Feb. 7, 1928. 1,658,547

F. E. ASELTINE

ENGINE GOVERNOR

Filed Feb. 26, 1921

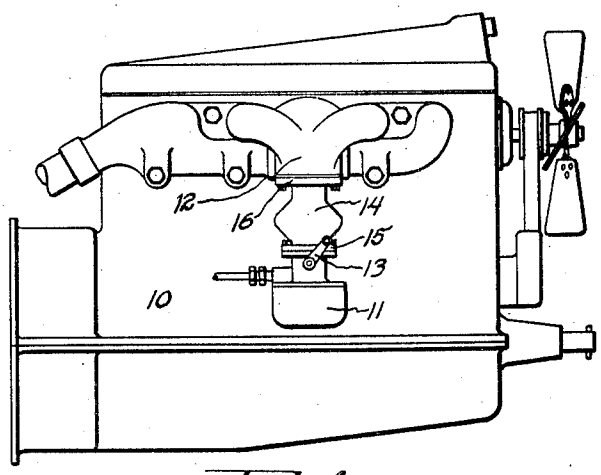

Fig. 1

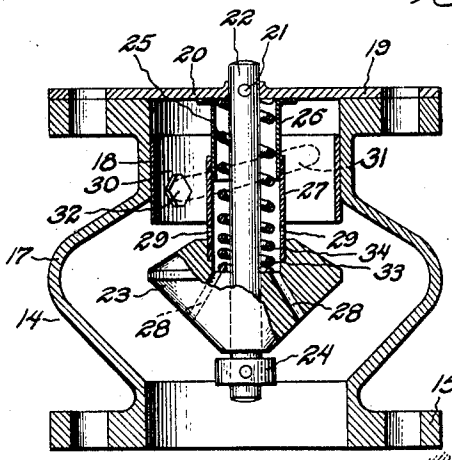

Fig. 2

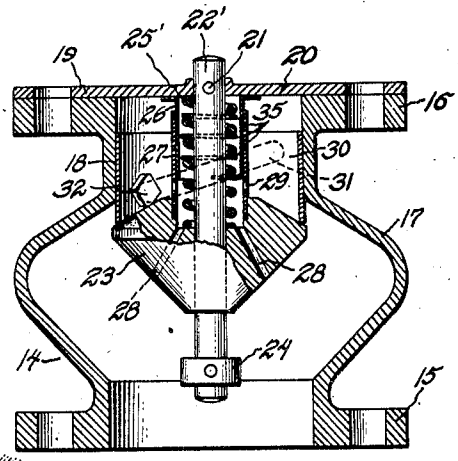

Fig. 3

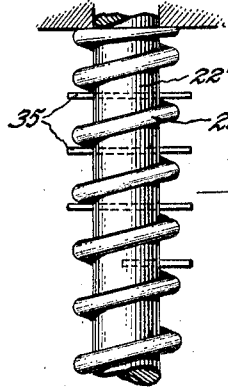

Fig. 4

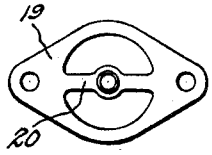

Fig. 5

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UNITED STATES PATENT OFFICE.

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ENGINE GOVERNOR.

Application filed February 26, 1921. Serial No. 448,269.

The invention relates to valve means for controlling the flow of fluid through a conduit together with certain features and elements thereof of more or less general applicability and is more particularly concerned with means responsive to the flow of the fluid itself and adapted to regulate such flow to a point of utilization of the fluid. One of the applications of such devices is for the control of the flow of combustible mixture from a carbureter to the cylinders of an internal combustion engine in order to regulate the speed of the engine, and the invention will be described herein with special reference to its use in such relationship. It will be understood, however, that the invention in its broader aspects is not limited to use in the specific embodiment hereinafter described and is to be considered as limited only by the language of the subjoined claims.

One of the objects of the invention is to provide an engine governor comprising a valve arranged in the engine intake and adapted to restrict the flow to the engine as the rate of flow increases, the movement of the valve being opposed by resilient means arranged to offer a resistance which increases disproportionately to the extent of movement of the valve.

A further object is to provide a valve device adapted to be moved in one direction by the flow of fluid, such movement being resisted by a spring the effective length of which decreases as the valve approaches its seat, thereby producing successively increasing increments of resistance with successive increments of movement of the valve.

A further object is to provide a spring device including a coiled spring and an abutment or abutments with which coils of the spring may engage to vary thereby the effective length of the spring.

With the above and other objects in view, as will appear more fully from the following description, the invention comprises the features of novelty herein set forth and particularly pointed out in the appended claims, together with such variations or modifications as may be made by one skilled in the art to which the invention relates.

In the accompanying drawings,

Figure 1 is an elevation of an internal combustion engine showing my invention assembled therewith in operative relationship.

Figure 2 is a sectional elevation showing the invention on an enlarged scale;

Figure 3 is a view similar to Figure 2 but illustrating the valve in closed position and showing also a different form of construction of the spring resisting means;

Figure 4 is an enlarged view of the spring device shown in Figure 3; and

Figure 5 is a plan view of the spider upon which the valve mechanism is supported.

Referring to the drawings, 10 indicates an internal combustion engine having the carbureter 11 and intake manifold 12, the carbureter being provided with the usual form of throttle valve operable by the lever 13. These parts may be of any usual or desired construction, except that the intake conduit should be suitably formed to provide for the reception of the governor device constituting the principal subject matter of my invention. For this purpose the intake conduit is constructed with or consists in part of a section 14, which section may be separately formed and connected to the carbureter and the intake manifold proper respectively by flanged unions, as at 15, 16. This section is provided with an enlargement 17 of roughly bi-conical form, above which enlargement is a cylindircal portion 18.

A perforated plate or spider 19 having a cross-piece 20 adapted to support the valve mechanism hereinafter described may be clamped between the section 14 and the manifold 12. Depending from the central portion of the cross-piece 20 and secured thereto, as by the pin 21, is a rod 22 serving as a guide or spindle for the valve member 23. This valve member is preferably of approximately bi-conical form and is provided with a central or axial aperture whereby it is mounted upon and permitted to slide with reference to the guide or spindle 22. A stop collar 24 secured to the lower end of the spindle 22 serves to limit the movement of the valve member 23 in downward direction. In order to resist the movement of the valve member in an upward direction or toward its seat, I have provided a resilient device comprising a spring 25 (see Figure 2). This spring is illustrated as being of the coiled type and is mounted around the spindle 22 and within a chamber formed by the telescoping sleeves 26, 27, the former of which is secured to the cross-piece 20 and the latter to the valve member 23. Holes 28 may

be provided in the valve head or member 23 communicating with the chamber within the sleeves 26, 27. Apertures 29 may be provided through one of the sleeves, as the sleeve 27. The openings referred to serve as vents for the chamber enclosed by the telescoping sleeves and may also permit the flow of a certain limited amount of mixture through the valve mechanism when the valve head is in contact with the seat, as shown in Figure 3.

The valve seat is formed upon or constituted by the lower end of a sleeve 30 fitting closely within the cylindrical portion 18 of the section 14. In order to permit adjustment of the sleeve 30 toward or from the valve member 23, I have provided a cam slot 31 in the cylindrical portion 18 of the conduit and a clamping screw or bolt 32 whereby the sleeve may be clamped in the desired position of adjustment.

If the usual form of coiled spring of uniform pitch is employed to resist the movement of the valve, there is a tendency for the valve to close suddenly upon increase in rate of utilization of the fluid due to the fact that the suction increases very rapidly as the valve approaches its seat whereas the distortion or compression of the spring is proportional to the force applied. Therefore, in order to enable the valve to attain a balanced partially open position under predetermined conditions of flow and suction in the intake conduit it is desirable to oppose the movement of the valve head toward the seat by means which shall exert a resistance increasing more rapidly than the rate of movement of the valve member. In Figures 2 and 3, respectively, I have illustrated two forms of spring devices adapted to provide greater resistance to the movement of the valve member with successive increments of such movement. In the form illustrated in Figure 2, the coils of the spring are shown as of gradually increasing pitch from one end toward the other. As a result of this construction it will be seen that, as the valve member moves toward its seat, the coils which are spaced the shortest distance apart, as for example at 33, 34, will be brought into engagement with each other thereby reducing the effective length of the spring and accordingly increasing its stiffness in constantly increasing ratio. It will be seen that the coils which thus come into engagement form stop means or abutments for the successive coils and thereby prevent the further compression of these coils.

In the form illustrated in Figures 3 and 4 the coils 25′ may be of constant pitch and the abutments serving to decrease the effective length of the spring as its compression proceeds are constituted by bars or pins 35 secured in apertures in the spindle 22′. These bars, of which one or more may be provided as is deemed necessary, are so spaced and arranged with reference to the coils of the spring 25′ that the progressive movement of the spring as the valve member 23 approaches its seat will cause the coils to engage the bars successively from one end of the spring toward the other. As a result the spring will be progressively shortened as the area of the passage is decreased, thus exerting a resistance to the closure of the conduit increasing disproportionately with the progress of such closure. Thus it will be seen that by properly varying the pitch of the spring or by otherwise constructing or calibrating it to offer a resistance to the closing movement which is substantiallly proportional to the increase in suction applied to the upper surface of the valve as the valve approaches its seat the tendency of the valve to close may be offset by the action of the spring. That is, it is possible to so set the seat or the sleeve 30 that the valve will remain in balanced position at approximately a desired engine speed, as 1200 R. P. M. It will be noted that the enlargement 17 in the intake conduit provides sufficient cross-sectional area of the passageway to insure that the flow of fluid therethrough shall not be materially restricted except as such restrictions is brought about by closure of the valve. It will be noted further that the bi-conical form of the enlargement and of the valve member 23 serves to direct the fluid around the valve member and affords the least possible resistance to the flow consistent with the rendering of the valve properly responsive to the varying conditions of pressure and flow in the conduit.

The stream of fluid impinging upon the lower conical surface of the valve will be directed outwardly and will then be deflected inwardly by the upper wall of the biconical enlargement in the conduit. In controlling the flow of combustible mixture to an engine this deflection may serve the useful purpose of separating from an incompletely vaporized mixture the larger particles of fuel which may be deposited upon the walls until more completely vaporized by the incoming stream of air.

While I have shown and described the preferred forms of resilient devices for affording increased resistance above referred to, it will be understood that other and equivalent forms may be adopted within the scope of the invention. Various other modifications may be made in details of construction without departing from the spirit of the invention or sacrificing its advantages.

I claim:—

1. In valve mechanism the combination with a conduit section having a valve seat therein of a valve body mounted in the conduit and arranged to move to its seat in the

direction of and in response to flow through the conduit, and spring means adapted to oppose closing movement of the valve body, said spring means comprising a single coiled spring arranged to be compressed by movement of said body toward its seat and stops arranged in the path of certain coils of said spring to reduce the effective length of the spring as its compression proceeds.

2. In a governor valve construction, the combination of an engine intake conduit having a valve seat, a valve body movable toward said seat under the influence of flow of mixture to the engine and means for opposing such movement comprising a coiled spring, a rod about which said spring is mounted, and abutments extending from said rod in the path of the coils of said spring, said abutments arranged to engage the successive coils and gradually shorten the effective length of the spring as the spring is compressed.

3. An engine governor comprising an intake conduit, a sleeve longitudinally adjustable therein, the end of said sleeve providing a valve seat, a valve adapted to engage said seat, a rod arranged to guide said valve in its movement toward and from said seat, a coiled spring surrounding said rod and arranged to resist movement of the valve toward its seat, and a casing enclosing said spring, means being provided to increase the resistance to closure at a rate greater than the rate of closure of the conduit.

In testimony whereof I affix my signature.

FRED E. ASELTINE.