March 4, 1930. G. L. MOYERS ET AL 1,749,500

GOVERNOR FOR INTERNAL COMBUSTION ENGINES

Filed Feb. 20, 1928

Fig. 5.

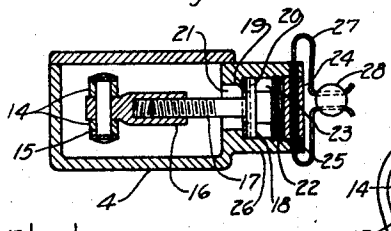
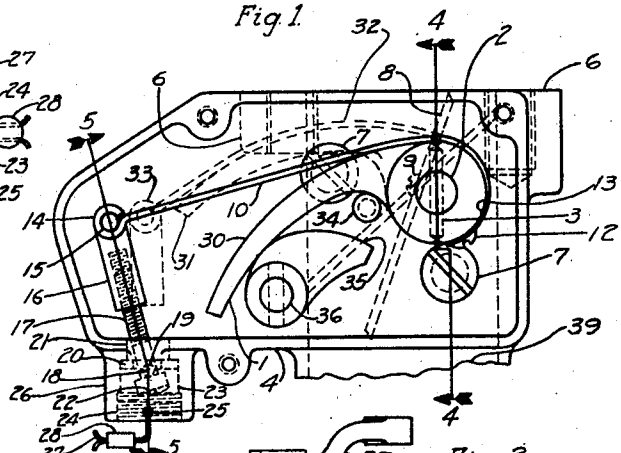


Fig. 1.



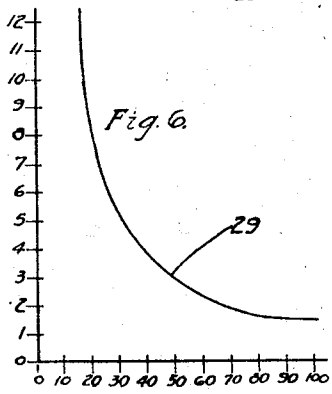


Fig. 6.

Fig. 2.

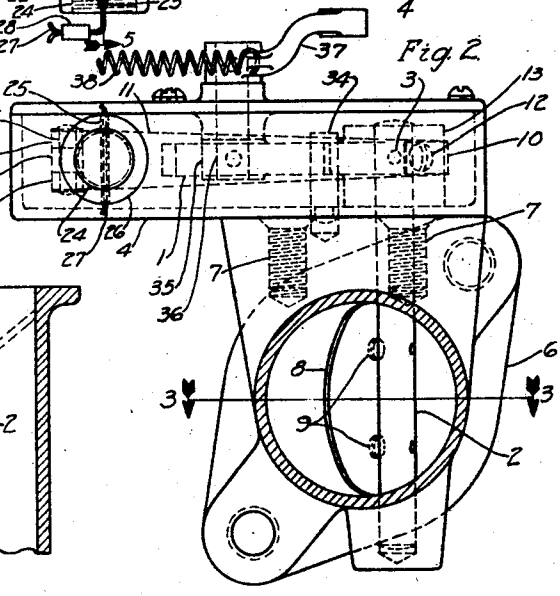


Fig. 3.

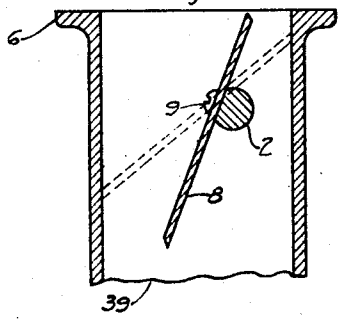


Fig. 4.

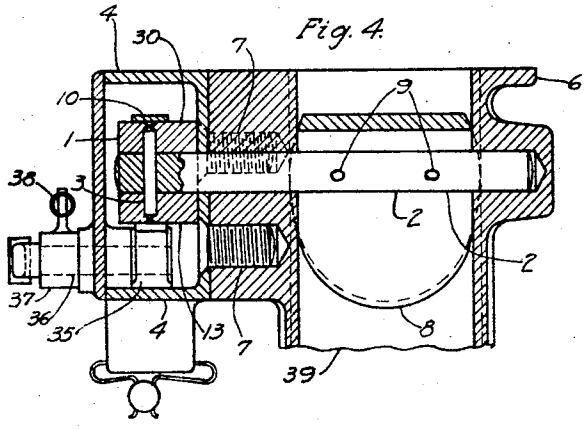
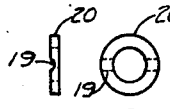


Fig. 7



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UNITED STATES PATENT OFFICE

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GOVERNOR FOR INTERNAL-COMBUSTION ENGINES

Application filed February 20, 1928. Serial No. 255,736.

Our invention relates to improvements in governors for use on internal combustion engines in which the governor valve mechanism is actuated by the flow of the fuel charge to the engine; and the objects of our improvement are, first, to provide a governor having a resilent cam follower capable of generating and transmitting exact and sensitive forces to provide a perfect balance between the torque reactions imposed upon the governor valve by the flow of the fuel charge and the counterbalancing means of the governor for any given engine at a predetermined speed; second, to provide a flexible cam follower capable of generating and transmitting exact and sensitive counterbalancing efforts, the said flexible cam follower being anchored, at one of its ends, to an oscillating member; third, to provide a governor, having a valve control cam whose control characteristics change in any increment of movement, with means for manually controlling the said valve control cam; fourth, to provide a governor having a counterbalanced valve capable of being used also as the manually controlled throttle valve for an internal combustion engine; and fifth, to provide a flexible cam follower having adjustable means for varying the flexibility of the said cam follower.

We attain these objects by the mechanism illustrated in the accompanying drawing, in which—

Figure 1 is a side elevation of the entire governor with its housing cover removed and showing its counterbalancing mechanism; Fig. 2, a view of the governor as it appears in a plane parallel to its control housing cover; Fig. 3, a sectional view of the governor valve in its housing on the line 3—3, Fig. 2; Fig. 4, a sectional view on the line 4—4, Fig. 1; Fig. 5, a sectional view on the line 5—5, Fig. 1; Fig. 6, a curve plotted in variables of governor valve opening and torque reactions imposed upon the valve by the flow of the fuel charge; and Fig. 7, detail views of the washer for engaging the adjusting screw.

Similar numerals refer to similar parts throughout the several views.

In Fig. 1, the lever 1 is fastened to the valve shaft 2 by the pin 3. The lever 1 together with its control mechanism is contained in the housing 4 having a flange 6. The flange 6 enables the housing 4 to be bolted to the intake manifold (not shown) of any internal combustion engine. The housing 4 may be constructed as an integral part of a carburetor housing, the greater portion of the carburetor not being shown, as indicated by the broken line 39. The housing 4 is shown as being fastened to the carburetor housing by the screws 7 but it may be constructed as an integral part of the carburetor housing, thus becoming an integral part of a carburetor. The valve 8 is fastened to the shaft 2 by the screws 9. The resilent member 10 may be made of varying widths and thicknesses to provide for the proper resiliency and valve counterbalancing characteristics and is shown with an increasing width as at 11 near its outer extremity. The resilient member 10 is fastened, at its inner end, to the lever 1 by the screw 12 and contacts with the hub 13 of the lever 1 when the valve 8 is in an open position as shown by the full lines in Fig. 3. The outer end 14 of the resilient member 10 is fastened around the pin 15 which oscillates in the member 16. The pin 15 is also free to oscillate in the outer end 14 of the resilient member 10. The member 16 is threaded on the screw 17. The pin 18 is mounted in the screw 17 and is adapted to oscillate in the groove 19 of the washer 20 in a plane parallel to the plane of the movement of the lever 1. The hole 21 in the housing 4 provides clearance around the screw 17 in its oscillating movement. Adjustment for varying the flexibility of the resilient member 10 is obtained by turning the screw 17 by means of the slot 22. In turning the screw 17, the pin 18 will ride out of the groove 19 in the washer 20 until the screw 17 makes one half of a revolution when the pin 18 will again firmly seat in the groove 19 due to the tension of the resilient member 10. The washer 20 is pressed into the hole 23 which is closed at its outer end by the threaded member 24. The hole 25 extends through the threaded

member 24 and the boss 26 on the housing 4 and permits of the locking of the governor setting, against tampering, by means of the wire 27 and the seal 28.

Fig. 6 is the torque curve of a governor valve in the intake of an engine displaying the reactions exerted on the said valve in its different increments of movement. This curve is plotted in variables of throttle opening and intake manifold pressure and is general in resultant form for all internal combustion engines. The abscissæ represent the variables of throttle opening and the ordinates represent the intake passage pressures. The curve 29 represents the characteristics of the reactive forces necessary to balance a throttle valve at various positions of the valve and the governing forces must be determined with the corresponding reactive characteristics in accordance with the curve 29. The cam face 30 of the lever 1 in combination with the resilient member 10 is developed in accordance with the characteristics of the reactive forces of a given internal combustion engine, as represented by the curve 29. As the valve 8 tends to move to a closed position, as denoted by the dotted lines in Fig. 3, the effort of the resilient member 10 is overcome by means of the cam face 30 of the lever 1 contacting with the resilient member 10. The lever 1 and the resilient member 10 will then occupy respective positions as shown by the dotted lines 31 and 32 in Fig. 1. The ability of the resilient member 10 to thus be moved by the lever 1 upward and at the same time circumferentially with respect to the shaft 2 moves the point of contact of the resilient member 10 outwardly on the cam face 30 of the lever 1. This results in a rapid acceleration of the counterbalancing force of the resilient member 10, this force being exerted at points increasingly removed from the center of the shaft 2, thus opposing the forces acting on the valve 8. When the lever 1 and the resilient member 10 are moved to the position as shown by the dotted lines 31 and 32, the member 16 will then have moved to a position as denoted by the dotted lines 33 in Fig. 1. The pin 34 is mounted in the housing 4 and engages the lever 1, thereby forming a stop for the lever 1. The position of the pin 34 may be so located as to properly establish the open throttle position of the valve 8 in accordance with the maximum fuel demands of a given engine at the governed speed. The cam 35 is fastened to the shaft 36 and engages the lever 1. The lever 37 is also fastened to the shaft 36 and is adapted to be connected to the usual manually controlled throttle linkage (not shown) operated by the ratchet throttle lever located on or adjacent the steering column and by the foot accelerator pedal of an automotive vehicle, the movement of the foot accelerator pedal being suitably opposed by a spring. The spring 38 is suitably anchored and tends to keep the cam 35 in engagement with the lever 1, this tending to always move the throttle valve 8 to a closed position, the engagement position of the cam 35 being always determined by the selected ratchet position of the throttle lever on the steering column or by the spring opposed accelerator pedal in the throttle control linkage.

We claim:

1. In a governing device for a hydrocarbon engine, the combination of a housing having an intake conduit, a governing member located in the intake conduit of the said housing, the said governing member being capable of being moved to a closed position by the reactions imposed thereupon by the operation of the motor, a cam connected to the said governing member and adapted to move therewith, a movable member mounted on the said housing, and a resilient member contacting with the said cam, the said resilient member being connected to the said cam and the said movable member, the said resilient member increasing its length of contact with the said cam during the movement of the said governing member to a closed position and thereby exerting an increasing tension to maintain, in accordance with a predetermined curve, the said governing member in a state of equilibrium at a predetermined speed, relative to the reactions imposed thereupon by the operation of the engine.

2. In a governing device having a governing member capable of being moved to a closed position by the reactions imposed thereupon by the operation of the engine, a cam connected to the governing member and adapted to move therewith, a fulcrumed member, and a resilient member contacting with the said cam, the said resilient member having its inner end connected to the said cam and its outer end connected to the said fulcrumed member, the outer end of the said resilient member being moved about the fulcrum point of the said fulcrumed member with the movement of the governing member to a closed position, the said resilient member thereby maintaining, in accordance with a predetermined curve, the said governing member in a state of equilibrium, at a predetermined speed, relative to the reactions imposed thereupon by the operation of the engine.

3. In a governor for a hydrocarbon engine, the combination of a housing with an intake passage, a governing member located in the intake passage of the said housing, the said governing member being supported in the said housing and having an extension through one of the walls thereof, a cam fastened to the extension of the said governing member, a resilient member fastened to the said cam and contacting therewith, a secondary housing extending from the said housing

with an intake passage, and a movable member connected to the said secondary housing and to the said resilient member, the said resilient member thereby exerting a sufficient reaction on the said cam to maintain, in accordance with a predetermined curve, the said governing member in a state of equilibrium at a predetermined speed, relative to the reactions imposed thereupon by the operation of the engine.

4. In a governing device for a hydrocarbon engine, the combination of a housing having an intake conduit, a governing member located in the intake of the said housing, the said governing member being capable of being moved to a closed position by the reactions imposed thereupon by the operation of the engine, the said governing member having a shaft extending through the wall of the said housing, a cam mounted on the shaft of the said governing member and adapted to move therewith, a movable member attached to the said housing, and a resilient member connecting the said movable member and the said cam, the said resilient member progressively contacting with the said cam at points increasingly removed from the shaft of the said governing member during its movement to a closed position.

5. In a governor for a hydrocarbon engine, the combination of an intake conduit, a governing member located in the said conduit, the said governing member being capable of being moved to a closed position by the reactions imposed thereupon by the operation of the engine, and means for maintaining in accordance with a predetermined curve, the said governing member in a state of equilibrium at a predetermined speed, relative to the reactions imposed thereupon by the operation of the motor, the said means comprising a cam connected to the said governing member, a resilient member fastened, at one of its ends, to the said cam, and a movable member fastened at one of its ends, to the said resilient member, the said movable member being suitably fulcrumed at the other of its ends.

6. In a valve counterbalancing mechanism in a governor for an internal combustion engine, the combination of a cam connected to the valve and adapted to move therewith, a member, swivelly mounted, and a resilient member connected to the said cam and the said member, the said resilient member being adapted to progressively contact with the said cam throughout its movement, the said resilient member thereby exerting on the said cam, a reaction whose control characteristics change with every increment of movement of the said cam.

7. In a valve counterbalancing mechanism in a governor for an internal combustion engine, the combination of a cam connected to the valve and adapted to move therewith, a fulcrumed member, and a spring member connected to the said cam and adapted to contact therewith, the said spring member being connected to the said fulcrumed member and thereby exerting a force on the said cam at points increasingly removed from the valve of the governor during the closing movement of the valve.

8. In a valve counterbalancing mechanism in a governor for an internal combustion engine, the combination of a cam connected to the valve and adapted to oscillate therewith, a spring member connected to the said cam and adapted to contact therewith, and a member swivelly anchored to permit movement in a plane parallel to the plane of the movement of the said cam, the said member being connected to the said spring member, the said spring member thereby exerting an accelerating force on the said cam, during the closing movement of the valve, in accordance with a predetermined torque curve produced by the reactions exerted on the valve by the operation of the engine.

9. In a valve counterbalancing mechanism in a governor for an internal combustion engine, the combination of a cam connected to the valve and adapted to move therewith, an oscillating member suitably mounted, and a resilient member connected to the said cam and to the said oscillating member, the said resilient member exerting forces on the said cam at points increasingly removed from the pivotal point of the said cam during the closing movement of the valve, and means for stopping the said cam in a throttle position established in accordance with the maximum fuel demands of a given engine at the governed speed.

10. In a governing device for an internal combustion engine, an intake conduit, a valve located in the said intake conduit, the said valve being capable of being moved to a closed position by the reactions imposed thereupon by the operation of the engine, a cam connected to the said valve and adapted to move therewith, a movable member suitably mounted, a resilient member connecting the said movable member and the said cam, the said resilient member progressively conforming to the shape of the said cam and exerting forces thereupon during its movement, and means for stopping the said cam in accordance with a predetermined open position of the said valve.

11. In a governing device for an internal combustion engine, an intake conduit, a valve located in the said conduit, the said valve being capable of being moved to a closed position by the reactions imposed thereupon by the operation of the engine, a cam connected to the said valve and adapted to move therewith, a fulcrum shaft suitably mounted, a member oscillating on the said fulcrum shaft, and a resilient follower adapted to contact

with the said cam, the said resilient follower being connected to the said cam and the said member, the said resilient follower thereby exerting variable forces on the said cam in accordance with a predetermined torque curve developed from the reactions exerted on the said valve by the operation of the engine.

12. In a governing device for an internal combustion engine, a valve capable of being moved to a closed position by the reactions imposed thereupon by the operation of the engine, resilient means opposing the movement of the said valve, and oscillating means for anchoring the said resilient means.

13. In a valve control mechanism for an internal combustion engine, the combination of a cam connected to the valve and adapted to move therewith and a resilient member progressively contacting with the said cam, the said resilient member being connected, at one of its ends, to the said cam and movably anchored at the other of its ends.

14. In a valve counterbalancing mechanism in a governor for an internal combustion engine, the combination of a cam connected to the valve and adapted to pivot therewith, an oscillating member suitably mounted, a resilient member connecting the said cam and the said oscillating member, the said resilient member exerting forces on the said cam at points increasingly removed from the pivotal point of the said cam during the closing movement of the valve, and means for manually operating the said cam.

15. In a governor for an internal combustion engine, the combination of an intake conduit, a valve located in the said conduit, the said valve being capable of being moved to a closed position by the reactions imposed thereupon by the operation of the engine, a cam connected to the said valve and adapted to move therewith, a fulcrumed member, a resilient member connecting the said cam and the said fulcrumed member, the said resilient member being adapted to contact with the said cam, a lever suitably mounted adjacent the said cam, and means for manually operating the said lever into contact with the said cam, the said cam thereby operating the said valve independently of the reactions imposed thereupon by the operation of the engine.

16. In a governing device for internal combustion engines, the combination of a housing having an intake conduit, the said housing being a part of a carburetor, a governing member in the said housing, a cam connected to the said governing member and adapted to move therewith, a movable member, a resilient member connecting the said cam and the said movable member, the said resilient member contacting with and exerting forces on the said cam at points increasingly removed from the said governing member during its closing movement, and means for manually operating the said governing member as a throttle valve.

17. In a governing device for an internal combustion engine, the combination of a housing having an intake conduit, the said housing being a part of a carburetor, a governing member in the intake conduit of the said housing, the said governing member being capable of being moved to a closed position by the reactions imposed thereupon by the operation of the engine, a cam connected to the said governing member and adapted to move therewith, a movable member suitably mounted, a resilient member connecting the said cam and the said movable member, the said resilient member thereby exerting forces on the said cam at points increasingly removed from the said governing member during its closing movement, and means for manually operating the said cam.

18. In a valve counterbalancing mechanism in a governor for an internal combustion engine, the combination of a housing, a cam connected to the valve and adapted to move therewith, a resilient member connected to the said cam and adapted to contact therewith, a grooved member mounted in the said housing, and a threaded member suitably connected to the said resilient member, the said threaded member having means for engagement with the said grooved member, the said engagement being maintained by the said resilient means.

19. In a valve counterbalancing mechanism in a governor for an internal combustion engine, the combination of a housing, a valve mounted in the said housing, a cam connected to the said valve and adapted to move therewith, a resilient member connected to the said cam and adapted to contact therewith, a grooved member mounted in the said housing, and an adjustable member suitably connected to the said resilient member, the said adjustable member having projecting arms engaging the said grooved member, the said adjustable member being thereby enabled to oscillate in a plane parallel to the plane of the movement of the said cam.

20. In a governing device for an internal combustion engine, a valve capable of being moved to a closed position by the reactions imposed thereupon by the operation of the engine, resilient means opposing the closing movement of the said valve, oscillating means for anchoring the said resilient means, and means for varying the effective length of the said oscillating means.

Dearborn, Mich., February 17, 1928.

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