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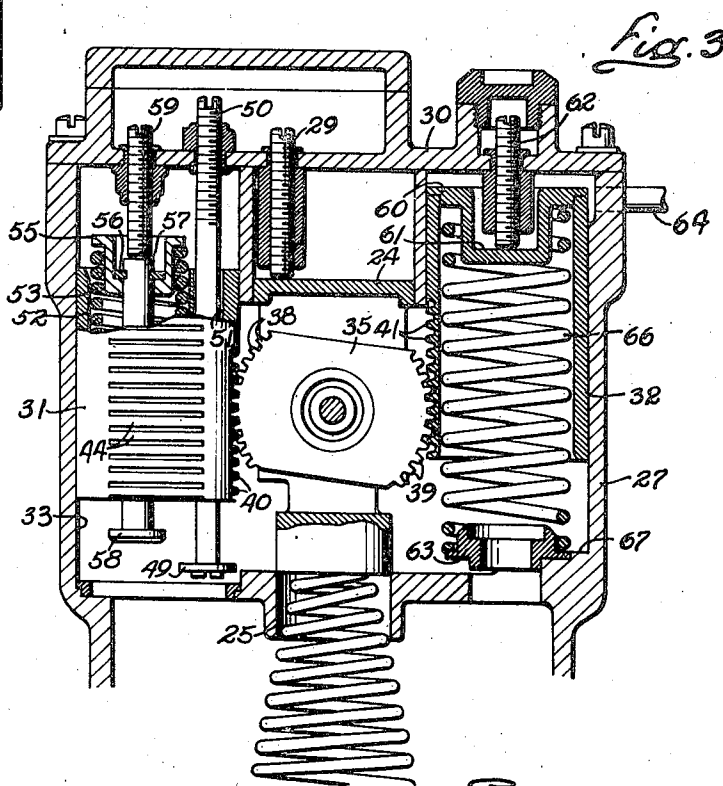
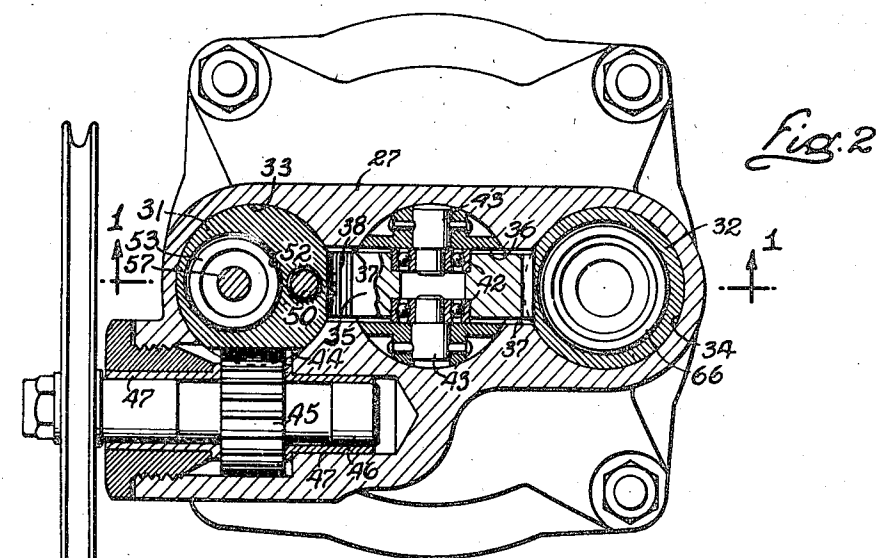
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GOVERNOR

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GOVERNOR

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3 Claims. (Cl. 264—3)

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This invention relates generally to governors having mechanism operable while the governor is operating to adjust the governor speed setting.

One object is to provide a governor having a plurality of speed adjusting mechanisms interconnected in a novel manner to enable the speed setting to be adjusted in predetermined increments and also progressively.

Another object is to provide for actuating one of the adjusting mechanisms manually and the other by a fluid pressure actuator.

The invention also resides in the simple construction of the adjusting mechanisms and their novel arrangement with the governor into a compact unit.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

Figure 1 is a vertical sectional view of a governor embodying the novel features of the present invention, the section being taken along the line 1—1 of Fig. 2.

Fig. 2 is a section taken along the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary view similar to Fig. 1 showing a different position of the parts.

In the drawings, the invention is shown for purposes of illustration embodied in a centrifugal governor in which the controlling force is derived centrifugally by the rotation of flyweights 5. These project upwardly and are fulcrumed on pins 6 on a ball-head 7 fixed to the upper end of a drive sleeve 8 which is journaled in a bore 9 in a casing 10. The sleeve projects from the lower end of the casing and is coupled to the rotary parts whose speed is to be measured.

Horizontal arms 11 on the flyballs bear upwardly against the outer race of a ball bearing 12 whose inner race supports the head 13 on a stem 14 reciprocable endwise in the sleeve 8 and carrying lands 15 and 16. These coact respectively with ports 17 and with the lower end of the sleeve bore 19. If, in response to a detected speed increase, the valve stem 14 is raised from the position shown, fluid delivered under pressure by a pump 20 to a supply chamber 20 flows past the land 15 and through a port 21 to a hydraulic servo actuator 22. Lowering of the valve stem from the position shown allows fluid from the servo to drain past the land 16 out of the lower end of the sleeve 8.

The vertically directed force of the flyballs is opposed by and balanced against the stress of a coiled compression spring 23 bearing at its lower

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end against the valve stem head 13, and at its upper end against a plunger 24 guided for movement axially of the speeder spring. The reduced lower end of the plunger slides in a bore 25 in a horizontal partition 26 in a casting 27 having a skirt fitting over the flyballs and secured to the top of the casing 10. The casting 27 is formed with a central vertical bore whose wall 28 forms a guide for the larger upper end of the plunger 24 which is movable upwardly and downwardly to respectively increase and decrease the governor speed setting. An adjustable stop screw 29 threading through a cover 30 on the casting 27 serves to limit the upward plunger movement.

Such axial adjustment of the plunger may be effected by movement of either of two actuating members 31 and 32 disposed on opposite sides of the plunger 24 and guided for vertical reciprocation in bores 33 and 34 formed in the casting 27 parallel to the bore 28. The motions of the member are transmitted differentially to the plunger through a lever 35 fulcrumed intermediate its ends on the plunger 24 with its ends 25 pivotally connected to the respective actuating members. Herein, the lever constitutes a spur gear projecting through a transverse slot 36 in the plunger and registering slots 37 in the bores 33 and 34. Arcuate series of teeth 38 and 39 on the ends of the gear element mesh with rack teeth 40 and 41 formed on the adjacent sides of the actuating members. The gear is fulcrumed on antifriction bearings 42 received on steel shafts 43 pinned to the plunger 24 and projecting into the slot 36.

With the differential connection thus provided between the plunger and the two actuating members, it will be apparent that when either member is held fixed, the lever 35 will fulcrum about this member and the plunger will move up and down as the other member is raised and lowered. The plunger motion will, of course, be half that of the actuating member.

In the present instance, the actuating member 31 is adapted to be moved manually and by mechanical means. For this purpose, rack teeth 44 formed on one side of the member mesh with a pinion 45 fast on a shaft 46 which projects into the casting 27 and is journaled in bearings 47. On its outer end, the shaft carries a wheel 48 which may be turned through the medium of a cable or the like. Downward movement of the member 31 is limited by a stop 49 on the lower end of a rod 50 which projects up through a

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hole 51 in the member and is adjustably anchored in the cover 30.

Disposed in a bore 52 in the member 31 is a coiled compression spring 53 acting between a lower end wall 54 and a head 55 held by a snap ring 56 on the upper end of a rod 57 projecting upwardly through and guided by the end 54 of the member 31 and having a head 58 on its lower end. A screw stop 59 on the cover 30 limits the upward movement of the rod 57. The spring 53 is made substantially stronger than the speeder spring 23 so as to be capable of overcoming the latter spring and moving the plunger 24 to a predetermined position in the event that the cable or other part of the connections to the wheel 48 is broken. This position is determined by the stops 58 and 59 against which the spring 53 expands when the member 31 is freed.

Herein, the other actuating member 32 is arranged to be actuated by power controllable from a remote point. For this purpose, it is made in the form of a sleeve and closed at its upper end by a piston 60 depressed as indicated at 61 and engageable with an adjustable screw stop 62 on the cover 34. A spring 66 enclosed within the sleeve 32 acts between the piston 60 and a projection 63 on the partition 26 to supplement the force of the speeder spring 23 in urging the sleeve and piston upwardly toward the stop 62. The member may be forced downwardly by admitting pressure fluid through a pipe 64 into the cylinder 34 between the cover 30 and the piston 60. Under pressure sufficient to overcome the spring 66 and the speeder spring 23, the piston is moved downwardly until the lower end of the member 32 strikes a stop shoulder 67.

Let it be assumed that the parts are positioned as shown in Fig. 3, the spring 66 holding the actuating member 32 upwardly against the stop 62 in the low speed position of the latter. Changes in the governor speed setting may then be made by turning the wheel 48, thereby moving the member 31 up or down. In this movement, the lever 35 fulcrums on the then fixed member 32 and the plunger 24 is moved in the same direction as the member 31 but through half the distance. When the member 31 is in its lower limit position against the stop 49, the maximum speed setting obtainable by movement of this member obtains. As the member is raised, the control speed of the governor is decreased progressively. If the member 31 is raised above the position at which the rod 57 engages the stop 59, the spring 53 is compressed in the continued rise of the member to a high speed position which may be limited by stops (not shown) associated with the cable actuator.

Now if it is desired to increase the governor speed setting quickly, fluid at a pressure sufficient to overcome the springs 23 and 66 is admitted to the cylinder 34 whereupon the member 32 is forced downwardly to its high speed position (Fig. 1). The lever 35 will fulcrum on the member 31 and the plunger 24 will be moved downwardly a corresponding distance further compressing the speeder spring 23 a fixed amount. With the member 32 in its new position, the member 31 may be moved up or down to effect a further adjustment of the governor speed setting. In this way, the governor is adjustable by the member 31 through a lower speed range when the member 32 is in its low speed position

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(Fig. 3) and through a high speed range when the member 32 is in its high speed position (Fig. 1). By energizing the hydraulic actuator, the deflection of the speeder spring may be increased or decreased in a fixed increment and the speed setting of the governor shifted from one range to the other. Such shift may be effected quickly and is controllable from a remote point.

I claim as my invention:

1. A governor comprising a speeder spring, rotary speed responsive means opposing the force of said spring, a member mounted for movement in a rectilinear path and in opposite directions to increase or decrease the force applied by said spring, a gear element mounted on said member to turn relative thereto about an axis extending transversely of said path, said gear element having arcuate rows of teeth arranged on opposite sides thereof concentric with said axis, rack element meshing with said gear element on opposite sides of said member so as to have a rolling connection therewith, means guiding said elements for rectilinear movements parallel to said path, means selectively operable to move one of said rack elements back and forth between opposite limit positions to vary the deflection of said spring in a fixed increment, and means by which said other rack element may be moved selectively variable distances to adjust the stress of said spring progressively,

2. A governor comprising a speeder spring, rotary speed responsive means opposing the force of said spring, a member mounted for movement in a rectilinear path and in opposite directions to increase or decrease the force applied by said spring, a gear element mounted on said member to turn relative thereto about an axis extending transversely of said path, said gear element having arcuate rows of teeth arranged on opposite sides thereof concentric with said axis, rack elements meshing with said gear element on opposite sides of said member so as to have a rolling connection therewith, means guiding said elements for rectilinear movements parallel to said path, means for moving one of said rack elements back and forth to fulcrum said gear element about the other rack element and thereby move said member, and means for actuating said other rack element to fulcrum said gear element about the first rack element and correspondingly move said member.

3. A governor comprising a resilient speeder element, rotary speed responsive means opposing the force of said element, a member guided for movement in a rectilinear path and in opposite directions to increase or decrease the force applied by said element, a lever fulcrumed intermediate its ends on said member to turn relative thereto about an axis extending transversely of said path, an actuating member pivotally connected to one end of said lever and guided for movement parallel to said path between two spaced positions, a spring urging said actuating member to one of said limit positions, power actuated means adapted when energized to overcome said spring and move said actuating member to said other limit position, a second actuating member pivotally connected to the other end of said lever, and mechanism selectively operable to adjust the position of said second actuating member progressively.

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