May 14, 1940. A. P. THOMAS 2,200,459

GOVERNOR

Original Filed Aug. 16, 1937 3 Sheets-Sheet 1

Fig. 1.

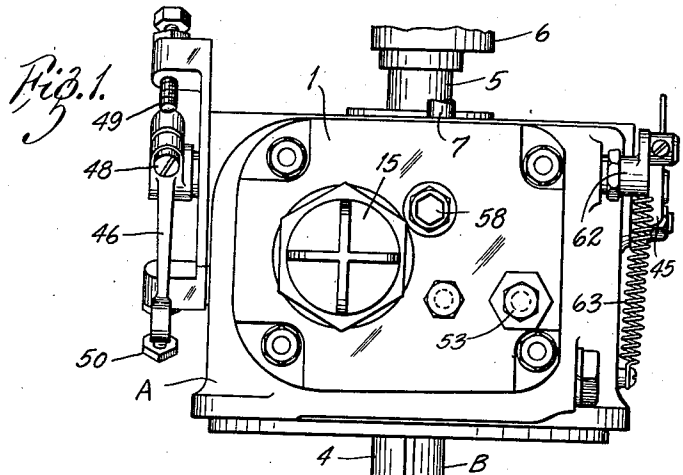


Fig. 3.

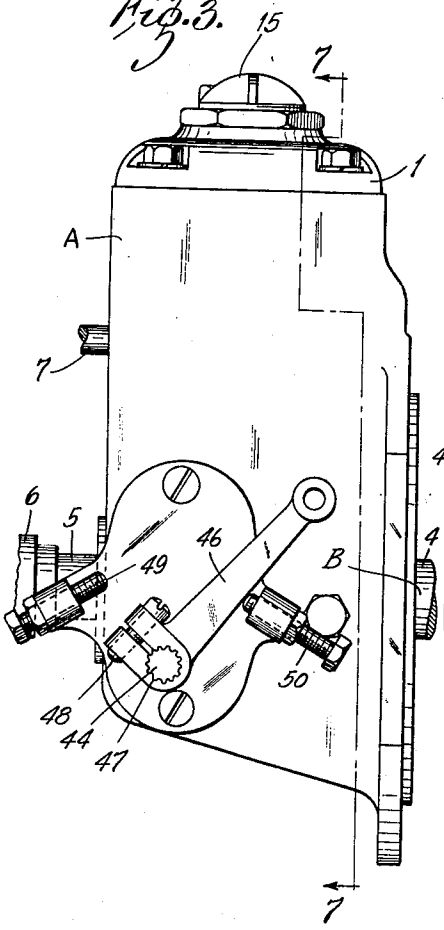
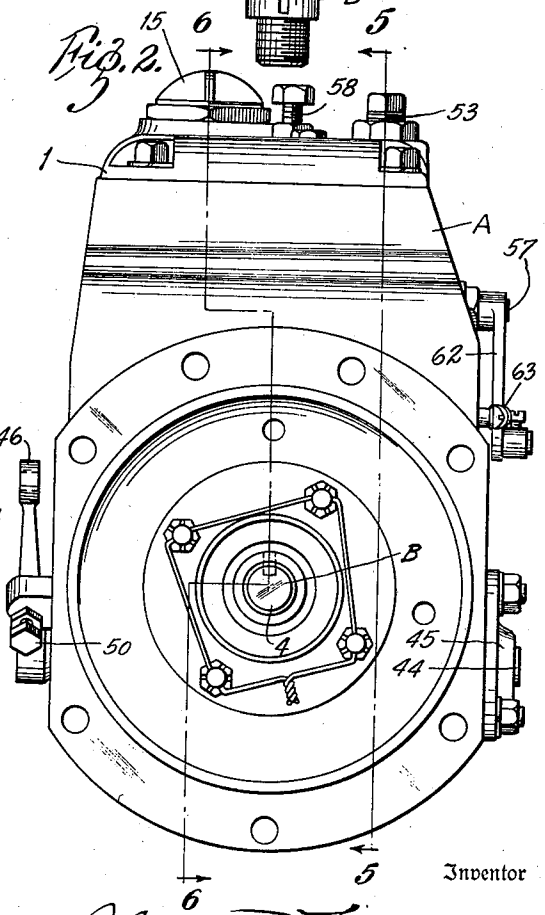


Fig. 2.



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GOVERNOR

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Fig. 4.

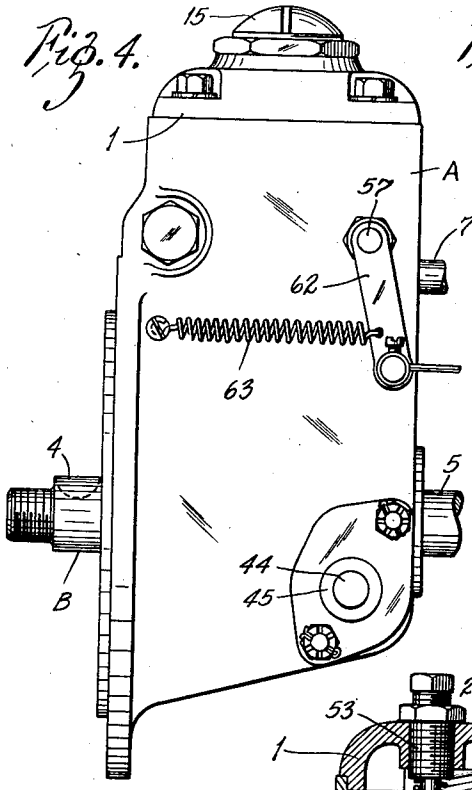


Fig. 6.

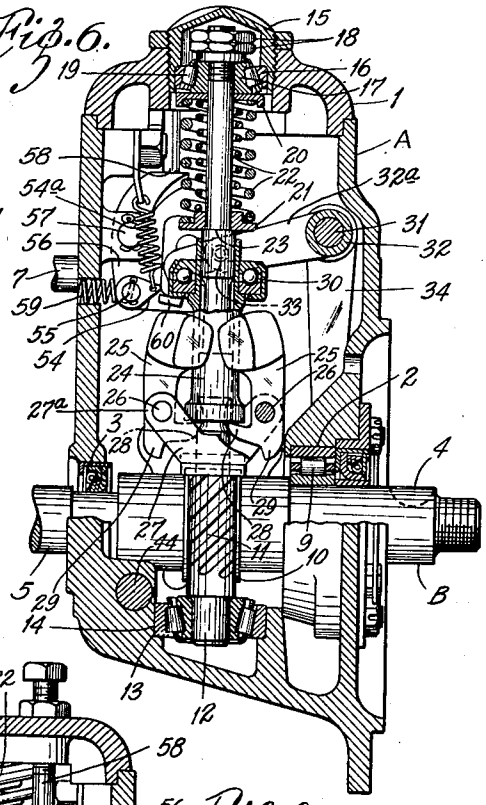


Fig. 5.

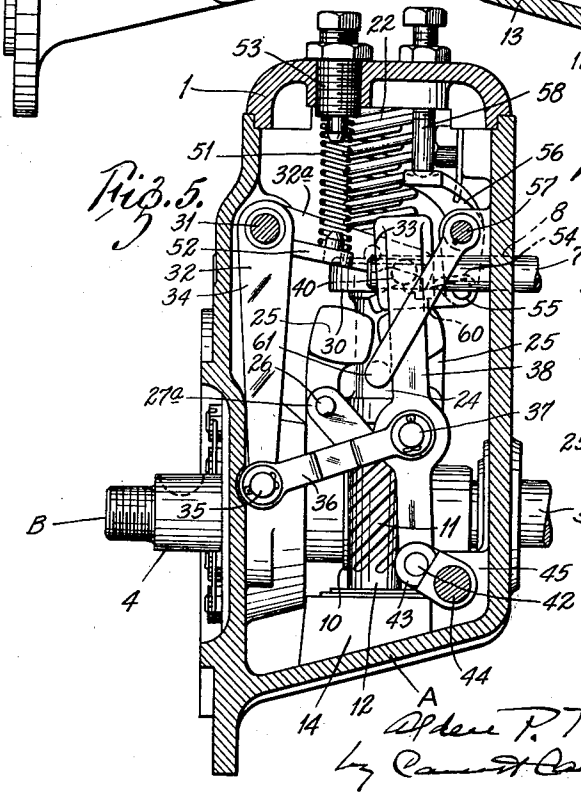
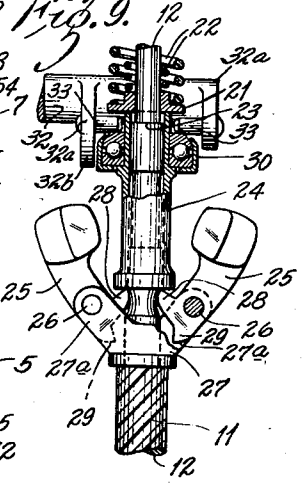


Fig. 9.



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GOVERNOR

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Fig. 7.

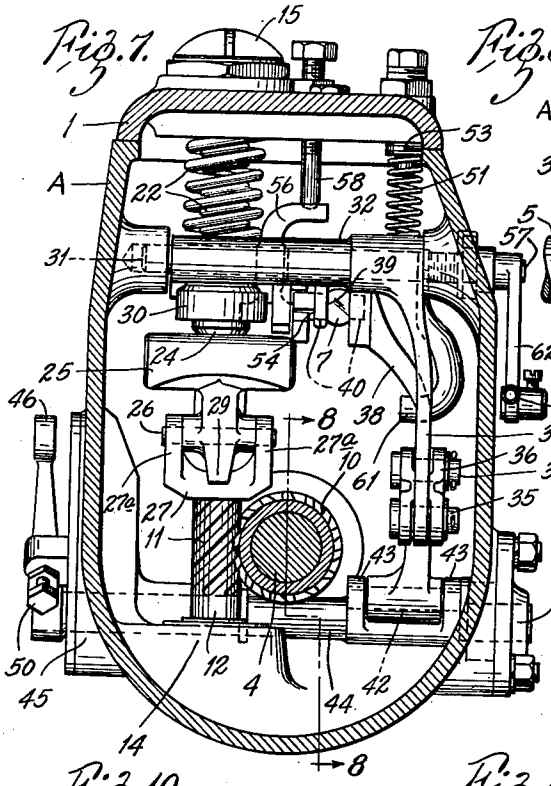


Fig. 8.

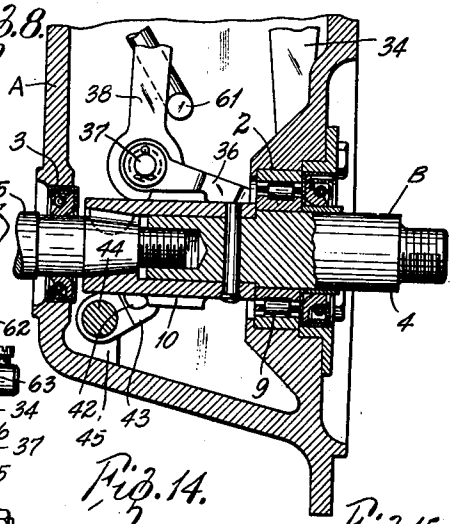


Fig. 14.

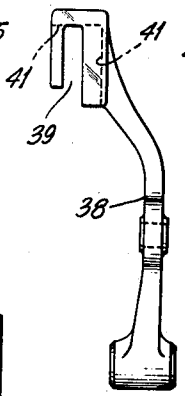


Fig. 15.

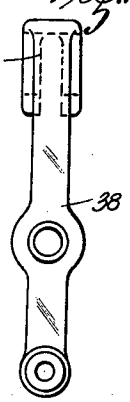


Fig. 10.

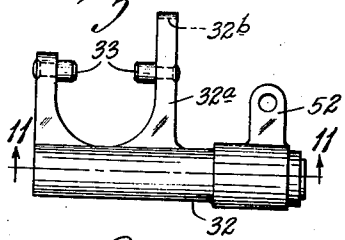


Fig. 13.

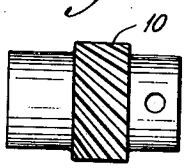


Fig. 11.

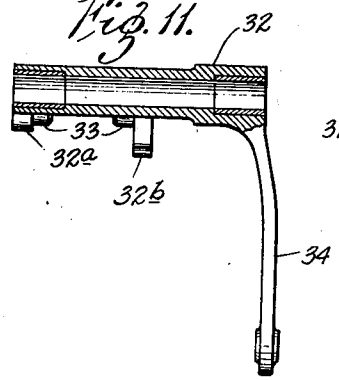
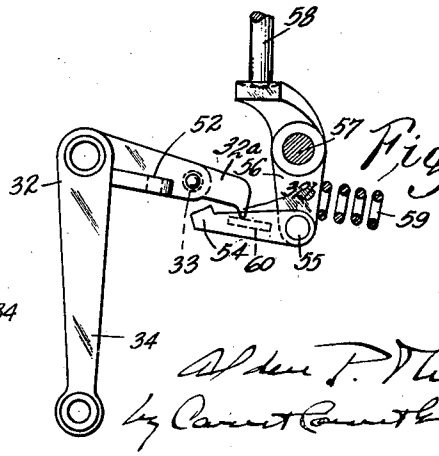


Fig. 12.



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Patented May 14, 1940 2,200,459

UNITED STATES PATENT OFFICE

2,200,459

GOVERNOR

Alden P. Thomas, Canton, Ohio, assignor to The Timken Roller Bearing Company, Canton, Ohio, a corporation of Ohio

Original application August 16, 1937, Serial No. 159,315, now Patent No. 2,153,125, dated April 4, 1939. Divided and this application November 2, 1938, Serial No. 238,294

14 Claims. (Cl. 264—3)

This application is a division of my copending application Serial No. 159,315, filed August 16, 1937.

This invention relates principally to speed regulating devices for internal combustion engines and more particularly to governors for automatically controlling the output of fuel pumps for such engines. One of the objects of the present invention is to provide a completely enclosed, self-contained compact device of simple and economical construction which will automatically control the speed of the engine at both idling and high speeds in all throttle positions. Another object is to enable the fuel supply to be cut off in any position of the throttle or governor. Other objects are to provide for adjusting the idling and high speeds of the engine and the maximum quantity of fuel delivered by the pump and to enable such adjustments to be made outside the governor housing. Other objects are to enable the fuel pump to operate at full pumping capacity when starting the engine and to prevent the operator from overloading the engine with too much fuel when running. The invention consists in the governor and in the construction, combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings, which form part of this specification and wherein like symbols refer to like parts wherever they occur,

Fig. 1 is a plan view of a speed governor embodying my invention, the governor being shown associated with the cam shaft and control rod of the fuel pump for an internal combustion engine,

Fig. 2 is an elevation of the engine opposing end of said governor,

Fig. 3 is an elevation of one side of the governor,

Fig. 4 is an elevation of the other side of said governor,

Fig. 5 is a vertical longitudinal section on the line 5—5 in Fig. 2,

Fig. 6 is a similar section on the line 6—6 in Fig. 2,

Fig. 7 is a vertical transverse section on the line 7—7 in Fig. 3,

Fig. 8 is a vertical central longitudinal section through the lower portion of the governor,

Fig. 9 is a detail view, partly in section, showing the positions assumed by the centrifugal weights and the sleeve actuated thereby at high speed,

Fig. 10 is a plan view of the governor actuated yoke lever,

Fig. 11 is a part sectional and part side elevational view of said yoke lever,

Fig. 12 is an end view of said lever and the stop device associated therewith,

Fig. 13 is a side view of the helical driving gear of said governor; and

Figs. 14 and 15 are side and end views, respectively of the control rod actuating lever.

The centrifugal speed regulating device or governor shown in the accompanying drawings comprises a housing A having a top opening, which is closed by a removable cover 1, and axially alined openings 2 and 3 in its respective end walls, through which a drive shaft B extends. As shown in the drawings, said drive shaft comprises a section 4 adapted to be driven by and in unison with a compression ignition internal combustion engine (not shown), and a section 5 that has one or more cams 6 thereon for actuating the pistons of a suitable fuel pump (not shown), which is provided with a horizontally reciprocable control rod 7 for varying the quantity of fuel supplied by said pump to the working cylinders of said engine. As shown in the drawings the control rod 7 extends into the governor housing through an opening 8 provided therefor in the pump opposing end wall of said housing.

The section 4 of the main drive shaft B is journaled in a suitable antifriction bearing 9 located in the opening 2 in the engine opposing end wall of the governor housing A; and the section 5, which forms the cam shaft of the fuel pump, extends through the opening 3 in the pump opposing end wall of said housing and has a reduced end portion that is threaded into the adjacent end of the shaft section 4. Mounted on the adjacent ends of the drive shaft sections 4 and 5 is a helical gear 10, which is pinned to the shaft section 4 and is keyed to the shaft section 5. The helical gear 10 drives a helical gear 11 formed on a vertical shaft 12 located in the pump housing at one side of the helical gear 10. The lower end of the shaft 12 is supported in a suitable antifriction bearing 13 supported in a seat 14 provided therefor in the lower portion of the governor housing.

The governor housing is provided at its upper end with an opening which is closed by a threaded cap 15. The upper end of the vertical shaft 12 is provided with a roller bearing comprising an outer bearing member 16 seated in the cap 15, an inner bearing member 17 sleeved on said shaft and adjustable endwise thereof by means of nuts 18 threaded on the upper end thereof, and bearing rollers 19 interposed between said bear-

ing members. Sleeved on the vertical shaft 12 between upper and lower spring seat members 20 and 21, respectively, are one or more compression springs 22, hereinafter referred to as high speed springs. The lower spring seat 21 seats on an annular shoulder 23 provided therefor on the upright shaft 12; and the upper spring seat 20 is pressed upwardly by said springs against the lower end of the inner bearing member 17 of the upper bearing for said shaft and thus serves to press said inner bearing member against the lowermost of the two spring adjusting nuts 18 on the upper end of said shaft.

A thrust sleeve 24 is slidably mounted on the vertical shaft 12 and is adapted to be slid upwardly on said shaft into abutting relation with the lower spring seat 21 and against the pressure of the high speed springs 22 by means of a pair of weighted centrifugal levers 25 that are pivotally supported one on each side of said shaft on horizontal pivots 26 carried by pairs of ears or lugs 27a on the upper end of a spider 27 that is pinned to said shaft just above the helical gear 11 thereon. Each of these centrifugal levers is provided at the end remote from its weighted end with a finger 28, which is adapted to abut against the lower end of the thrust sleeve 24 and slide it upwardly on the shaft 12, and a finger 29, which is adapted to abut against the spider 27 and limit the outward swinging movement of said weighted end of said lever. Mounted on the upper end of the thrust sleeve against movement axially thereof is a suitable ball thrust bearing 30.

Journaled on a horizontal shaft 31 that extends from side wall to side wall of the governor housing A, at one side of the vertical shaft 12, is a lever 32 having one arm in the form of a yoke 32a that straddles the vertically slidable thrust sleeve 24 and thrust bearing 30 and is provided with horizontal pins 33 that overhang and cooperate with the upper surface of said bearing. The other or depending arm 34 of the yoke lever 32 extends downwardly in the housing and is pivotally connected, as at 35, at its free lower end with one end of a link 36, whose opposite end is pivotally connected, as at 37, to an upright lever 38 intermediate between the ends thereof.

The upper end of the upright lever 38 is provided with a downwardly opening notch 39 that straddles the adjacent end of the pump control rod 7, which has a lateral abutment member or pin 40 thereon that projects on opposite sides thereof with its ends fitting within downwardly opening notches 41 formed in the opposite side walls of the main control rod receiving notch 39. The lower end of the upright lever 38 fits between and is pivotally connected, as at 42, to the outer ends of a pair of ears or lugs 43 that project radially from a horizontal shaft 44, which extends transversely of the governor housing with its ends journaled in suitable bearings 45 provided therefor in the side walls of said housing.

One end of the horizontal shaft 44 extends outside of the governor housing A and has a manually operable control arm 46 fixed thereto. The cooperating portions of the shaft and arm are provided with interfitting ribs and grooves 47, whereby said arm may be angularly adjusted on said shaft. The hub portion of said arm is split and provided with a clamping screw 48 for locking said arm in the desired position of its angular adjustment. The swinging movement of the manual control arm 46 is limited in one direction to limit the maximum feed of the pump by an adjustable stop screw 49 and in the opposite direction to control the minimum fuel feed by a similar adjustable stop screw 50. These stops limit the operator's control over the output of the fuel pump.

The pins 33 on the yoke 32a of the lever 32 are held down on the thrust bearing 30 on the vertical shaft 12 by means of a helical compression spring 51 (hereinafter referred to as the idling speed spring). This spring is supported at its lower end on a lug or arm 52 that projects from the hub of the yoke lever 32; and the upper end of said spring bears against the lower end of a screw 53 that is threaded vertically through the cover 1 of the governor housing.

An adjustable stop device is provided for limiting the feed movement of the control rod 7 of the pump. Said device comprises a hook 54 pivoted, as at 55, to the lower arm of a lever 56 that is pivotally supported on a horizontal shaft 57 mounted in the governor housing just above the pump control rod 7. This stop hook is held in the path of the pin 40 on the control rod 7 by means of a coil tension spring 54a and thus limits the feed movement of said rod. The lever 56 may be adjusted to shift the hook lengthwise of said rod by means of an adjusting screw 58 that is threaded vertically through the housing cover 1 with its lower end in abutting relation to the free upper end of the upper arm of the hook supporting lever 56. A coil compression spring 59 is mounted in the side wall of the governor housing adjacent to the hook supporting lever 56 and serves to hold the upper arm thereof against the lower end of the adjusting screw 58. One branch of the yoke 32a of the yoke lever 32 is extended to form a finger 32b adapted, when the governor is not operating, to press down on a lug 60 on the stop hook 54 so as to swing the same clear of the control rod pin 40 and thus permit said rod to be moved beyond the maximum feed position established by said hook when it is in engagement with said control rod pin. The mechanism for shifting the control rod 7 in a direction that will completely shut off the supply of fuel to the engine and thus stop the operation thereof comprises a stop hook 61 that is fixed to the horizontal shaft 57 and is adapted to be swung into engagement with the upright lever 38 when said shaft is manually rotated by means of an arm 62 fixed thereto outside of the governor housing. The stop arm 62 is normally held in inoperative position by means of a tension spring 63 having one end anchored to the governor housing and the other end secured to said arm.

The operation of the hereinbefore described speed governor is as follows:

When the manually operable control or throttle arm 46 is set for idling speed, as shown in Fig. 3, such speed is insufficient to swing the centrifugal levers 25 out far enough to lift said sleeve into engagement with the lower seat 21 for the relatively strong high speed springs 22 and a uniform idling speed is maintained by the relatively weak idling speed spring 51; and when said control or throttle arm is set for high speed, the greater centrifugal force is sufficient to swing the centrifugal levers out far enough to raise the thrust sleeve high enough to compress the high speed springs 22 and thus bring them into operation to maintain a uniform high speed. During both idling and high speeds the idling speed spring 51 operates to hold the yoke pins 33 of the yoke lever 31 down on the thrust bearing 30 and the governor action is transmitted be-

tween the thrust sleeve 24 and the pump control rod through the yoke lever 31, link 36 and upright lever 38. During the governor operation, the upright lever 38 swings on the pivot 42 carried by the manually rotatable control shaft 44 and operates to shift the pump control rod in a direction that will reduce the fuel supply when the speed of the engine increases and to shift said rod in the opposite direction and increase the fuel supply when the speed of the engine decreases. However, when the pump control rod is manually set or operated by manipulating the control arm 46, the upright lever 38 swings about its pivotal connection 37 with the link 36.

The idling spring 51 is adjusted by means of the screw 53; and the high speed spring 22 is adjusted by means of the bearing retaining nuts 18 on the upper end of the vertical shaft 12. This vertical shaft, together with the parts mounted thereon, may be inserted in and removed from the governor housing A through the opening closed by the cover 1. The high speed springs 22 rotate with the vertical supporting shaft 12 therefor and thus do not transmit any load to the ball thrust bearing 30, which takes only the relatively light load imparted thereto by the idling speed spring 51.

The external control or throttle arm 46 is capable of manual operation independently of the governor mechanism either when manual operation is desired or when it is desired to set the governor at idling speed or high speed or any speed intermediate therebetween.

The adjustable stop hook 54 limits the maximum fuel supply for a given speed setting of the throttle or control arm 46 and thus prevents the operator from overloading the engine with too much fuel and thus causing it to smoke. The adjusting screw 58 in the cover 1 of the governor housing allows the stop hook 54 to be set in any desired position to limit the maximum quantity of fuel supply. As the maximum travel of the pump control rod during the operation of the engine does not provide a quantity of fuel sufficient for starting the engine, the stop hook 54 is adapted to automatically drop clear of the pump control rod whenever the engine is stopped. This automatic release of the stop hook 54 is brought about by the pressure of the finger portion or extension 32a of one of the branches of the yoke 32 of the yoke lever 31 on the lug 60 of said stop hook when the governor is not operating and the thrust sleeve 24 is in its lowermost position. Thus, a greater quantity of fuel may be supplied to the engine during starting than when the engine is running. When the engine starts, the centrifugal levers 25 lift the finger 32, thereby permitting the stop hook 54 to again swing into operative position in the path of the pin 40 on the control rod 7. This arrangement permits the quantity of fuel to be increased when starting the engine; and it also prevents the operator from overloading the engine and causing it to smoke while running.

The operator may stop the engine regardless of the position of the throttle arm 46 or the operation of the governor mechanism, by moving the stop arm 62 against the tension of the spring 63 to swing the stop hook 61 into engagement with the upright lever 38 and thus shift the pump control rod in a direction that will completely shut off the fuel supply to the engine. This stop hook 61 is normally held in inoperative position by the tension spring 63.

The governor is a completely enclosed, self-contained, fully automatic unit. All forces due to the action of the centrifugal levers at all speeds are taken in tension by the vertical shaft 12 and in compression by the thrust sleeve 24, thereby decreasing the loads on and prolonging the life of the bearings for said shaft. The helical drive gearing provides for quiet operation of the governor; and all adjustments may be quickly and easily made from conveniently located points located externally of the governor housing. The adjustable stops 49 and 50 for the throttle arm 46 limit the operator to predetermine idling and high speeds.

What I claim is:

1. A speed governor for internal combustion engines including a movable fuel speed control member and a shaft driven by said engine, said governor comprising a thrust sleeve slidably mounted on said shaft and adapted to be slid longitudinally thereof in response to the speed thereof, a lever having one arm disposed in abutting relation to said thrust sleeve, a spring associated with said lever for yieldably resisting the movement imparted thereto by said thrust sleeve, a second lever disposed alongside of said other arm of said first mentioned lever and pivotally supported at one end and connected at its other end to said fuel feed control member, and a cross-link connecting said other arm of said first mentioned lever with said second lever intermediate between the ends of the latter.

2. A speed governor for internal combustion engines including a movable fuel feed control member and a shaft driven by said engine, said governor comprising a thrust sleeve slidably mounted on said shaft and adapted to be slid longitudinally thereof in response to the speed thereof, a lever having one arm disposed in abutting relation to said thrust sleeve, a spring associated with said lever for yieldably resisting the movement imparted thereto by said thrust sleeve, a second lever disposed alongside of said other arm of said first mentioned lever and pivotally supported at one end, and connected at its other end to said fuel feed control member, a cross-link connecting said other arm of said first mentioned lever with said second lever intermediate between the ends of the latter, and means for shifting the supporting pivot for the end of said second lever to cause the latter to swing about its pivotal connection with said cross-link and actuate said fuel feed control member.

3. A speed governor for internal combustion engines including a movable fuel feed control member and a shaft driven by said engine, said governor comprising a thrust sleeve slidably mounted on said shaft and adapted to be slid longitudinally thereof in response to the speed thereof, a lever having one arm disposed in abutting relation to said thrust sleeve, a spring associated with said lever for yieldably resisting the movement imparted thereto by said thrust sleeve, a second spring mounted on said shaft for yieldably resisting further movement of said thrust sleeve, a second lever pivotally supported at one end and connected at its other end to said fuel feed control member, a link connecting the other arm of said first mentioned lever with said second lever intermediate between the ends of the latter, manually operable means for shifting the supporting pivot for said second lever to cause the latter to swing about its pivotal connection with said link and move said fuel feed control member, and normally disengaged means cooperating with said second lever between its points of connection with

said link and said fuel feed control member for swinging said second lever about its supporting pivot in a direction that will shift the control member to fuel cut-off position.

4. A speed governor for internal combustion engines including a movable fuel feed control member and a shaft driven by said engine, said governor comprising a thrust sleeve mounted on said shaft and adapted to be shifted longitudinally thereof in response to the speed thereof, a high speed spring sleeved on said shaft and adapted to be compressed by the pressure imparted thereto by said thrust sleeve, a lever having one arm adapted to be actuated by the movement of said sleeve in the direction of said high speed spring, an idling speed spring operatively engaging said lever for urging said arm in the direction of said thrust sleeve, said last mentioned spring being adapted to be compressed prior to said high speed spring, a second lever disposed alongside of said other arm of said first mentioned lever and pivotally supported at one end and operatively connected at its other end to said fuel feed control member, a cross-link connecting said other arm of said first mentioned lever with said second lever intermediate between the ends of the latter, and manually operable means for moving the supporting pivot for the end of said second lever to cause it to pivot about its point of connection with said cross-link.

5. A speed governor for internal combustion engines including a movable fuel feed control member and a horizontal shaft driven by said engine, said governor comprising a housing having an opening in the top thereof, a cover for said opening, a vertical shaft in said housing, gearing connecting said shafts, centrifugal levers pivotally supported on said vertical shaft for vertical swinging movement towards and away therefrom, a thrust sleeve axially slidable but nonrotatably mounted on said vertical shaft and adapted to be shifted vertically thereon when said centrifugal levers swing outwardly due to centrifugal force, a lever operatively connected to said fuel feed control member and adapted to be actuated by said thrust sleeve, an idling speed spring adapted to yieldably resist the initial movement of said thrust sleeve under the influence of said centrifugal levers, and a high speed spring sleeved on said vertical shaft and adapted to resist further movement of said thrust sleeve, all insertable in and removable from said housing through the opening in the top thereof.

6. A speed governor for internal combustion engines including a movable fuel feed control member, means for limiting the maximum fuel feed position of said control member and a shaft driven by said engine, said governor comprising centrifugal weights pivotally supported on said shaft for swinging movement towards and away therefrom, a thrust sleeve mounted on said shaft and adapted to be slid longitudinally thereof by the outward movement of said centrifugal levers, a lever having one arm disposed in abutting relation to said thrust sleeve and adapted in the inoperative position thereof to render ineffective the limiting means for said control member, a spring associated with said lever for yieldably resisting the movement imparted thereto by said thrust sleeve, a second lever pivotally supported at one end and connected at its other end to said fuel feed control member, and a link connecting the other arm of said first mentioned lever with said second lever intermediate between the ends of the latter.

7. A speed governor for internal combustion engines including a movable fuel feed control member and a shaft driven by said engine, said governor comprising centrifugal weights pivotally supported on said shaft for swinging movement towards and away therefrom, a thrust sleeve slidably mounted on said shaft and adapted to be slid longitudinally thereof by the outward movement of said centrifugal levers, a lever having one arm disposed in abutting relation to said thrust sleeve, a relatively weak spring associated with said lever for yieldably resisting the movement imparted thereto by said thrust sleeve at the beginning of the sliding movement imparted thereto by said centrifugal weights, a relatively strong spring associated with said sleeve for yieldably resisting further sliding movement thereof, a second lever disposed alongside of said other arm of said first mentioned lever and pivotally supported at one end and connected at its other end to said fuel feed control member, and a cross-link connecting said other arm of said first mentioned lever with said second lever intermediate between the ends of the latter.

8. A speed governor for internal combustion engines including a movable fuel feed control member, means for limiting the maximum fuel feed position of said control member and a shaft driven by said engine, said governor comprising centrifugal weights pivotally supported on said shaft for swinging movement towards and away therefrom, a thrust sleeve slidably mounted on said shaft and adapted to be slid longitudinally thereof by the outward movement of said centrifugal levers, a lever having one arm operatively engaging said thrust sleeve and adapted in the inoperative position thereof to render ineffective the limiting means for said control member, a spring associated with said lever for yieldably resisting the movement imparted thereto by said thrust sleeve, a second lever pivotally supported at one end, and connected at its other end to said fuel feed control member, a link connecting the other arm of said first mentioned lever with said second lever intermediate between the ends of the latter, and means for shifting the supporting pivot for said second lever to cause the latter to swing about its pivotal connection with said link and actuate said fuel feed control member.

9. A speed governor for internal combustion engines including a movable fuel feed control member and a shaft driven by said engine, said governor comprising centrifugal weights pivotally supported on said shaft for swinging movement towards and away therefrom, a thrust sleeve slidably mounted on said shaft and adapted to be slid longitudinally thereof by the outward movement of said centrifugal levers, a lever having one arm operatively engaging said thrust sleeve, a spring associated with said thrust sleeve for yieldably resisting the movement imparted thereto by said centrifugal weights, a second lever disposed alongside of said other arm of said first mentioned lever and pivotally supported at one end and pivotally connected at its other end to said fuel feed control member, and a cross-link connecting said other arm of said first mentioned lever with said second lever intermediate between the ends of the latter.

10. A speed governor for internal combustion engines including a movable fuel feed control member and a shaft driven by said engine, said governor comprising centrifugal weights pivotally supported on said shaft for swinging movement towards and away therefrom, a thrust

sleeve slidably mounted on said shaft and adapted to be slid longitudinally thereof by the outward movement of said centrifugal levers, a lever having one arm operatively engaging said thrust sleeve, a spring associated with said thrust sleeve for yieldably resisting the movement imparted thereto by said centrifugal weights, a second lever disposed alongside of said other arm of said first mentioned lever and pivotally supported at one end and pivotally connected at its other end to said fuel feed control member, a cross-link connecting said other arm of said first mentioned lever with said second lever intermediate between the ends of the latter, and manually operable means for shifting the supporting pivot for said second lever to cause the latter to swing about its pivotal connection with said cross-link and move said fuel feed control member.

11. A speed governor for internal combustion engines including a movable fuel feed control member and a shaft driven by said engine, said governor comprising centrifugal weights pivotally supported on said shaft for swinging movement towards and away therefrom, a thrust sleeve slidably mounted on said shaft and adapted to be slid longitudinally thereof by the outward movement of said centrifugal levers, a lever having one arm operatively engaging said thrust sleeve, a spring associated with said thrust sleeve for yieldably resisting the movement imparted thereto by said centrifugal weights, a second lever pivotally supported at one end and pivotally connected at its other end to said fuel feed control member, a link connecting the other arm of said first mentioned lever with said second lever intermediate between the ends of the latter, manually operable means for shifting the supporting pivot for said second lever to cause the latter to swing about its pivotal connection with said link and move said fuel feed control member, stops cooperating with said manually operable means for limiting such movement of said control member, and manually operable means cooperating with said second lever for swinging the latter about said supporting pivot in a direction that will move said control member beyond the limit established by one of said stops.

12. A speed governor for internal combustion engines including a movable fuel feed control member and a shaft driven by said engine, said governor comprising an upright shaft, centrifugal levers pivotally mounted on said upright shaft for swinging movement toward and away therefrom, a thrust sleeve mounted on said upright shaft and adapted to be shifted upwardly thereon by the outward movement of said centrifugal levers, a thrust bearing mounted on said thrust sleeve, a high speed spring sleeved on said upright shaft and adapted to be compressed by the pressure imparted thereto by said thrust bearing, a lever having one arm adapted to be actuated by the movement of said thrust bearing in the direction of said high speed spring, an idling speed spring operatively engaging said lever for urging said arm in the direction of said thrust bearing, said last mentioned spring being adapted to be compressed prior to said high speed spring, a second lever pivotally supported at one end and adapted to be operatively connected at its other end to said fuel feed control member, said first mentioned lever having a second arm, a link connecting said second arm with said second lever intermediate between the ends of the latter, and manually operable means for moving the supporting pivot of said second lever to cause it to pivot about its point of connection with said link and actuate said fuel feed control member.

13. A speed governor for internal combustion engines including a movable fuel feed control member and a shaft driven by said engine, said governor comprising centrifugal weights pivotally supported on said shaft for swinging movement towards and away therefrom, a thrust sleeve slidably mounted on said shaft and adapted to be slid longitudinally thereof by the outward movement of said centrifugal levers, a thrust bearing on said sleeve, a bent lever having a yoke arm operatively engaging said thrust bearing, means for yieldably resisting the movement imparted to said thrust sleeve by said weights, a second lever disposed alongside of the other arm of said bent lever and pivotally supported at one end and connected at its other end to said fuel feed control member, a cross-link connecting said other arm of said bent lever with said second lever intermediate between the ends of the latter, and manually operable means for shifting the supporting pivot for said second lever.

14. A speed governor for an internal combustion engine having a movable fuel feed control member and a shaft driven by said engine, said governor comprising a housing having an opening in the top thereof, a cover for said opening, a vertical shaft in said housing with its lower end journaled therein and with its upper end journaled in said cover, said vertical shaft being adapted to be driven by said engine driven shaft, centrifugal levers pivotally supported on said vertical shaft for vertical swinging movement towards and away therefrom, a thrust sleeve rotatable with said vertical shaft and slidable axially thereof by the action of said centrifugal levers, a lever adapted to be connected to said fuel feed control member and operatively engaging said thrust sleeve to be actuated thereby, an idling speed spring adapted to yieldably resist the initial movement of said thrust sleeve under the influence of said centrifugal levers, and a high speed spring sleeved on said vertical shaft and adapted to resist further movement of said thrust sleeve, said vertical shaft, levers, thrust sleeve and springs being all insertable in and removable from said housing through the opening in the top thereof.

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