

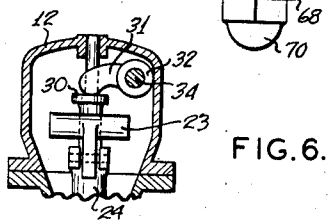
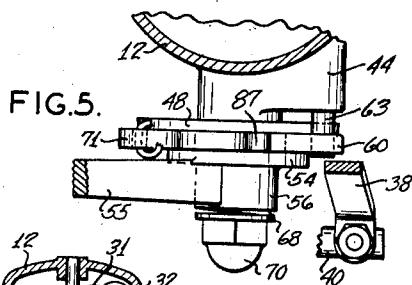
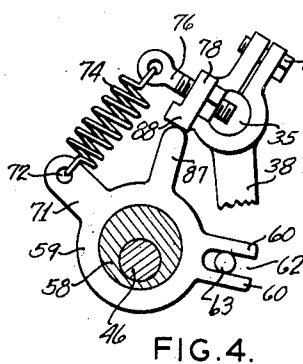
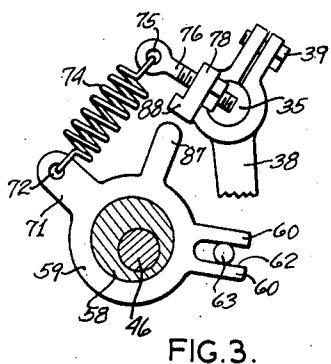
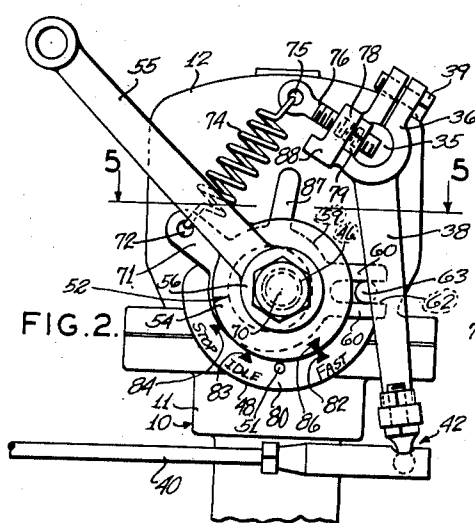
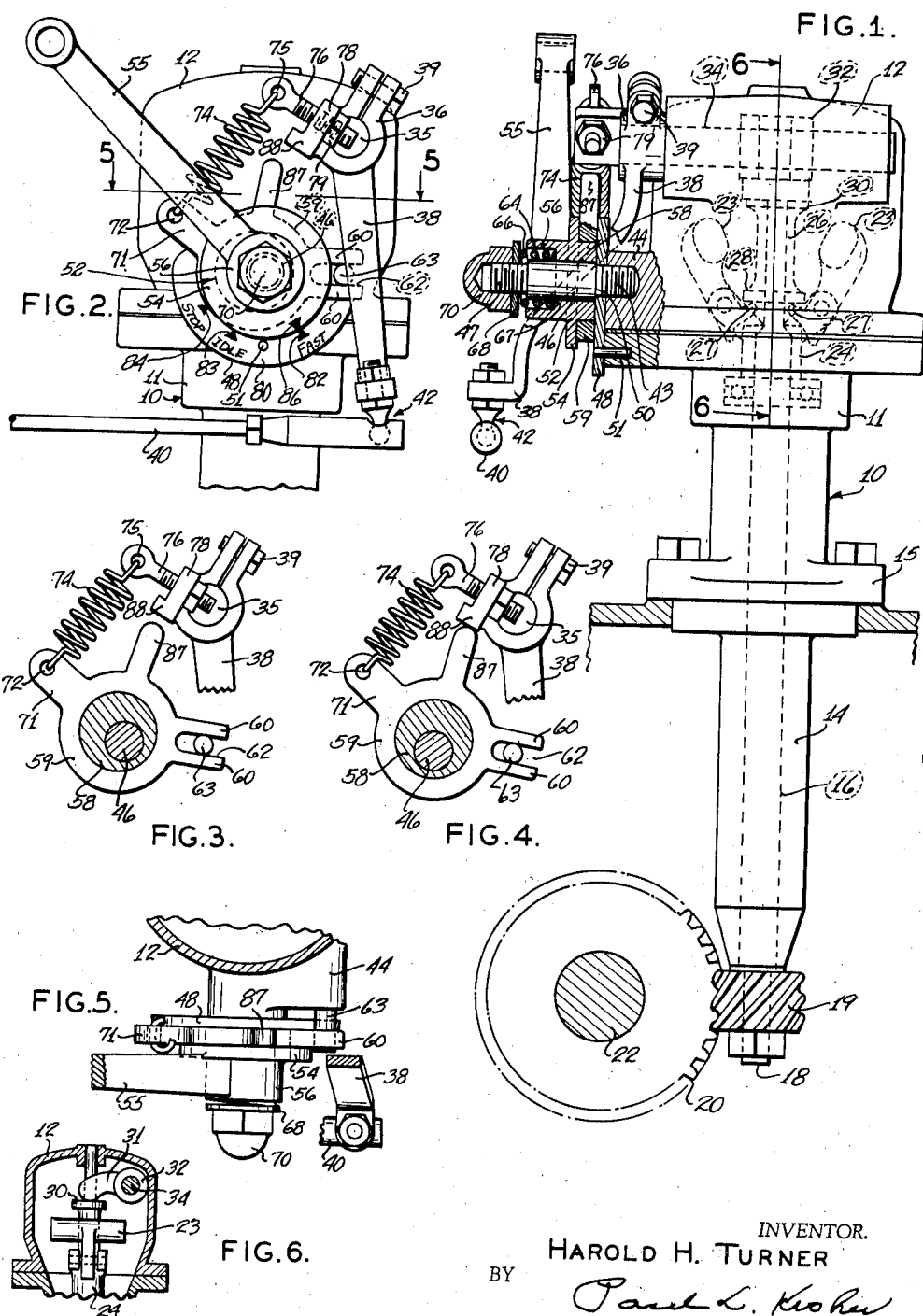
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GOVERNOR

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2,307,974

GOVERNOR

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This invention relates to improvements in governor mechanisms for internal combustion engines and the like, and has particular reference to improved regulating means for an engine speed governor.

An object of the invention is to provide an improved and simplified regulating mechanism for an engine speed governor, the mechanism being operable selectively during engine operation, for adjusting the governor to determine any desired engine speed between idling and maximum speeds, or to effect through the governor fuel control means, complete cessation of engine operation.

Another object resides in the provision of governor regulating mechanism of simple construction and of a character which assures positive regulation of the governor for determining engine speed, the improved mechanism further being inherently stable or self-retained in any of its regulating positions.

Additional objects and advantages attained by the present invention will appear from the following description of a preferred embodiment of the governor control, as exemplified in the accompanying drawing, in which:

Fig. 1 is an assembly elevation of the improved governor control and a governor with which it is operatively associated, portions of the control being shown in section to illustrate details thereof; Fig. 2 is an elevation in plan of the control mechanism, showing the parts thereof in position to determine maximum engine speed control by the governor; Fig. 3 illustrates essential parts of the regulating means in operative position to determine idling speed control by the governor; Fig. 4 is a view similar to that of Fig. 3, but showing the parts in operative position to unload the governor and to cause cessation of engine operation; Fig. 5 is a fragmentary horizontal sectional view of the regulating mechanism, as viewed from line 5—5 in Fig. 2, and Fig. 6 is a fragmentary vertical section, greatly reduced, of the governor device, as taken along the line 6—6 in Fig. 1.

Referring to the drawing by appropriate characters of reference, there is illustrated in Fig. 1, a governor 10 of centrifugally operated type, which may be of any well known or usual construction. Since the structural details of the governor elements, apart from the presently improved regulating mechanism therefor, are not essential to the present invention, these elements are shown in dotted or broken lines within the

governor housing or frame structure indicated at 11, and will be described only briefly hereinafter.

The governor illustrated is of the vertical type, and includes the housing 11 which provides an upper enlarged head 12 for enclosing the centrifugally operated governor parts, and a lower stem-like section 14 including a mounting flange 15 by which the governor may be secured upon the engine to be controlled (not shown). A spindle 16 is suitably journaled in the housing 11 and particularly in the stem 14 thereof, and has secured to its lower exposed end 18, a spiral gear or pinion element 19. The pinion 19 meshes a gear 20 which may be driven from the engine camshaft indicated at 22, in order to effect governor spindle rotation in direct proportion to engine speed.

Located in the upper enlarged head 12 of the governor casing, are centrifugally operated weight elements 23 which are pivotally mounted on a support 24 arranged on and secured to the upper end of the spindle 16 for rotation therewith. A member 26 is sleeved on the spindle above the weight-support 24, for movement longitudinally of the spindle. Movement of the sleeve member in one direction, as upwardly, is effected in response to outward centrifugal operation of the weights 23, the operative connection for this purpose being effected by weight fingers 27 in actuating engagement with the lower flanged end 28 of the sleeve 26. Movement of the sleeve in the opposite direction is effected by a variable applied force which is in opposition to the forces exerted on the sleeve by the weight elements 23, the means providing such force being part of the governor regulating means presently to be described.

Operatively associated with the upper flanged end 30 of sleeve 26 is a lever or yoke 31, the arms of which bear against the sleeve flange 30, as appears more particularly in Fig. 6. The hub 32 of the yoke is sleeved on and secured to a horizontally arranged rock shaft 34 which is suitably journaled in the head 12. One end 35 of the rock shaft extends outwardly of the governor casing, and has seated thereon the split hub 36 of an engine speed control lever or arm 38, the arm being adjustably secured to the rock shaft for movement therewith as by a suitable screw or bolt 39 serving to draw together the split portions of the hub and thus to bind the hub on the shaft end. To the lower end of the arm 38 is connected one end of a control rod 40, the connection being made preferably by a ball-and-socket joint indicated generally by the numeral 42. The control

rod 40 may extend to an engine throttle or other engine fuel control means (not shown) for regulating fuel input to the engine in response to engine speed governing operation of the governor.

Turning now to the governor regulating mechanism which constitutes the principal subject of the present invention, a shaft element or stud 43 is threadedly secured to a laterally projecting portion or boss 44 on the governor casing head 12 and below the rock shaft 34, the stud projecting horizontally therefrom and arranged so that its axis parallels the axis of the rock shaft 34. The central section 46 of the stud is cylindrical, while the outer end 47 is reduced in diameter and is threaded for a purpose to be described. A disc or washer 48 is arranged between an inner shoulder 50 of the stud and the face of the boss 44, this element serving to provide a frictional bearing face for a part of the mechanism presently to be described. The washer is secured against rotation as by a pin or dowel 51 between the washer and the governor casing 12.

Freely journaled on the cylindrical section 46 of the stud, is an eccentric forming member 52 provided with a circumferential flange 54 intermediate its ends, and an operating lever 55 preferably formed integrally with the outer end portion 56 of the member and extending substantially radially therefrom. The flange 54 and end portion 56 of member 52 may be concentric with respect to the stud section 46, as indicated in Fig. 2, while the inner end portion 58 of member 52 provides the eccentric element thereof, as this best appears from Figs. 3 and 4. Frictionally received on the eccentric 58 is an annular eccentric strap or follower 59, the lateral faces of which bear against the flange 54 and the disc 48 (Fig. 1). In order to constrain the follower against rotation with the eccentric and to limit its motion as effected by movement of the eccentric, to a limited rocking displacement, the follower is formed on its periphery to provide a pair of spaced projections or fingers 60 which define a slot 62 having its major axis directed substantially radially of the follower. Received in the slot 62 is a pin 63 which is secured to the governor casing boss 44 (Fig. 5), the diameter of the pin being substantially equal to the width of the slot, so that the opposed inner faces of the fingers 60 will be in constant contact with the pin. Thus the pin and slot arrangement 62-63 provides a pivotal anchorage for the eccentric follower 59, confining the latter to a rocking displacement about the pin 63 as the eccentric 58 is rotated or rocked. Accordingly, and as now appears from the described arrangement, the member 52 through its eccentric portion 58, constitutes a camming element for positioning the follower 59 within the limits of its rocking displacement.

The eccentric and its follower may be retained in assembly on the stud 43 by any suitable means. In the present example, the outer portion 56 of the eccentric forming member 52 is internally axially bored to provide a recess 64 concentric with the stud. Encircling the stud and seated in the recess, is a coil spring 66 having its inner end abutting the recess shoulder 67 and its outer end in engagement with a washer 68. A nut 70 threadedly received on the outer threaded end 47 of the stud and bearing against the washer 68, provides for adjustable compression of the spring 66, the spring when suitably compressed, thereby serving to bias the member 52 and hence the eccentric 58 and its follower

59, axially toward the face plate or disc 48. By preference, the width of the follower 59 is made slightly greater than the width of the eccentric end portion 58 on which the follower is seated, so that under the influence of the spring 66, the strap or follower 59 is frictionally confined between the flange 54 and the disc 48 to an extent such as to prevent any axial play thereof or chattering of the follower from vibrations of the engine normally occurring during operation.

The follower 59 is formed to provide a projecting arm 71 on a portion of the periphery thereof opposite the fingers 60, and in the outer end of the arm is an opening or eye 72 for receiving a bent or hooked end of a governor loading spring 74. The opposite hook end of the tension spring is anchored in the eye 75 of an eye-bolt 76 which is secured to the control arm 38 of the governor. As shown in Figs. 1 and 2, the split hub 36 of the arm 38 has a lateral projection or lug 73 formed thereon, which is apertured to threadedly receive the eye-bolt 76, a lock nut 79 being provided to retain the bolt in threadedly adjusted position on the lug. By preference, the bolt 76 is mounted so that its longitudinal axis is normal to the axis of the rock shaft 34, and further, such that the bolt axis lies in the medial plane of the eccentric follower 59. As a result, the longitudinal axis of the spring 74 also will lie in this medial plane, as indicated in Fig. 1, so that there is thus precluded undesirable lateral twisting or bending of the spring as it is axially or longitudinally extended or contracted in operation.

It will be observed from Figs. 2 and 6, that the governor loading spring 74 when tensioned, exerts through the lever arm provided by the eye-bolt 76, a turning force on the control arm 38 and the rock shaft 34 tending to turn these elements in the counter-clockwise direction (Fig. 2), while any upward movement of the governor sleeve 26 under outward centrifugal displacement of the weights 23, serves to turn the rock shaft 34 and hence the arm 38, in the clockwise direction (Figs. 2 and 6). Accordingly, the spring 74 provides a resistance to governor movement of the shaft 34 and arm 38, and depending upon the degree of spring tension, determines the extent of shaft and arm movement for a given rate of engine speed. Swinging of the arm 38 in the clockwise direction or to the left in Fig. 2, moves the fuel control rod 40 toward the left in the figure, the rod thereby regulating the fuel feed device (not shown) to cause a throttling or reduction in fuel supply to the engine. Movement of the arm 38 and rod 40 in the opposite direction, as to the right in Fig. 2, controls the fuel feeding means for increased delivery of fuel to the engine.

In the operation of the regulating mechanism, rocking the lever 55 to the left in Fig. 2, as to the position shown in the figure, conditions the mechanism for regulating the governor to determine and maintain a maximum or fast engine speed. Where the lever 55 is adapted for manual manipulation, it is preferred to provide an engine speed scale or indicia of engine speed corresponding to control positions of the lever 55. Accordingly, there are formed on the lower exposed face 80 of the washer 48, index markings 82, 83 and 84 indicating respectively, "fast," "idle" and "stop" positions for the lever. An index pointer 86 is located on the lower margin of the flange 54, such that for example, in the "fast" speed position of the lever 55 as shown in Fig. 2, the

pointer will be in registry with the "fast" index 82.

Movement of the lever 55 to its "fast" position as described, rocks the member 52 and hence its eccentric 58 in the counterclockwise direction (Fig. 2), and thereby rocks the follower 59 downwardly and to the left of the figure, about the pivot pin 63. The spring 74 is thereby extended to effect maximum loading of the governor, the governor weights 23 yielding under the influence of the increased spring tension until maximum engine speed is reached, to cause swinging of the arm 38 and rod 40 to the left in Fig. 2, sufficiently to effect increased fuel feed to the engine for attaining maximum engine speed.

Rocking the lever 55 to the right in Fig. 2 from its "fast" position, effects decreased or intermediate engine speeds, the follower 59 thereby being rockably displaced upwardly an amount corresponding to the extent of lever movement, to effect an unloading or contraction of the tension spring 74. Thus in any intermediate speed position of the lever, the governor regulating mechanism will be adjusted to regulate the governor function for maintaining the desired intermediate engine speed.

When the lever 55 is moved to register the pointer 86 with the "idle" index 83, the parts of the regulating mechanism will assume the positions as indicated in Fig. 3. The spring 74 in this instance, is contracted so that it has a predetermined minimum tension sufficient only to maintain a counterforce or loading on the governor such as will assure governor regulation of the fuel feed to maintain the desired idling speed of the engine.

Further rightward movement of the control lever 55, as to register the pointer 86 with the "stop" index 84 (Fig. 2) effects upward displacement of the eccentric follower 59 to an extent, according to the presently preferred arrangement, such as to substantially or completely collapse the spring 74, whereby to unload the governor. The parts of the regulating mechanism are then positioned as shown in Fig. 4. With the governor thus unloaded, the weights 23 may then move outwardly a maximum distance under the influence of the centrifugal forces acting thereon, to effect movement of the arm 38 and fuel control rod 40 to the left in Fig. 2, sufficiently to condition the fuel delivery means (not shown) for minimum or no fuel delivery to the engine. The engine then ceases operation for lack of fuel.

In order to assure in a positive manner, cessation of engine operation when the lever 55 is moved to its "stop" position, there is provided on the eccentric follower 59 an extension or abutment element 87 which is adapted for engagement with a companion abutment 88 on the lug 78, as the follower is displaced upwardly into its stop position, as indicated in Fig. 4. Thus, upon engagement of these abutment elements, the arm 38 will be mechanically urged to the left (Fig. 2) and positioned to effect, through the rod 40, complete stoppage of fuel feed to the engine. It will be observed in addition, that these abutments when engaged, effectively prevent counterclockwise fuel-increasing movement of the arm 38 by the governor, if for any reason, there should occur a sudden or accidental rise in engine speed when the lever 55 is positioned to stop the engine. As appears from Figs. 2 and 3, actuation of the governor regulating mechanism to "fast," "idle" or intermediate engine speed control positions, effects separation of the follower abutment 87

from the abutment 88 to an extent in each instance, which is sufficient to clear the arm 38 for full operation in the governor control of the engine fuel supply to maintain any given engine speed.

An important feature of the presently improved regulating mechanism resides in its inherent stability of control position. While the lever 55 may be moved easily and by a minimum force applied manually or otherwise to the outer end of the lever, the nature of the mechanism and the operative relationship of its parts are such as to render wholly unnecessary any external holding means for retaining the lever 55 in any of its regulating positions. Although the spring 74 when tensioned, exerts a force on the follower 59 tending to turn the eccentric 58 and hence the member 52 and its lever 55, such force is effectively counter-balanced by the frictional resistance imposed by the eccentric and follower assembly. To assure this result, the degree of eccentricity of the eccentric 58 and the degree of frictional engagement between the eccentric and its follower 59, are predetermined such that the force exerted by the spring 74 when under maximum tension, cannot cause displacement of the lever 55 from the control position thereof which determines the maximum tension of the spring. Therefore, since the eccentric and follower present an assembly which is mechanically stable in any operative position, the lever 55 will remain in any actuated position, as will be now readily appreciated.

While the present disclosure relates to a preferred embodiment of the invention, it is to be understood that alterations or modifications in the parts and assembly relation thereof, may be made within the full scope and intent of the invention, as defined by the appended claims.

I claim:

1. Governor regulating mechanism for a governor having centrifugally operated means, comprising a lever movable by said centrifugally operated means, a spring opposing movement of said lever, a rotatable eccentric, an eccentric-follower on said eccentric and connected to one end of said spring, means for operating said eccentric to position said follower for regulating the opposing force of said spring, and an abutment on said follower engageable with said lever in one position of the follower.

2. Governor regulating means for a speed responsive governor having a governor actuated control lever, said means comprising a rotatable eccentric, an eccentric-follower on said eccentric, a tension spring between said eccentric-follower and said control lever, arranged to oppose movement of the lever by the governor, an operating lever for rotating said eccentric to vary the position of said follower for regulating the tension of said spring, and cooperating abutments on said eccentric-follower and control lever, engageable in one position of said follower.

3. Governor regulating means for a speed responsive governor having a governor actuated control lever, said means comprising a support on said governor, an eccentric rotatable on said support, an eccentric-follower frictionally received on said eccentric, a bearing surface adjacent said eccentric-follower, means including a yieldable element, urging said follower into lateral frictional engagement with said bearing surface, means limiting said follower to a rocking displacement in response to rotation of said eccentric, a tension spring connected between said

follower and said control lever and arranged for opposing movement of the lever by the governor, and an operating lever for rotating said eccentric to cause rocking displacement of said follower, whereby to adjust the tension of said spring.

4. Governor regulating means for a speed responsive governor having a governor actuated control lever, said means comprising a support on said governor, an eccentric rotatable on said support, an eccentric-follower on said eccentric, positionable in response to eccentric rotation, means including a yieldable element adapted for frictionally retaining said eccentric and follower in assembly, a spring connected at one end to said follower and adjustably connected at its other end to said lever, said spring being arranged for opposing movement of said control lever by the governor, an actuating lever for said eccentric, and abutment means between said follower and control lever, engageable in one position of said follower.

5. Governor regulating means for a speed responsive governor having a governor actuated control lever, said means comprising a shaft element, an eccentric rotatable on said shaft element, a follower member on said eccentric, means constraining said follower member to a limited rocking displacement responsively to eccentric rotation, means frictionally retaining said eccentric and follower member in assembly, a projec-

tion on said follower member, a tension spring having one end connected to said projection and its opposite end connected to said control lever, arranged for opposing movement of the control lever by the governor, an operating lever for said eccentric, operable to rotate said eccentric for effecting rocking displacement of the follower member to regulate the tension of said spring, and abutment means on said follower member and control lever, engageable in one displacement position of the follower member.

6. Governor regulating means for a speed responsive governor having a governor actuated control lever, said means comprising a shaft element on said governor, an eccentric rotatable on said shaft element, an eccentric-follower frictionally seated on said eccentric, means constraining said follower to a limited rocking displacement responsively to eccentric rotation, a tension spring between said follower and said control lever, arranged for opposing movement of the latter by the governor, and an actuating element for said eccentric, the degree of eccentricity of said eccentric and the degree of frictional engagement between the eccentric and said follower being predetermined such as to effect self-retention of the follower, eccentric and actuating element in any regulated position.

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