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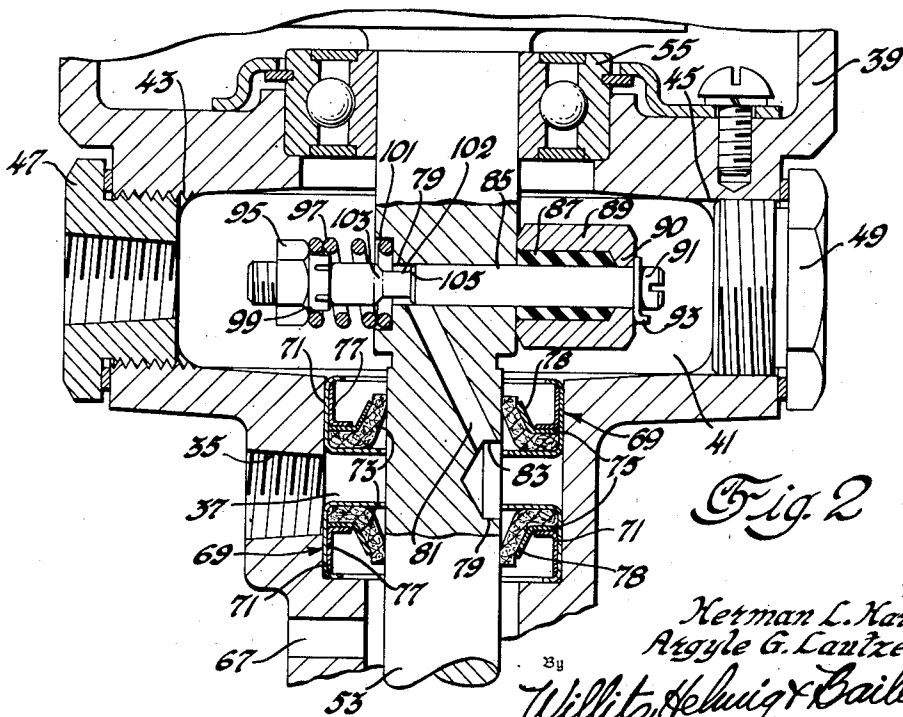
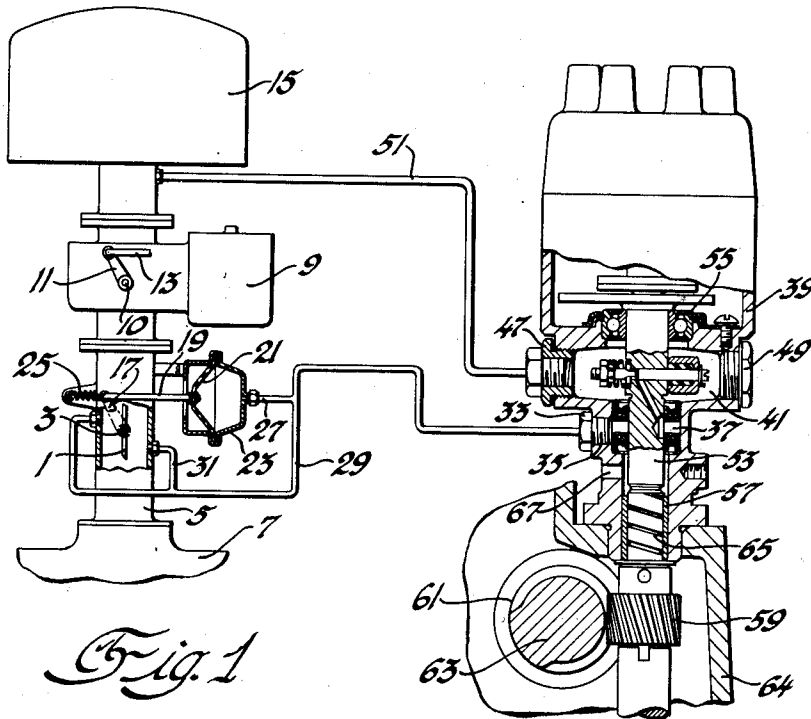
H. L. HARTZELL ET AL

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ENGINE GOVERNOR.

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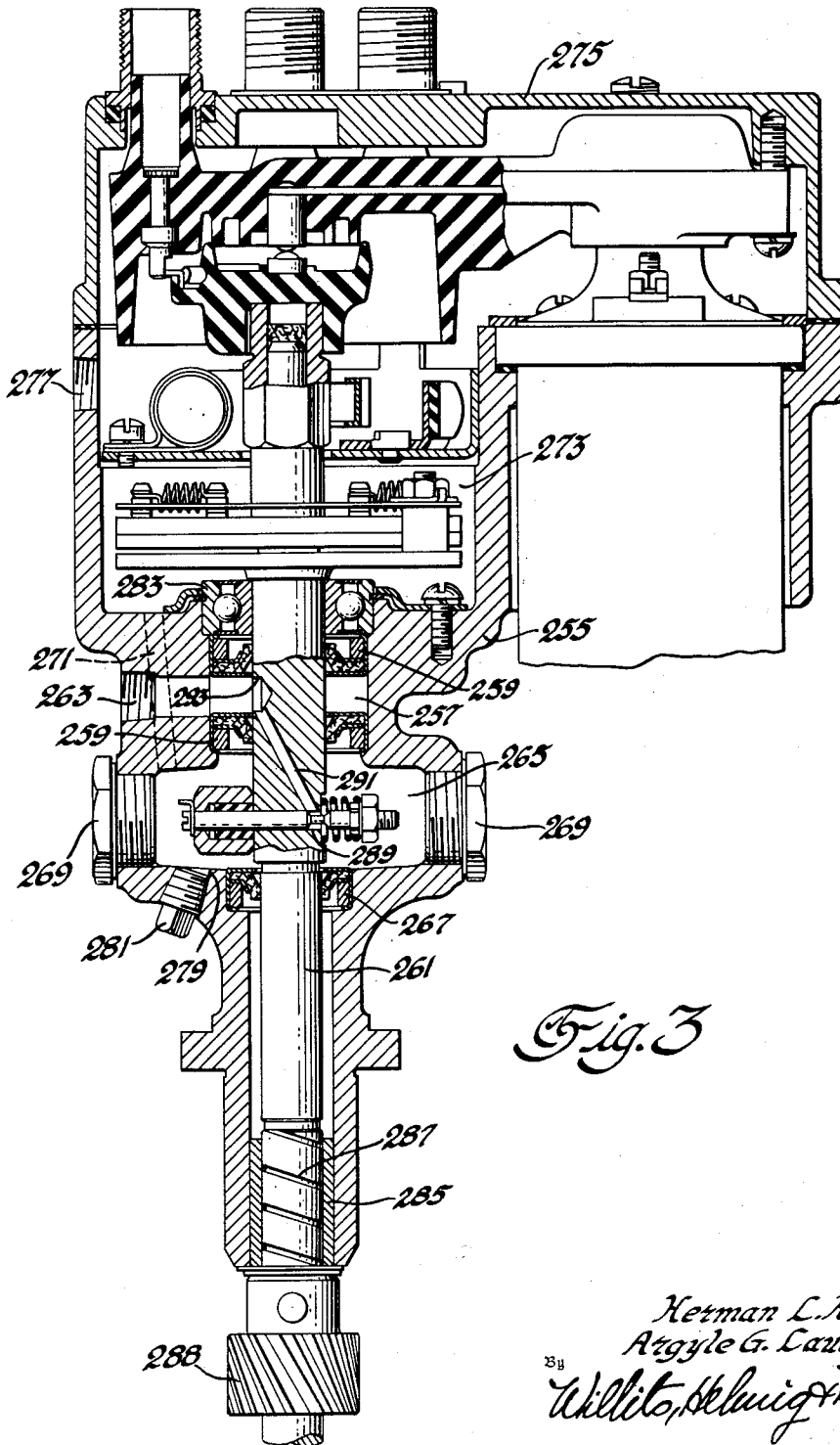


Fig. 3

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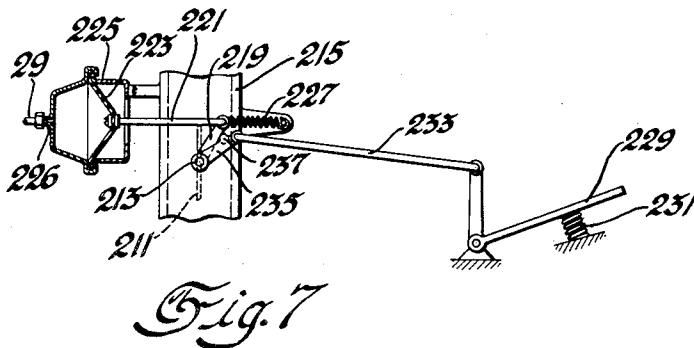
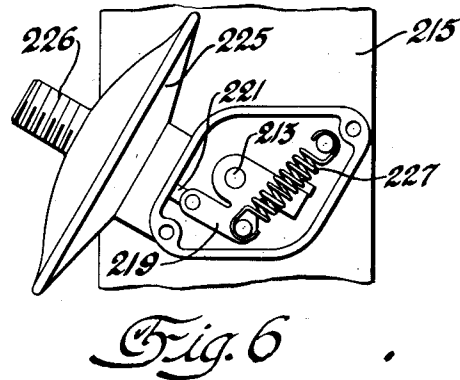
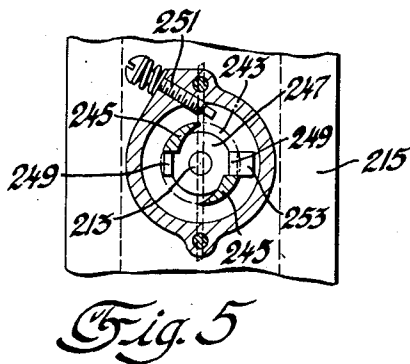
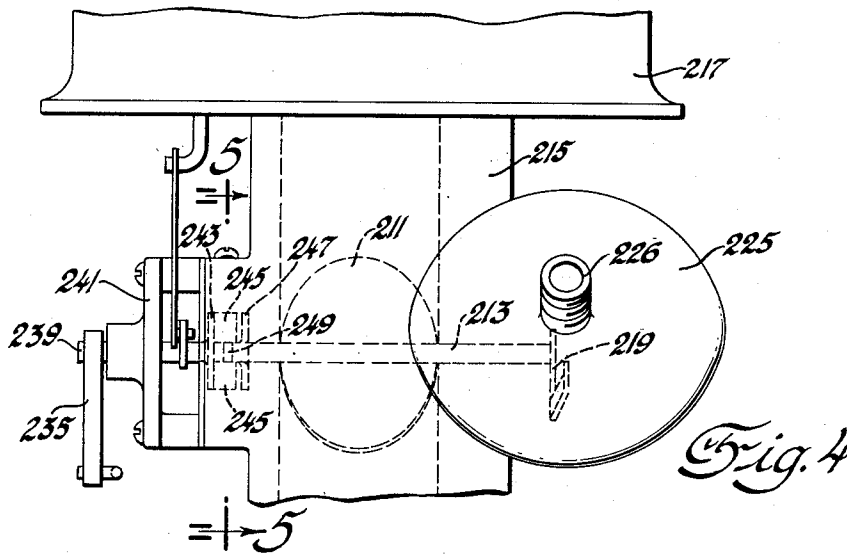
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,664,867

ENGINE GOVERNOR

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15 Claims. (Cl. 123—103)

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This invention relates to engine controlling means and more particularly to governor means for controlling engines of the internal combustion type.

The principal object of the present invention is to provide a simple and inexpensive engine governor and control means utilizing parts of existing engine driven mechanism and incorporating therein governing means acting in accordance with any one of a plurality of values of speed to accurately hold this value of speed without hunting of the governing means and control means.

The combination of control means by which this object is accomplished together with other novel features of the invention will become apparent by reference to the following detailed description and drawings illustrating different modifications of the invention.

Figure 1 of the drawings is a diagrammatic view of one modification of the invention with parts shown broken away and in section.

Figure 2 is an enlarged view of a portion of Figure 1 with parts shown broken away and in section.

Figure 3 is an enlarged cross sectional view similar to Figure 2 of a modified form of a portion of the control mechanism shown in Figure 2.

Figure 4 is a vertical elevation of a modification of a modified form of another portion of control means shown in Figure 1.

Figure 5 is a view taken on line 5—5 of Figure 1 with parts shown broken away and in section.

Figure 6 is a side elevation of a portion of the mechanism shown in Figure 5.

Figure 7 is a diagrammatic view of the control mechanism shown in Figures 4, 5, 6 and 7.

The control system shown in Figure 1 included governor throttle valve 1 of the butterfly type secured on a shaft 3 journaled in the vertical portion 5 of an engine intake manifold 7. A carburetor 9 having a conventional butterfly throttle valve, not shown, on a shaft 10 journaled in the carburetor and having an arm 11 secured thereto and manually operated by a link 13. The carburetor 9 is connected to the upper end of the vertical manifold portion 5 and an air cleaner 15 is mounted in the air inlet of the carburetor.

The governor valve shaft 3 has an arm 17 secured on one end and a rod 19 is pivoted at one end thereto and secured at the other end to the center of a circular flexible diaphragm 21 secured at the periphery in a cylinder 23 sup-

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ported on a projection of the intake manifold portion 5. A tension spring 25 is secured between another projection on the manifold portion 5 and the arm 17 and the spring 25 urges the governor valve 1 to the open position, as shown. One end of the cylinder 23 is open to atmosphere and the other end is connected to a suction conduit 27 connected to another suction conduit 29, shown connected at one end to a port in the manifold portion 5 on the carburetor side of the valve 1. A branch suction conduit 31 is connected between the conduit 29 to another port located on the engine side of the valve in the manifold portion 5. The other end of the suction conduit 29 is connected by means of a threaded reducing bushing 33 screwed in a port 35 extending radially through a wall of a cylindrical cavity portion 37 provided in the body 39 of an engine ignition distributor. An adjacent enlarged diameter, upper cylindrical cavity portion 41 is located immediately above and in communication with the cavity portion 37. The upper cavity portion 41 is provided with large diameter threaded ports 43 and 45 disposed diametrically in the wall of this cavity portion. A reducing bushing 47 is threaded into the port 43 and a plug 49 is threaded into the port 45. As shown in Figure 1 a conduit 51 is connected between the bushing 47 and a port in the outlet side of the air cleaner 15. The distributor body bore is shown extending axially with respect to the cavity portions 37 and 41 and a distributor shaft 53 is downwardly insertable through the bore and is rotatably mounted by means of a ball bearing 55 in the upper portion of the body bore and by a plain bearing 57 in the lower portion of the bore, as best seen in Figure 1. A spiral, driven gear 59 is secured on the lower end of the shaft 53 and a spiral driving gear 61 on the engine driven camshaft 63 within the engine crankcase 64 meshes with and rotates the gear 59. A helical oil return groove 65, see Figure 1, is provided in the shaft portion supported in the plain bearing 57 and an atmospheric vent port 67 is provided in the distributor bore immediately above the plain bearing 57 and opening into the body bore. The oil return groove 65 and vent port 67 prevents oil from the engine crankcase 64 from working upwardly along the distributor shaft 53.

A pair of distributor shaft seal assemblies, generally indicated by the character reference 69 in Figure 2, are provided in the lower cavity portion 37 to form a suction chamber between these assemblies and an upper atmospheric pressure

chamber in the upper cavity portion 41 above the seal assemblies.

Each of these seal assemblies are of conventional type and include a tubular housing 71 having internal end flanges with a synthetic rubber sealing washer 73 and annular spacers 75 and 77 held in compression between the end flanges of the seal housing 71. The flexible sealing washer 73 is provided with an axially flaring, sealing lip 78 the inner edge of which engages the distributor shaft 53 and the outer portion of which is engaged by a similarly flared portion of the spacer 75. It will be noted that the seal housings 71 are pressed into the upper and lower portions of the lower cavity 37 in the distributor body 1, above and below the suction port 37 to form a suction chamber between these seal assemblies. The flared sealing lip 78 of the upper sealing washer 73 extends upwardly and engages the shaft 53 and the lip 78 of the lower washer extends downwardly and engages the shaft and the intake manifold suction applied through the conduit 29 and suction port 35 draws these lips 84 into tight sealing contact with the distributor shaft 53. The upper seal assembly 69 seals off the upper cavity portion 41 from the suction chamber between the seal assemblies and the upper cavity 41 then serves as an atmospheric air chamber as it is connected by the conduit 51 directly to the outlet side of the air cleaner 15.

The distributor shaft 53 is shown provided with a diametrically drilled main passage 79 in the plane of the ports 45 and 43 of the upper atmospheric chamber and a branch passage 81 is drilled diagonally in the shaft from a radial counterbore 83 therein, in the suction chamber, to the main shaft passage 79 adjacent one end thereof.

A valve stem 85 has a synthetic rubber bushing 87 pressed on one end and a hollow cylindrical, centrifugal flywheel 89 is cushioned on the bushing 87 and is provided with an internal outer end flange 90 having an internal diameter slightly larger than the valve stem. A machine screw 91 having a washer 93 thereon, provided with a spring finger, is threaded into the end of the valve stem to prevent outward movement of the flyweight 89 off this end of the stem. A nut 95 is adjustably threaded on the other end of the valve stem 85 and a compression spring 97 is placed on the stem between a seat portion 99 on the nut 95 and a counterbore 101 in the adjacent end of the diametrical main shaft passage 79.

The stem 85 is provided with an annular groove 102 provided with end walls 103 and 105 tapering axially from the bottom to the shaft periphery. The spring 97 urges the flyweight 89 and rubber bushing 87 into contact with one end of the main shaft passage 79 and positions the annular groove 102 in the valve stem 85 in overlapping relation with the other end of the main passage 79 and adjacent upper end of the diagonal branch passage 81 communicating therewith in the distributor shaft 53.

The tapered end wall 103 of the groove 102, positioned outwardly of the end of the main shaft passage 79, has a smaller taper angle than the other end wall 105 shown registering with branch passage 81. These tapered end wall portions 103 and 105 permit easy entry of clean air at atmospheric pressure into the groove 102 and the ends of the shaft passages 79 and 81, when the shaft is rotating. The more gradually tapered end wall 103 of the groove 102 also provides an increasing restriction to the clean air flowing into the groove 102 and the adjacent ends of the shaft passages

79 and 81 as this wall of the stem groove is moved inwardly toward and into the main shaft passage and finally closes off the end of the main passage when the speed of rotation of the distributor shaft 53 and flyweight 89 increases to a value causing the centrifugal force acting radially outwardly on the flyweight to move the valve stem groove inwardly against the force of the spring 95. This initial decrease and final cutoff of clean air at atmospheric pressure through the passages 79 and 81 in the distributor shaft 53 to the lower suction chamber 37 in the distributor body and to the communicating suction conduits 27, 29 and 31 cause increased suction to be applied the diaphragm 21 in the cylinder 23 and a controlled rate of closure of the governor throttle 1 toward the closed position to limit the engine speed to a preselected value. The tapered end walls of the valve stem groove 102 have the same pressure applied thereto, and the groove moves inwardly into the main shaft passage 79 in the same direction as the clean air entering this passage. Inertia and frictional forces between the valve stem 85 and wall of the main shaft passage in the distributor shaft 53 applied thereto by the torsional vibration of the engine crank and camshafts are materially reduced and free sliding movement of the stem together with long life of the stem is provided. All of the above mentioned items provide a control system which accurately limits the engine speed to anyone of a plurality of desired values by adjustment of the force of both the spring 97 on the valve stem and the spring 25 urging the governor valve 1 to the open position without hunting of the valve stem and governor valve.

If desired, the governor throttle valve 1, shown in Figure 1, may be dispensed by using a lost motion connection, such as shown in Figures 4, 5, 6 and 7, between the carburetor throttle valve shaft and the conventional accelerator pedal.

As best seen in Figures 4, 6 and 7, the carburetor butterfly valve 211 is secured to a shaft 213 journaled in the carburetor body 215 and an air cleaner 217 is connected to the air intake side of the carburetor body. An arm 219 is secured on one end of the valve shaft 213 and is connected by means of a rod 221 to the diaphragm 223 in a cylinder 225 secured to a carburetor body and having a suction connection 226 adapted to be connected to the suction conduit 29 shown in Figures 1 and 7. A spring 227 is connected between the arm 219 and carburetor body to urge the valve 211 to the open position. An accelerator pedal 229 provided with a stiff return spring 231 and is connected by an arm 232 to a link 233 shown connected to an arm 235. A lost motion connection is positioned between the arms 219 and 235. As shown schematically in Figure 7, this lost motion connection includes a lug 237 on the arm 235, which is rotatably mounted on the throttle shaft 213. The lug 237 is urged into engagement with one side of the arm 219 secured on the shaft by the stiffer accelerator return spring 231. With the accelerator pedal 229 depressed to compress the accelerator return spring 231, as shown in Figure 7, the weak spring on the arm 219 causes this arm to be held in engagement with and follow movement of the arm 235 by the accelerator pedal 229 and cause opening of the throttle valve 211 by the spring 227. When suction is applied to the diaphragm 223 through the conduit 29 by action of the governor flyweight at a preselected engine speed, as previously described, the diaphragm 223 moves the arm 219 against the force of the spring 227 away from the lug 237 on the

lever 235 and moves the throttle valve 211 toward the closed position when the accelerator 229 is depressed. When foot pressure is relieved from the accelerator pedal 229 the stiff return spring 231 moves the link 233 to the left and thereby moves the lever 235 counterclockwise and the lug 237 thereon engages and moves the lever 219 counterclockwise against the force of the weaker spring 227 and causes the throttle valve 211 to be moved substantially the closed position to cause the engine to operate at idling speed in conventional manner.

The lost motion connection shown in Figures 4, 5 is similar to that shown in Figure 7 and comprises a stub shaft 239 journaled in a bearing member 241 secured to the carburetor body 215 with the stub shaft 239 positioned in end-to-end alignment with the throttle valve shaft 213. The lever 235 is secured to the outer end of the stub shaft 239 and a coupling flange 243 is secured to the inner end thereof. The inner end face of the flange 243 is shown in Figures 4 and 5, provided with diametrically spaced lugs 245, corresponding to the lug 237 on the lever 235 shown in Figure 7. Another coupling flange 247 is secured on the throttle valve shaft 213 adjacent the flange 243. The flange 247 is also provided with diametrically spaced lugs 249 corresponding to the side of the lever 219 engaged by the lug 237 on the lever 235 shown in Figure 7. The lugs 249 are moved into engagement with the lugs 247 by the spring 227 to cause opening of the throttle valve 211 when the accelerator pedal 229 is fully depressed and the accelerator return spring 231 moves the lugs 245 in the opposite direction into contact with the lugs 249 to move the throttle valve 211 to the idle position. As shown in Figure 5 an idle speed stop screw 251 is threaded in the bearing member 241 and is engaged by a radial extension 253 on one of the lugs 249 to move this extension 249 into contact with the idle stop screw 251 and position the throttle valve 211 in the idle position.

With an engine designed for under water operation the ignition distributor is slightly modified from that shown in Figure 1. The ignition distributor, for under water operation, shown in Figure 3, differs only from the one shown in Figure 1 in the following manner:

The distributor body 255 is provided with a cylindrical, upper suction chamber 257 formed by two seal assemblies 259 spaced axially apart in this chamber extending around the distributor shaft 261. A suction port 263 extends through the wall of the suction chamber 257 between the seal assemblies and is adapted to be connected to the suction conduit 29, shown in Figure 1. A lower, cylindrical atmospheric chamber 265 of larger diameter is provided in the body 255 and is sealed off by the shaft seal assembly 259 in the upper end of this chamber and another shaft seal assembly 267 in the lower end. The atmospheric chamber 265 is also provided with diametrically disposed ports in the wall, shown closed by threaded plugs 269. A clean air inlet passage 271 in the body 255 extends upwardly from the atmospheric chamber 265 to the upper, open end, ignition chamber 273 shown closed by a distributor cap 275. This ignition chamber 273 is provided with a clean air inlet port 277 for ventilation of this chamber and the port 277 is adapted to be connected to the outlet side of an engine air cleaner by a conduit 29 such as shown in Figure 1. The lower end wall of the atmospheric chamber 265 is provided with a threaded pressure opening 279 shown closed, by a pipe plug

281. The pressure opening 279 is adapted to be connected by a suitable conduit to an engine crankcase and supplied with air pressure above that of the atmosphere when operating under water so that substantially equal pressure will be maintained on opposite sides of the shaft seal assembly 267 adjacent the lower end of the distributor shaft 261. The shaft 261 is likewise shown rotatably supported at the upper end by a ball bearing 283, and supported at the lower end by a plain bearing 285 and the shaft portion within the bearing 285 is also provided with a helical oil return groove 287. When equal pressure is maintained on opposite sides of the seal assembly 267 the oil return 287 and seal 267 prevents entry of oil vapor into the distributor body 255. A driving gear 288 is secured to the lower end of the distributor shaft 261.

It will be noted that the distributor shaft 261 is likewise provided with a diametrical main passage 289 in the plane of the ports closed by the plugs 269 in the atmospheric chamber 265 and a diagonally upwardly extending branch passage 291 leads from a point adjacent one end of the main passage 289 to a counterbore 293 in the shaft 261 located in the suction chamber 257 between the seal assemblies 259. Either of the plugs 269 is removable to permit insertion of a valve stem assembly similar to that described with reference to the valve stem assembly shown in Figure 1. The valve stem assembly shown in Figure 7, also includes a valve stem having a rubber bushing pressed on one end, a centrifugal flyweight pressed on the bushing, a spring for the stem and an annular groove having end walls tapering outwardly from the bottom and cooperating with the adjacent ends of the main and branch passages 289 and 291 in the shaft in identical manner to that previously described with reference to the operation of the valve stem by the flyweight opposed by the stem spring.

Each of the above described engine control mechanisms have been found to cooperate in the manner described to provide means for accurately limiting the speed of internal combustion engines without overshooting, undershooting and hunting. The modification shown in Figure 3 enables the engine to be run under water when fording streams.

We claim:

1. A control device for an internal combustion engine having an intake passageway, a valve therein, resilient means urging the valve to an open position, a suction actuated device in communication with the intake passageway and operatively connected to the valve for moving the valve toward the closed position, said control device comprising a control valve body having a pair of chambers therein, each chamber having a port in the wall thereof and a bore extending through the chambers, a shaft rotatable in the bore in accordance with the speed of the engine and having a main passage extending diametrically therethrough within one chamber and a branch passage leading therefrom to the other chamber, valve means adapted to close said branch passage from said main shaft passage, said valve means comprising a valve stem slidable in the main shaft passage and having a centrifugal weight on one end and a groove spaced therefrom, resilient means urging the weight into contact with the shaft at one end of the main shaft passage and biased to position the groove in the stem in overlapping relation with the other end of the main shaft passage and with the ad-

acent end of the branch passage and means for placing one chamber port in fluid communication with the suction operated device and the other port serving as a fluid inlet port.

2. A control device for an internal combustion engine having an inlet passageway, an air cleaner at the entrance thereof and a governor valve in the passageway, resilient means urging the governor valve to the open position, a suction actuated device in communication with the inlet passageway on opposite sides of the governor valve and operatively connected therewith for moving the valve toward the closed position, said control device comprising a control valve body having a pair of chambers therein, each chamber having a port in the chamber wall, a bore extending through the chambers, a shaft rotatable in the bore in accordance with the speed of the engine and having a main passage extending diametrically therethrough within one chamber and a branch passage extending from the main passage to the other chamber, valve means adapted to close said branch passage from said main shaft passage, said valve means comprising a valve stem slidable in the main shaft passage and having a centrifugal weight on one end and a groove spaced therefrom, resilient means urging the weight into contact with the shaft at one end of the main shaft passage and biased to position the valve stem groove in overlapping relation with the other end of the main shaft passage and with the adjacent end of the branch passage, means for placing one chamber port in fluid communication with the engine air cleaner and means placing the other chamber port in fluid communication with the vacuum operated device.

3. A control device for an internal combustion engine having an intake passageway including an air cleaner on the inlet end, a governor valve on the engine side and a carburetor having a throttle valve in the passageway between the air cleaner and governor, resilient means urging the governor valve to the open position, a suction operated device in communication with the intake passageway on opposite sides of the governor valve and having a member connected to the governor valve for moving said valve toward the closed position, said control device comprising a valve body having at least two chambers therein and a bore extending therethrough, a shaft rotatable in the bore in accordance with engine speed having a main passage extending therethrough and located in one chamber and a branch passage leading from the main passage to the other chamber, conduit means connecting one chamber to the intake passageway adjacent the air cleaner, conduit means connecting the other chamber to the suction operated device, valve means adapted to close said branch passage from said main shaft passage, said valve means comprising a valve stem slidable in the main shaft passage having a groove therein, a resilient bushing on one end of the valve stem, a centrifugal weight supported on the bushing means secured to the stem for retaining the weight thereon and resilient means biased to position the groove in the valve stem in overlapping relation with one end of the main passage and with the adjacent end of the branch passage and urging the weight into contact with the other end of the main shaft passage.

4. A control device for an internal combustion engine having an intake passageway for the motive fluid of the engine, a valve in the passage-

way, resilient means urging the valve to the open position, and fluid operated means in communication with the intake passageway on opposite sides of the valve for moving the valve toward the closed position, said control device comprising a valve body having a pair of chambers therein, each chamber having a port in the wall thereof and a bore extending through the chambers, a shaft rotatable in the bore in accordance with the engine speed and having a main passage extending diametrically therethrough within one chamber and a branch passage leading from the main passage to the other chamber, slide valve means adapted to close said branch passage from said main shaft passage, said valve means comprising a valve stem supported in said main passage and having a groove and a centrifugal weight thereon, resilient means opposing movement of the centrifugal weight and biased to position the valve stem groove in overlapping relation with one end of the main passage and with the adjacent end of the branch passage, means for placing one chamber port in fluid communication with the intake passageway adjacent the inlet end and means for placing the other chamber port in fluid communication with the fluid operated means.

5. A control device for an internal combustion engine having an intake passageway, a valve therein, resilient means urging the valve to the open position, a suction operated device in communication with the intake passageway and operably connected to the valve for moving said valve toward the closed position, said control device comprising a control valve body having a pair of chambers therein, each chamber having a port in the chamber wall and a bore extending through the chambers, a shaft rotatable in the bore in accordance with engine speed and having a main passage extending diametrically therethrough within one chamber and a branch passage extending from the main passage to the other chamber, valve means adapted to close said branch passage from said main shaft passage, said valve means comprising a valve stem slidable in the main passage having a groove and a centrifugal weight on one end of the stem, resilient means urging the weight into contact with the shaft at one end of the main passage and biased to position the valve stem groove in overlapping relation with the outer end of the main passage and with the adjacent end of the branch passage leading therefrom, a fluid connection interconnecting the port of the chamber to which the branch passage extends with the suction operated device, the port in the other chamber being open to atmospheric pressure.

6. A control device for an internal combustion engine having an intake passageway, an air cleaner on the inlet thereof, a valve in the passageway, resilient means urging the valve to the open position, a suction actuated device in communication with the intake passageway and operatively connected with the valve for moving said valve toward the closed position, said control device comprising a valve body having a pair of chambers therein and a bore extending through the chambers, a shaft rotatable in the bore in accordance with the speed of the engine and having a main passage extending diametrically therethrough within one chamber and a branch passage extending from the main passage to the other chamber, valve means adapted to close said branch passage from said main shaft passage, said valve means comprising a

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valve stem slidable in the main passage having a groove and a centrifugal weight thereon, resilient means biased to position the valve stem groove in overlapping relation with one end of the main passage and with the adjacent end of the branch passage leading therefrom, a fluid connection interconnecting the chamber having the valve stem therein with the intake passage-way adjacent the air cleaner and a fluid connection interconnecting the other chamber with the suction operated device.

7. A control device for an internal combustion engine comprising a body having aligned small and large diameter bores in the ends thereof, a shaft bearing in each bore, shaft seals spaced apart in the large bore inwardly of the bearing therein, a shaft insertable through the bearings and seals and rotatable thereon and forming adjacent chambers in the body, said body having openings in the walls of one chamber thereof and closures for the body openings, said shaft having a main passage extending diametrically through the shaft in the plane of the body openings in one chamber and a branch passage extending from the main passage to the adjacent chamber, said adjacent chamber having an outlet port therein valve means insertable through the body openings and comprising a valve stem slidable in the main passage and having a groove adjacent one end thereof, an adjustable spring seat on the end of the stem adjacent the groove, a spring between the seat and one side of the shaft, a rubber bushing on the other end of the stem, a centrifugal weight supported on the bushing, and means on the stem in engagement with the weight to prevent outward movement of the weight relative to the stem, said spring biased to position the valve stem groove in registry with the outer end of the main shaft passage and branch passage and retaining the weight in contact with the opposite side of the shaft.

8. A control device for an internal combustion engine comprising a body having aligned small and large diameter bores in the ends thereof, a shaft bearing in each bore, shaft seals spaced apart in the large bore inwardly of the bearing therein, a shaft insertable through the bearings and seals and rotatable thereon and forming adjacent chambers in the body, said body having openings in the walls of one chamber thereof and closures for the body openings, said shaft having a main passage extending diametrically through the shaft in the plane of the body openings in one chamber and a branch passage extending from the main passage to the adjacent chamber, said adjacent chamber having an outlet port therein valve means insertable through the body openings and comprising a valve stem slidable in the main passage and having a groove adjacent one end thereof, an adjustable spring seat on the end of the stem adjacent the groove, a spring between the seat and one side of the shaft, a rubber bushing on the other end of the stem, a centrifugal weight supported on the bushing, and means on the stem in engagement with the weight to prevent outward movement of the weight relative to the stem, said spring biased to position the valve stem groove in registry with the outer end of the main shaft passage and branch passage and retaining the weight in contact with the opposite side of the shaft, the outer end wall of the stem groove tapering outwardly with respect to the adjacent end of the main shaft passage.

9. A control device for an internal combustion

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tion engine comprising a body having aligned small and large diameter bores in the ends thereof, a shaft bearing in each bore, shaft seals spaced apart in the large bore inwardly of the bearing therein, a shaft insertable through the bearings and seals and rotatable thereon and forming adjacent chambers in the body, said body having openings in the walls of one chamber thereof and closures for the body openings, said shaft having a main passage extending diametrically through the shaft in the plane of the body openings in one chamber and a branch passage extending from the main passage to the adjacent chamber, said adjacent chamber having an outlet port therein, valve means insertable through the body openings and comprising a valve stem slidable in the main passage and having a groove adjacent one end thereof, an adjustable spring seat on the end of the stem adjacent the groove, a spring between the seat and one side of the shaft, a rubber bushing on the other end of the stem, a centrifugal weight supported on the bushing, and means on the stem in engagement with the weight to prevent outward movement of the weight relative to the stem, said spring biased to position the valve stem groove in registry with the outer end of the main shaft passage and branch passage and retaining the weight in contact with the opposite side of the shaft, said groove having end walls tapering axially outwardly from the bottom to restrict the flow of fluid through and direct the fluid into the main and branch passages.

10. A control device for an internal combustion engine comprising a housing having a pair of axially spaced chambers formed therein, a shaft extending through said chambers, shaft seals spaced axially of said shaft to prevent fluid leakage between said chambers, each of said chambers having at least one opening therein, said shaft having a main passage extending diametrically therethrough in one of said chambers and a branch passage extending from the said main shaft passage to the other chamber, valve means adapted to close said branch passage from said main shaft passage and comprising a valve stem slidable in said diametrical shaft passage and extending therethrough, a resilient cushion on one end of said stem without said main passage, a centrifugal weight on said cushion, resilient means seated between the other end of said stem and said shaft, said stem having a groove thereon intermediate the ends thereof, said resilient means biasing said stem to position the valve stem groove in overlapping relation between the end of said main shaft passage remote from said centrifugal weight and the end of said branch passage communicating with said main shaft passage.

11. In an internal combustion engine ignition and speed control device of the type which includes a housing rotatably supporting a shaft driven at one end from the engine and having engine ignition means therein at the other end of the shaft and a centrifugally unbalanced control valve intermediate the driven end and ignition end of the shaft for controlling fluid communication between spaced chambers in the housing through fluid passages in the shaft, the combination wherein said centrifugally unbalanced control valve comprises a valve stem having a passage connecting groove intermediate the ends thereof, a resilient bushing on one end thereof, a centrifugal weight surrounding the bushing and resilient means on the other end of

said stem opposing movement of said stem by said weight.

12. In combination with an engine driven shaft having a cross-bore extending generally transversely therethrough and at least one fluid branch passage communicating with said cross-bore, a centrifugally unbalanced governor valve extending through and slidable in said cross-bore, said governor valve comprising a valve stem having a groove intermediate the ends thereof, a resilient bushing on one end of said valve stem without said cross-bore, a governor weight surrounding said bushing and resilient means on the other end of said valve stem opposing movement of the valve stem by said centrifugal weight, said resilient means being biased to position the said stem groove in fluid controlling relationship with said cross-bore and said fluid branch passage.

13. A control device for an internal combustion engine having an intake passageway, a valve therein, a fluid pressure actuated device operatively connected to the valve, said control device including a housing having a pair of chambers therein and an axial bore extending centrally therethrough, a shaft rotatable in said bore in accordance with the speed of the engine and having a main passage extending diametrically therethrough within one of said chambers and a branch passage leading therefrom to the other of said chambers, valve means controlling fluid communication between said chambers through said main shaft passage and said branch passage, said valve means comprising a valve stem slidable in the main shaft passage and having a centrifugal weight on one end and a groove spaced therefrom intermediate the ends of said stem, means urging the weight into contact with the shaft at one end of the main shaft passage and biased to position the said groove in the stem in over-lapping relation with the other end of the main shaft passage and with the adjacent end of the branch passage and means for placing one of said housing chambers in fluid communication with the said fluid pressure operated device.

14. A centrifugal governor valve comprising in combination, a shaft portion adapted to be driven by a rotating agency in accordance with the rotational speed thereof, said shaft portion constituting a valve body and having a walled valve bore extending generally transversely therethrough and a pair of spaced fluid ports defined in the walls thereof each communicating with said valve bore, a slide valve including a valve stem in slidable engagement with the walls

of the valve bore, a governor weight on one end of said valve stem without said valve bore and balance means on the other end of said valve stem opposing movement thereof by said governor weight, said valve stem having a reduced portion thereon and being biased by said balance means to position the said reduced portion thereof in fluid controlling relationship with said fluid ports.

15. In an internal combustion engine ignition and speed control device of the type which includes a housing rotatably supporting a shaft driven at one end from the engine and having engine ignition means therein at the other end of the shaft and a centrifugally unbalanced control valve intermediate the driven end and the ignition end of the shaft for controlling fluid communication between spaced chambers in the housing through fluid passages in the shaft, the combination wherein said centrifugally unbalanced control valve comprises a walled valve body with a valve bore extending generally transversely through said shaft and having a pair of spaced fluid ports defined in the walls thereof each communicating with the valve bore and the said fluid passages in said shaft and a valve stem in slidable engagement with the walls of the valve bore, said valve stem having a reduced portion intermediate the ends thereof, a governor weight on one end of the valve stem without said valve bore and balance means on the other end of said valve stem biasing the valve stem to position the reduced portion thereof in fluid controlling relationship with the said fluid ports.

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2,381,131	Mallory	Aug. 7, 1945
2,381,550	Mallory	Aug. 7, 1945
2,393,556	Olson et al.	Jan. 22, 1946
2,399,080	Udale	Apr. 23, 1946
2,415,510	Mallory	Feb. 11, 1947
2,416,110	Mallory	Feb. 18, 1947
2,432,166	Mallory	Dec. 9, 1947