Oct. 23. 1951 H. F. BAKER 2,572,096

ENGINE CONTROL MECHANISM

Filed Nov. 13, 1948 2 SHEETS—SHEET 1

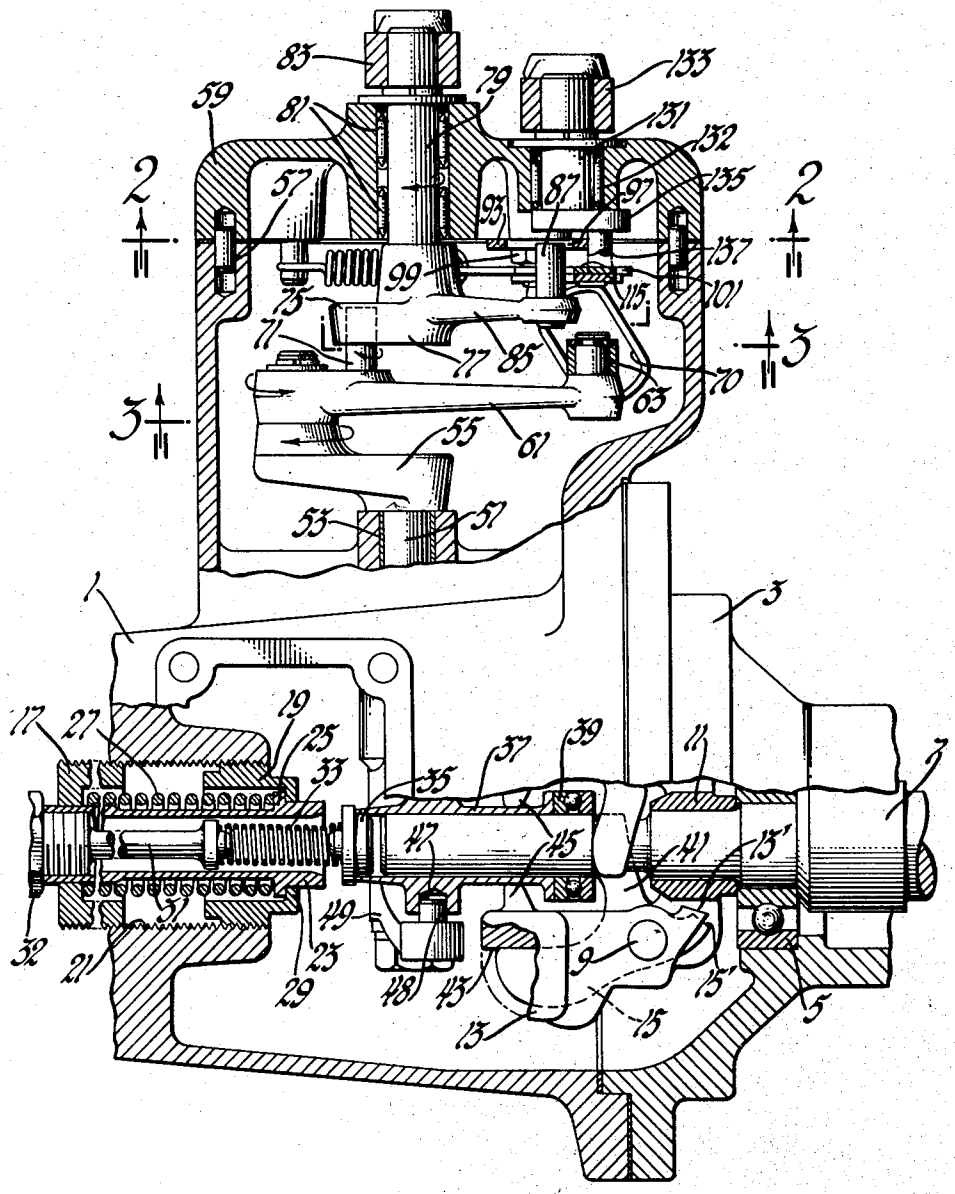

Fig. 1

Inventor
Herbert F. Baker

Spencer, Willis, Helwig & Baillio
Attorneys

Oct. 23, 1951 H. F. BAKER 2,572,096

ENGINE CONTROL MECHANISM

Filed Nov. 13, 1948 2 SHEETS--SHEET 2

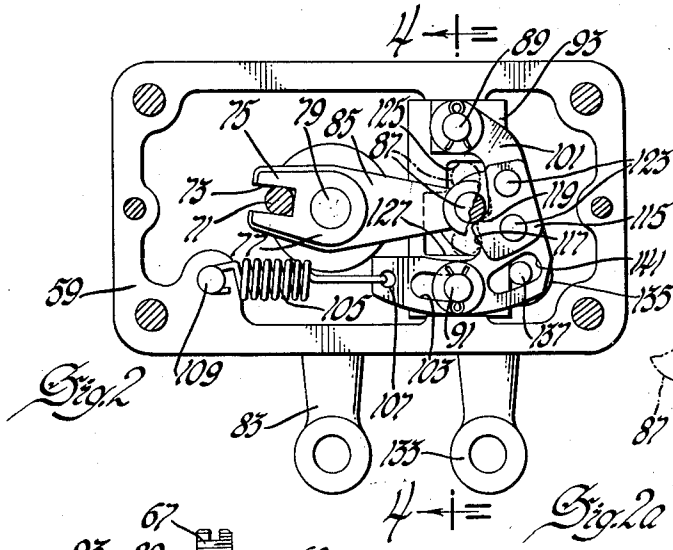

Fig. 2

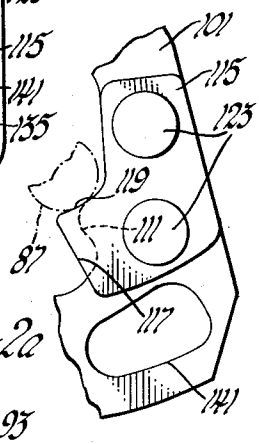

Fig. 2a

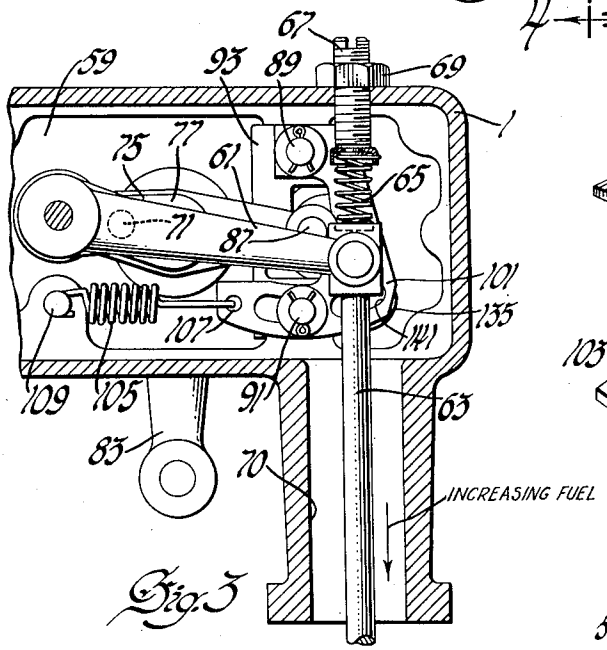

Fig. 3

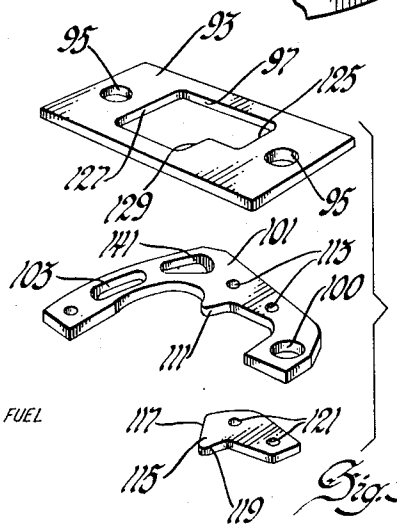

Fig. 5

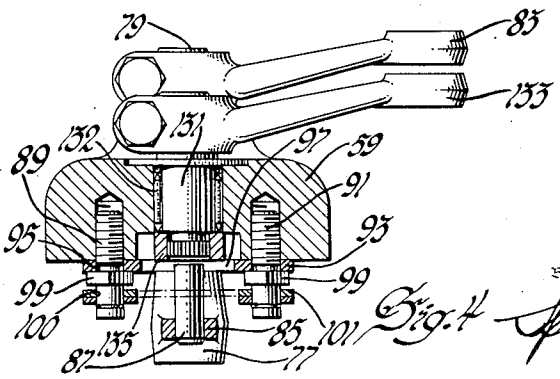

Fig. 4

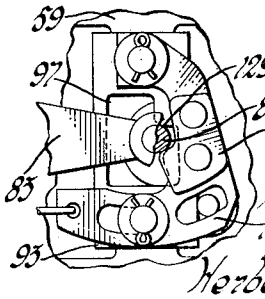

Fig. 6

Inventor
Herbert F. Baker

By Spencer, Willis, Helwig & Baillio
Attorneys

Patented Oct. 23, 1951

2,572,096

UNITED STATES PATENT OFFICE

2,572,096

ENGINE CONTROL MECHANISM

Herbert F. Baker, Detroit, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application November 13, 1948, Serial No. 59,896

7 Claims. (Cl. 264—3)

1

The present invention relates to control mechanism for an internal combustion engine and more particularly to a governor mechanism for a compression ignition engine.

The principal object of the present invention is to provide within a speed responsive engine governor mechanism cooperating manual and speed responsive control mechanism and detachable motion limiting and positioning means for said mechanism to obtain various engine control and operating characteristics.

The governor and associated mechanism incorporated therein whereby the above object is accomplished will become apparent by reference to the following detailed description and drawings illustrating the details of the governor.

Figure 1 is a vertical elevation of the governor with parts shown broken away and in section.

Figure 2 is a sectional view taken on line 2—2 of Figure 1.

Figure 2a is an enlarged view of certain of the parts shown in Figure 2 broken away.

Figure 3 is a sectional view taken on line 3—3 of Figure 1.

Figure 4 is a sectional view taken on line 4—4 of Figure 2.

Figure 5 is a perspective view of certain of the governor parts shown in Figures 1 to 4.

Figure 6 is a view similar to Figure 2 with certain of the parts in different positions.

As best illustrated in Figure 1 the governor comprises a housing 1 having an opening in one end shown closed by a removable bearing cover 3 including an antifriction bearing 5 rotatably supporting an engine driven governor shaft 7. Governor weights are pivoted by means of pins 9 to a weight carrier 11 secured on the shaft 7. Two sets of governor weights are shown, namely, a set of low speed weights 13 and a set of high speed weights 15. Each of these weights are provided with stops indicated at 13'—15' which engage the weight carrier 11 to limit outward centrifugal movement thereof.

Adjustable abutment members 17—19 are shown threaded in a housing opening 21 in axial alignment with the governor shaft 7. The inner end of a movable abutment sleeve 23 having an external flange 25 is shown projecting through and slidable in an opening in the abutment 19 and a high speed spring 27 is placed between the abutment 17 and the flange 25 of the sleeve to retain this flange in contact with an internal flange 29 of the abutment 19. Another adjustable abutment 31 is threaded in the outer end of the abutment sleeve 23 and locked thereto by a

2

nut 32. A low speed spring 33 is placed between the abutment 31 and an abutment 35 secured in the adjacent end of a governor sleeve 37 slidable on the governor shaft 7. An antifriction thrust bearing 39 is positioned between the other end of the governor sleeve 37 and fingers 41 on the high speed weights 15 to normally hold these weights in contact with abutments 43 on the low speed weights 13 and thereby normally retain projecting stops 45 thereon in contact with the governor sleeve as shown in Figure 1.

The governor sleeve 37 is provided with an external groove 47 in which pins 48 carried in a fork member 49 project. The fork member 49 is secured to a vertical shaft 51 rotatable in a bearing 53 in the housing 1 and having a lever 55 secured to the upper end and located below an upper opening 57 in the housing 1 shown closed by a removable housing cap 59 secured thereon. As best illustrated in Figures 1 and 3 one end of a floating lever 61 is pivotally connected to the lever 55 and the other end of the floating lever is pivotally connected to a fuel control rod 63 for adjusting the amount of fuel supplied to the engine fuel injector mechanism, not shown, in a well known manner. A buffer spring 65 is placed between a recess in the inner end of the fuel control rod 63 and an abutment 67 adjustably threaded in an adjacent opening in the housing 1 and locked thereto by a lock nut 69 to bias the fuel control rod away from the fuel cutoff or engine shut down position and the other end of the rod is shown extending outwardly through a passage 70 in one side of the housing for connection to the engine fuel injection means, not shown, as best illustrated in Figure 3. A fulcrum pin 71 is secured to the floating lever 61 intermediate its ends and projects upwardly, as best shown in Figures 1, 2 and 3, into a slot 73 in one arm 75 of a lever 77 secured on the inner end of a shaft vertical control 79 supported by antifriction bearings 81 in an opening of the housing cap 59 and having a manual control lever 83 secured on the end of the shaft 79 shown projecting upwardly and outwardly of the cap 59 in Figure 1. The other arm 85 of the lever 77, as best shown in Figure 1, has a stop pin 87 secured thereto and projecting upwardly toward the housing cap 59.

The housing cap 59, as best shown in Figures 2, 3 and 4, has two pins 89—91 threaded therein and projecting downwardly into the upper opening 57 of the housing 1. A stop plate 93 provided with two holes 95 on the longitudinal center line and an opening 97 of right angular form therebetween shown in Figure 5 is positioned by the

pins 89—91 in the cap 59, shown extending through the holes 95 in the stop plate and nuts 99 thereon hold the stop plate 93 to the inner side of the cap, as best seen in Figure 4.

The outer grooved end of the threaded pin 89 below the nut 99 thereon extends through a hole 100 in a U-shaped detent lever 101, shown in Figure 5, to allow pivotal movement thereon and the other outer grooved end of the threaded pin 91 extends through a slot 103 in the other end of the detent lever. Suitable retaining washers and cotter keys are shown provided on the lower grooved ends of the pins 89—91 to retain the detent lever on the housing cap 59. The details of the stop plate 93 and the detent lever 101 and attachment thereon, to be described, are best shown in Figure 5.

It will be noted in Figures 2 and 2a that the pin 87 on the arm 85 of the lever 77 on the lower end of the control shaft 79 extends upwardly along the inner side of the detent lever 101 and through the elongated portion of the right angular opening 97 of the stop plate 93 and a tension spring 105 is hooked between a hole 107 in the detent lever and a pin 109 secured to the housing cap 59 to hold the inner side of the pivoted detent lever 101 in contact with the pin 87 in the lever arm 85.

It will be seen in Figures 2a and 5 that a detent projection 111 having outwardly converging edges is provided on the inner edge of the detent lever 101 with two holes 113 adjacent thereto. A flat detent plate 115 having a projection provided with a ramp portion 117 on one edge and a hook shaped portion 119 on the other edge and two attaching holes 121 extending therethrough is also shown in Figure 5. The detent plate 115, as best shown in Figures 2 and 2a, is removably secured to the detent lever 101 by rivets 123 extending through the holes 113—121 therein with the outer end of the hooked edge 119 of the detent plate extending outwardly of the projection 111 of the detent lever and facing the shorter end 125 of the stop plate opening 97. The pin 87 is shown engaged by the hooked edge 119 of the detent plate to hold the pin and manual control lever 83 in an engine idling speed control position and to prevent movement of the pin into contact with the long end 127 of the stop plate opening 97 which serves as a stop for the pin to limit movement of the control lever 83 to an engine shut down or stop position. The ramp edge portion 117 of the detent plate 115 is positioned alongside the other edge of the detent projection 111 of the detent lever and when the pin 87 is moved from the engine shut down position into contact with the detent plate ramp portion by the control lever 83 more force must be applied thereto in order to cause pivotal movement of the detent lever, thereby retarding movement of the control lever to the idle speed controlling position. Further movement of the pin 87 by the control lever 83 in the same direction brings the pin 87 into contact with the short end 125 of the opening 97 in the stop plate 93 to position the control lever in a high speed and output engine controlling position. The converging sides of the detent projection 111 of the detent lever are formed so that by removal of the detent plate 115 from the detent lever 101 one side of the detent projection serves to position the pin 87 and control lever in the engine idling speed controlling position and also retards movement thereof to the engine shut down position and the other side retards movement of the pin and control lever to the idle position from the shut down position by the pin 87 engaging either side of the detent projection 111 and causing pivoting movement of the detent lever 101 relative to the housing cap 59 against the action of the spring 105.

The intermediate transverse edge 129 of the stop plate opening 97, as best illustrated in Figure 5, may likewise serve as a stop for the pin 87 by securing the stop plate 93 to the housing cap 59 in upside down relation, as shown in Figure 6, with respect to that shown in the other figures of the drawings in order to limit the control lever 83 movement to an intermediate engine speed and load controlling position from the engine shut down position.

In order to release the pin 87 from the hooked edge 119 of the detent plate and allow movement of the pin and control lever in the engine shut down position either by the control lever 83 or by the usual springs, not shown, acting on the engine fuel injection means or the fuel control rod 63 in opposition to the buffer spring 65 in order to shut off the fuel to the engine, detent lever releasing means are provided. This releasing means, as best shown in Figures 1, 2 and 4, includes a shaft 131 rotatable in an antifriction bearing 132 in a vertical opening in the housing cap 59 and having a manual releasing lever 133 secured to the outer end of the shaft 131 and an integral lever 135 on the inner end to which a pin 137 is secured which extends downwardly into a slot 141 in the detent lever 101 in order to move it out of contact with the pin 87.

The governing mechanism described above is suitable for limiting the idling speed and also the high speed and output of a fuel injection compression ignition engine and is accordingly known as a two speed limiting governor. The speed and output between the idle and high speed range being controlled solely by manual operation of the control lever 83 which upon movement from the shut down to the idle position rotates the control shaft 79 and the two armed lever 77 on the lower end in the direction of the arrow shown in Figure 1. This causes the pin 87 in the arm 85 of the lever 77 to move past the ramp portion 117 of the detent plate 115 and be positioned in the hooked edge 119 thereof and also cause rotation of the floating lever in the direction of the arrow about its point of connection with the lever 55 connected to the governor sleeve 37 by the pin 71 engaged in the slotted end of the arm 75 of the lever 77 on the control shaft 79. This causes the fuel control rod to be moved outwardly of the governor housing passage 70 from the zero fuel position in the direction of the arrow shown in Figure 3 to increase the fuel supply to the engine. Starting of the engine causes rotation of the governor shaft 7 and outward movement of the low speed governor weights 13 which causes outward movement of the high speed weights 15 by the abutment 43 on the high speed weights in engagement therewith. This causes the fingers 41 of the high speed weights to move the governor sleeve 37 to the left as viewed in Figure 1 until the centrifugal force of the weights 13—15 on the sleeve 37 is balanced by the opposing force of the idle spring 33 on the governor sleeve. This causes rotation of the fork 49 engaging the governor sleeve and lever 55 on the shaft 51 in the direction of the arrow thereon to rotate the floating lever 61 and fulcrum pin 71 in the same direction as shown by the arrow on the fulcrum pin with reference to the groove in the arm 75 of the lever on the control shaft 79 and cause the fuel control rod

63 to be moved to reduce the fuel supplied to the engine and limit the idling speed thereof.

Manual rotation of the control arm 83 and the shaft 79 and lever 77 thereon until the pin 87 in the arm of the lever engages the high speed and load stop portion 125 of the stop plate 93 as described above causes rotation of the floating lever 61 and fulcrum pin 71 with reference to the lever 55, shaft 51 and fork 49 connected to the governor sleeve 37 to stop movement of the fuel control rod in the maximum fuel delivery position. This causes an increase in the engine and governor speed and the abutment 35 on the governor sleeve now engages the sleeve 23 which is prevented from being moved further to the left by the opposing force of the prestressed high speed spring 27 on the governor weights. The low speed weights 15 at this time are limited from further outward movement by the stops 13' thereon engaging the weight carrier and the centrifugal force of the high speed weights is not sufficient to overcome the force of the high speed spring 27 until the engine speed increases to the maximum value which then causes rotation of the floating lever 61 with respect to the lever 77 on the control shaft 79 to cause a reduction in the fuel supplied the engine and thereby limit operation thereof to its maximum speed and load value. As previously described the control lever 83 can be moved back from the maximum speed and load position only to the idle position by reason of the pin 87 engaging the hooked edge of the detent plate 119. This moves the floating lever 61 and fuel rod 63 to the idle position to cause the low speed governor weights 13 to act and limit the engine idling speed and to prevent inadvertent shut down of the engine. In order to cause shut down as previously described it is necessary to rotate the detent releasing levers 133—135 to cause the pin 137 in the lever 135 to engage one side of the slot 141 in the detent lever 101 so that the detent plate 115 is moved out of engagement with the pin to cause movement of the manual control lever manually or by suitable springs, not shown, associated with the fuel control rod 63 to cause this rod and the control lever to move to the engine shut down position. As mentioned, if it is desired to move the fuel control rod to the engine shut down position by the manual control lever 83 no detent plate is necessary. To provide positioning of the control lever for a constant speed type of governor having a single set of governor weights the weights can be similarly mounted on the weight carrier 11 and the abutments for the single spring may be mounted in the housing and the detent lever and manually operable releasing means may be easily removed from the cap and the stop plate mounted in upside down relation to provide engine shut down and intermediate running speed and load positions for the control lever as mentioned above. On a variable speed governor only the stop plate and a modified detent lever having two detent projections may be used so that the detent plate projections position the pin 87 therebetween to position the control lever in the idle position and restricting movement thereof in either direction therefrom and the stop plate may be secured to the cap in either of the above mentioned positions to limit movement of the control lever between engine shut down and either intermediate or high speed and load positions.

The two position stop plate, detent lever and detent plate removably secured thereon and the detent lever releasing means all removably secured to the inner side of the housing cap provide proper positioning of the control lever for various types of governor mechanisms in the same housing which excludes the dust from these parts and prevents unauthorized tampering with these elements.

I claim:

1. An engine control device comprising a housing, an engine fuel control lever movable in said housing, a member within said housing movable in response to the speed of the engine and operatively connected to said fuel control lever, said housing having an opening, a cap removably secured to the housing and closing the housing opening, said cap including manually operable means engageable with said fuel control lever and operable from outside the cap, a stop member adjustably secured to the inner portion of said cap and having spaced stops engageable by the manually operable means to limit movement thereof in preselected ranges, a detent movably mounted on the inner portion of said cap and engageable and movable by the manually operable means in each preselected range permitted by the stops of said stop member to also position and retard movement of said control means in each preselected range of movement.

2. In an engine control mechanism comprising a housing, an engine fuel control lever movable in said housing, a member within said housing movable in response to the speed of the engine and operatively connected to said engine fuel control lever for controlling the engine speed, said housing having an opening, a cap removably secured to said housing and closing the opening therein, said cap including manually operable means operatively connected to said fuel control lever for varying the engine speed and operable from outside said cap, a stop member adjustably secured within the housing and provided with a plurality of spaced stops engageable by the manually operable means to limit movement thereof in preselected ranges, a detent movably mounted within said housing and engageable by said manually operable means upon movement thereof in one direction to stop movement thereof in each preselected range, said detent being contacted and movable by said manually operable control means upon opposite movement thereof in each range to retard movement of said manually operable means past said detent and detent-releasing means movably mounted within said cap and operable from outside said cap and operably connected to said detent to move said detent out of stopping engagement with said manually operable means.

3. An engine control mechanism comprising a housing, a member movable therein in response to engine speed, a lever operatively connected to said member for controlling the fuel supplied to the engine, said housing having an opening, a closure cap for said opening removably secured to said housing, said cap having manually operable engine control means extending through said cap and including an element operatively engageable with said fuel control lever, and a stop plate having an opening of right angle form adapted to be removably secured in upside down relation on the inner side of said cap, said manually operable control element projecting through said opening in said plate for engagement with the ends of a longitudinally extending leg of the right angular opening in the stop plate

when secured in one position or for engagement with the sides of the other transverse leg of the right angle opening in said plate when secured in the other position to provide two different ranges of movement of said element.

4. An engine control mechanism comprising a housing, a member movable therein in response to engine speed, an engine fuel control lever operatively connected to said member, said housing having an opening, a closure cap for said housing opening removably secured to said housing, a stop plate having an elongated opening therein and removably secured to the inside of said cap, a spring restrained detent lever pivoted to the inside of said cap and having a projection extending part way across the elongated opening in said stop plate, and a manually operable engine control lever pivoted on the inside of said cap and operatively engageable with said engine fuel control lever and having a projection extending through the elongated opening in said stop plate and in continuous engagement with said detent lever, said elongated opening serving for limiting the range of movement of said manually operable engine control lever and said detent lever projection serving for positioning and restricting movement of said manually operable control lever within the range of limited movement permitted by the elongated opening in said stop plate.

5. An engine control mechanism comprising a housing, an engine fuel control lever movable in said housing, a member within said housing movable in response to the speed of said engine and operatively connected to said fuel control lever for controlling the engine speed, said housing having an opening, a cap removably secured to said housing for covering the housing opening, said cap including manually operable means engageable with said fuel control lever for varying said engine speed and operable from outside said cap, and motion limiting means and positioning means removably secured to the inside of said cap and engageable by said manual control means, said positioning means including a detent blocking movement of said manual control means to reduce the fuel supplied said engine beyond a position causing the engine to operate at an intermediate speed, and releasing means for said detent movable on said cap and operable from outside said cap.

6. An engine control mechanism comprising a housing including movable engine fuel control means and manual and speed responsive control means for said fuel control means, said manual means being operably connected to said engine fuel control means to increase the fuel and to shut off the fuel supplied said engine, said speed responsive means being operably connected to said fuel control means to vary the fuel supplied said engine, said housing having an opening, and a cap removably secured to said housing and

closing said opening, said cap having means for operating said manual control means from outside said cap, motion limiting means inside cap for limiting movement of said manual control means to cause high speed operation and to shut down the engine, and detent means inside said cap for restricting movement of said manual control means intermediate the limits imposed by said motion limiting means to provide an intermediate speed controlling position for said manual control means.

7. An engine control mechanism comprising a housing having an opening therein, a cap removably secured to said housing and closing the opening therein, combined high and low engine speed responsive means in said housing including an element operably connected to the combined high and low engine speed responsive means and movable thereby in steps corresponding to a low and a high value of engine speed, a control shaft rotatable in said cap having a manually operable lever secured to the outer end and a second lever secured to the inner end, an engine fuel controlling lever in said housing operably connected to said element and movable thereby to decrease the fuel supplied to the engine, said fuel controlling lever being operatively engageable with said second control lever for moving said fuel controlling lever between fuel shut off and increasing fuel controlling positions, motion limiting means having a plurality of stops thereon and adapted to be removably secured in different positions to the inner side of said cap for limiting movement of said second lever between an engine shut down and different engine operating speed controlling positions, a detent lever having a detent projection pivotally mounted adjacent said second lever, spring means for urging said detent lever and the projection thereon into contact with said second lever, said detent projection being positioned to retard movement of said second lever through an intermediate speed controlling position, a detent plate adapted to be removably secured to said detent lever alongside said detent projection thereon to retard movement of said second lever from the engine shut down position to an intermediate speed controlling position and to prevent reverse movement back to said shutdown position, and detent lever releasing means movably supported on said cap and operatively engageable with said detent lever and operable from outside said cap.

HERBERT F. BAKER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,153,125	Thomas	Apr. 4, 1939