes so as to maintain a predetermined control over engine operation at various altitudes and various atmospheric pressures.

Although but several specific embodiments of the invention are herein shown and described, it will be understood that various changes in the sequence of operations, steps and materials employed may be made without departing from the spirit of the invention.

I claim:

1. A carburetor governor including a fuel mixture passageway, a throttle valve in said passageway normally urged toward closed position

by the flow of fuel mixture therethrough, and mechanism for yieldably urging said throttle valve toward open position including a resilient member and means acting directly upon said member throughout the entire range of operation of said throttle valve and varying in response to changes in atmospheric pressure adapted to compensate for variations in altitude.

2. In an engine fuel mixture system, a governor for limiting the flow of fuel mixture including a main body portion having a fuel mixture passage comprising high and low pressure chambers, a throttle valve in said passage between said chambers normally urged toward closed position by the flow of fuel mixture through said passage, means yieldably urging said throttle toward open position, and mechanism operable at all positions of said throttle valve responsive to atmospheric pressure changes and energized by the difference in pressure between atmospheric pressure and the pressure of said low pressure chamber for effectively varying the force urging said throttle valve toward open position to compensate for changes in altitude to which said governor is subjected.

3. A carburetor governor including a fuel mixture passageway, a throttle valve in said passageway normally urged toward closed position by the flow of fuel mixture through said passageway, a spring for yieldably urging said throttle toward open position, and mechanism operatively connected with said spring for variably tensioning it including a member responsive to changes in atmospheric pressure for effecting a greater tensioning of said spring at lower altitudes than at higher altitudes.

4. In an engine fuel mixture system, a governor for limiting the flow of fuel mixture including a main body portion having a fuel mixture passage comprising high and low pressure chambers, a throttle valve in said passage between said chambers normally urged toward closed position by the flow of fuel mixture through said passage, a spring for yieldably urging said throttle valve toward open positon, means connected with said spring operable by the difference in pressure between atmospheric pressure and the pressure of said low pressure chamber; for varying the tension of said spring, and mechanism responsive to changes in atmospheric pressure for controlling the application of said pressure differential on said spring tensioning means.

5. In an engine fuel mixture system, a governor for limiting the flow of fuel mixture including a main body portion having a fuel mixture passage comprising high and low pressure chambers, a throttle valve in said passage between said chambers normally urged toward closed position by the flow of fuel mixture through said passage, a spring for yieldably urging said throttle valve toward open position, means acting upon said spring operable by the difference in atmospheric pressure and the pressure of said low pressure chamber; for varying the tension of said spring, and mechanism responsive to changes in atmospheric pressure for controlling the application of said pressure differential on said spring tensioning means, said mechanism being so constructed and arranged as to effectively increase and decrease the tension of said spring as the atmospheric pressure increases and decreases respectively.

6. A carburetor governor including a fuel mixture passageway, a throttle valve in said passageway normally urged toward closed position

by the flow of fuel mixture through said passageway, a spring for yieldably urging said throttle toward open position, and mechanism for variably opposing the throttle valve opening action of said spring including means responsive to changes in atmospheric pressure adapted to effectively increase and decrease the resultant force urging said throttle valve toward open position as atmospheric pressure rises and falls respectively at diverse altitudes.

7. In an engine fuel mixture system, a governor for limiting the flow of fuel mixture including a main body portion having a fuel mixture passage comprising high and low pressure chambers, a throttle valve in said passage between said chambers normally urged toward closed position by the flow of fuel mixture through said passage, a cylinder in said main body portion having one end vented to atmosphere, a piston in said cylinder, a spring attached to said piston and operatively connected with said throttle valve for urging the latter toward its open position, a second spring normally urging said piston toward the vented end of said cylinder for tensioning said first mentioned spring, a suction passageway leading from said low pressure chamber to the other end of said cylinder for applying a pressure differential on said piston in opposition to the action thereon of said second mentioned spring, a valve in said suction passageway for controlling the application of said pressure differential on said piston, and atmospheric pressure responsive valve operating mechanism for moving said valve toward its open position in response to a decrease in atmospheric pressure and toward its closed position in response to an increase in atmospheric pressure, said mechanism being calibrated to vary the tension of said first mentioned spring in proportion to changes in atmospheric pressure.

8. In an engine fuel mixture system, a governor for limiting the flow of fuel mixture to said engine including a main body portion having a fuel mixture passage, a throttle valve in said passage normally urged toward closed position by the flow of fuel mixture through said passage, a spring operatively connected with said throttle valve normally urging it toward open position, a cylinder in said body portion having a suction passage at one end communicating with said fuel mixture passage, a piston in said cylinder operatively connected with said throttle valve for opposing the opening action thereon of said spring, said cylinder having a vent passage at said end, a valve element in said vent passage, and atmospheric pressure responsive valve operating mechanism for moving said valve toward its closed position in response to a decrease in atmospheric pressure and toward its open position in response to an increase in atmospheric pressure, said mechanism and piston being calibrated to variably oppose the throttle valve closing action of said spring in proportion to changes in atmospheric pressure.

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