Aug. 9, 1955 F. J. RILEY 2,714,880

CONSTANT SPEED REGULATOR

Filed March 24, 1950 2 Sheets-Sheet 1

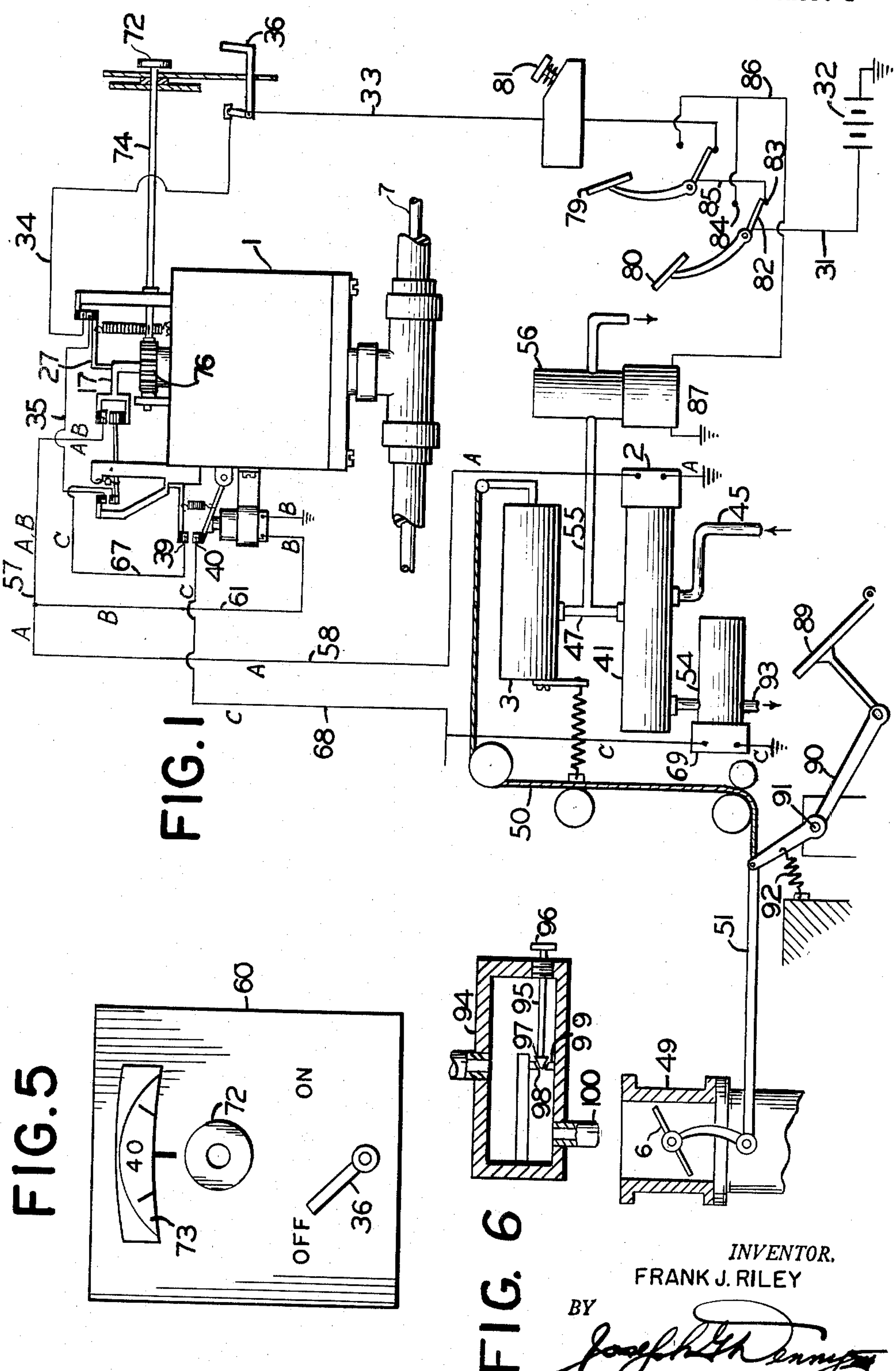


FIG. 1

FIG. 5

FIG. 6

INVENTOR.
FRANK J. RILEY

BY

HIS ATTORNEY

CONSTANT SPEED REGULATOR

Filed March 24, 1950 2 Sheets-Sheet 2

FIG. 4

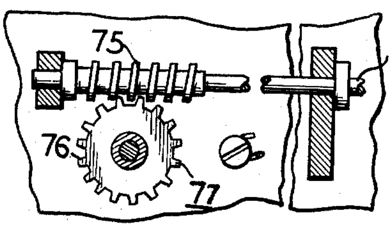


FIG. 3

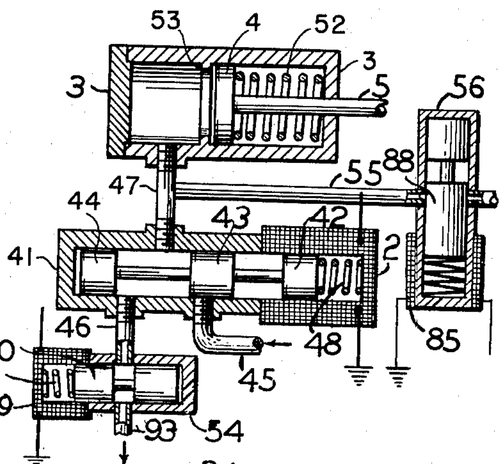
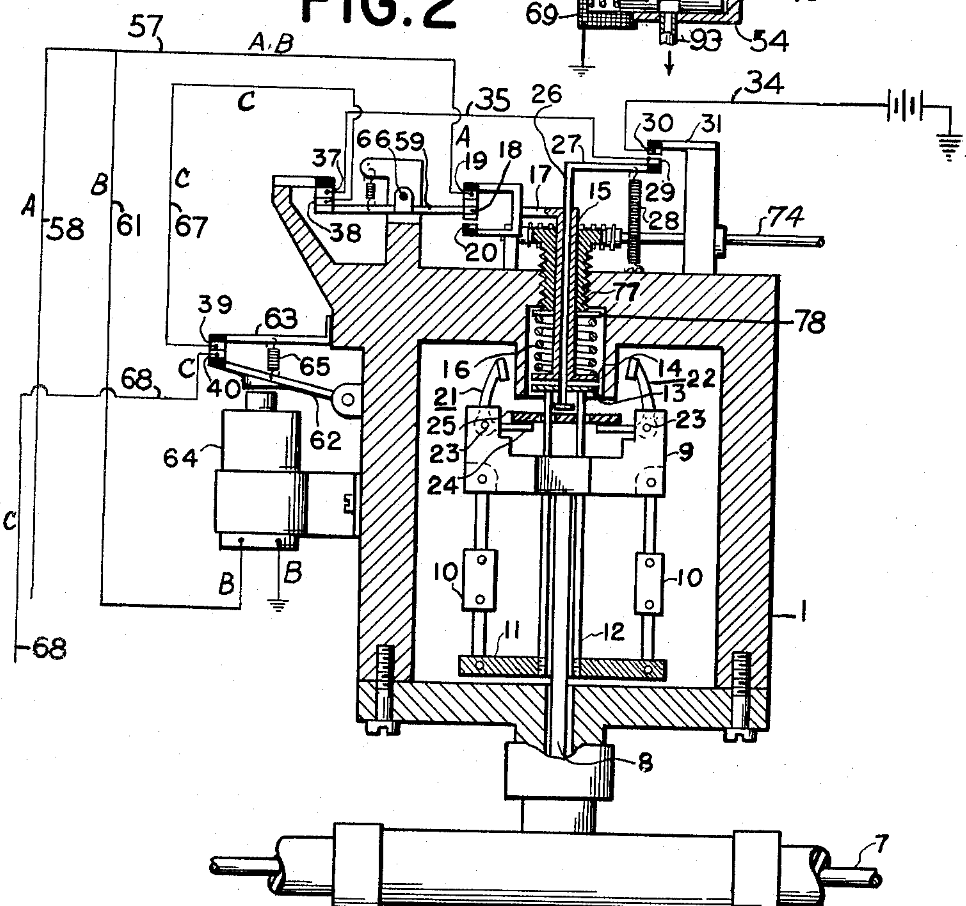


FIG. 2



INVENTOR.
FRANK J. RILEY
BY
Joseph G. Denny
HIS ATTORNEY

2,714,880
Patented Aug. 9, 1955

2,714,880

CONSTANT SPEED REGULATOR

Frank J. Riley, Biloxi, Miss.

Application March 24, 1950, Serial No. 151,646

3 Claims. (Cl. 123—103)

My invention is an improved speed regulator for internal combustion engines and in its preferred form comprises an accelerator actuated by fluid pressure under the control of a solenoid and governor.

My improved speed regulator or auto constant is particularly useful on heavy duty automobiles, busses or trucks where a constant speed is desired over long distances. My invention provides means whereby any desired speed can be set before or after the vehicle is in motion and which can be varied at will without the stopping of the vehicle. It also provides safety features whereby the regulator unit is cut out or overridden whenever the brakes are applied, the gears shifted, the manual accelerator used for short bursts of speed or the car stopped. Thus, there is no necessity for altering the conventional driver reflexes as the regulator unit will not be in operation when starting, braking or stopping the car.

The leading objects of my invention are to reduce driver fatigue; to provide means for a constant speed at all times regardless of the terrain; to provide means for quickly and easily setting any speed desired; to incorporate the speed regulation unit in the standard car without the necessity of changing driver reflexes; to provide means for eliminating the searching or hunting characteristic often found in regulator units of this general type; and to provide means for allowing the driver greater ease and freedom of movement.

The principles and characteristic features of my invention and the manner of making and constructing and using my improved speed regulator or auto constant will further appear in the accompanying drawing and the following description explaining the best modes in which I have contemplated using such principles.

In the drawings, Fig. 1 is a partly diagammatic view of my speed regulator; Fig. 2 is an elevational view, partly in cross-section, of the governor unit of the speed regulator; Fig. 3 is an enlarged cross-sectional view of the liquid portion of my speed regulator; Fig. 4 is an enlarged plan view of the speed adjustment gearing of my speed regulator; Fig. 5 is a view of the dashboard unit of my speed regulator and Fig. 6 is a cross-sectional view of the needle valve adjustment unit which may be added to my speed regulator.

As illustrated in the drawings, my preferred form of speed regulator or auto constant comprises a governor 1 by which the flow of fluid from a convenient source, such as oil from a crank case in an internal combustion engine, is varied and controlled by the energization of solenoids 2 and 69 located at the ends of cylinders through which the fluid may pass on its way to or from the crank case. The pressure of the fluid within the cylinder 3, having a pressure sensitive piston 4 connected with the piston rod 5 and butterfly valve 6, determines the speed of the motor and vehicle.

The speedometer cable 7 acting through a T connection turns a spindle 8 on which is mounted the rotor 9 located within the governor 1. Suspended from the rotor 9 are links which support the fly weights 10 which are also

linked to the outer ends of the rotor 11 joined to rods 12 located on opposite sides of the spindle 8. A disk 13 is mounted on the other end of the rods 12 and opposes a disk 14 flanged on the end of the tube 15.

When the rotor 9 is turned the fly weights 10 are thrown outwardly by centrifugal force which force acts on the fly weights 10 tending to pull the rotors 9 and 11 together. As the rotor 9 is not vertically movable, the rotor 11 must necessarily move upwardly toward the rotor 9 and in so doing the disk 13 is moved into engagement with the opposing disk 14 and it further tends to force upward the tube 15 against the opposition of the spring 16. This movement causes the contact 19 on the end of the bifurcated arm 17, joined to the tube 15, to move out of contact with the end 18 of the arm 59 thus breaking an electrical circuit as will be hereafter explained. Continued upward movement of the tube 15 and bifurcated arm 17 brings the end of the arm 20 on the lower half of the bifurcated arm 17 into contact with the end 18. Continued upward pressure causes the arm 59 to turn about its pivot point 66 thereby separating the contact points 37 and 38 which will also interrupt an electrical circuit as will be hereafter explained.

The centrifugal force resulting from any movement of the rotor 9 causes the legs 22 of the bell cranks 21, mounted in the upper portion of the rotor 9, to turn outwardly about their pivot points 23 thus moving the legs 24 of the bell cranks and the floating disk 25 upwardly against the flanged end of the rod 26—27 which in turn moves in an upward direction against the tension of the spring 28 anchored to the housing of the governor 1. As but a slight upward movement of the rod 27 brings its contact point 29 into engagement with the contact point 30, formed on the end of the arm 31 mounted on the governor housing 1, the contact points 29, 30 will remain closed as long as the rotor 9 is kept turning by the speedometer cable 7.

The liquid, preferably consisting of oil from the crank case, flows through a conduit 45 to a cylinder 41 containing a piston having an attraction head 42 and fluid control heads 43 and 44 so spaced each from the other that the inlet conduit 45 is fully open when the return conduit 46 is fully closed. The movement of the heads 42, 43, 44 is controlled by the energization of the solenoid 2 located in one end of the cylinder 41 as indicated in Fig. 3. When the inlet conduit 45 is uncovered, oil flows through the cylinder 41 through the conduit 47 thence into the cylinder 3 which contains the accelerator piston 4. As soon as the oil has filled the cylinder 3, it exerts a pressure on the piston 4 thereby tending to move the piston 4 against the resistance of a spring 52 and such movement varies the opening of the butterfly valve 6 located in the carburetor 49, to which the piston 4 is linked by means of the piston rod 5, the flexible member 50 and the accelerator rod 51.

Whenever the solenoid 2 is de-energized, the spring 48 biases the piston heads 42, 43 and 44 away from the solenoid 2 thereby closing the inlet conduit 45 and uncovering the outlet conduit 46 which permits the oil to return to the crank case via the conduit 46 and the cylinder 54. Under special conditions, as will be explained more fully hereafter, the oil may return to the crank case by passing through the conduit 55 to the clutch cylinder 56 and thence to the crank case. Obviously, as soon as either of these return passages are opened, the pressure in the cylinder 3 is reduced permitting the spring 52 to bias the piston 4 back toward the stop 53.

The electrical circuit is energized from some convenient source, such as the car battery 32, and as long as the main electrical circuit is energized, the solenoid 2 keeps open the inlet conduit 45 thereby allowing pressure to be exerted against the piston 4 and thus keep the butterfly valve 6 open to a relatively wide degree and thereby increase the speed of the vehicle. That is to say, after the speed regulator has been placed in operation by turning the switch 36 to the On position the electric circuit is fully energized from the battery 32 to at least the contact point 37. Energy flows from the battery 32 through the conductors 31, 85, 33 and 34 to the contact points 30, 29 thence through the conductor 35 to contact point 37. If the vehicle speed is below that set on the dashboard, the pivotal bar 59 will be in the position illustrated in Fig. 2. Thus, the flow of energy will continue from contact points 37, 38 through what may be designated circuit A which comprises the bar 59, the contacts 18, 19, conductors 57, 58, the solenoid 2 and the ground line. Under these conditions oil will continue to exert a pressure against the piston 4 in the cylinder 3 and the speed of the vehicle will tend to increase.

It will be noted that the conductor 57 is intercepted by the conductors 61 and a second circuit designated circuit B parallels circuit A. Assuming that the conductor 57 is energized, electricity in circuit B flows from the conductor 57 through conductor 61 through a holding magnet 64 and thence to the ground. The holding magnet 64 is energized during the entire time that solenoid 2 is energized as both coils are fed from a common point. When energized, the holding magnet 64 attracts to itself the pivoted arm 62 on the end of which is a contact point 40 which is thus kept separated from its corresponding contact point 39 on the end of the arm 63 mounted on the governor housing.

Should the speed of the vehicle rise slightly above that set on the dashboard 60, the speed of the rotor will, as heretofore explained, cause the contact point 19 on the bifurcated arm 17 to break its contact with the point 18 thus rupturing both circuits A and B. When circuit A is interrupted, solenoid 2 is de-energized and the flow of oil to the cylinder 41 will be interrupted and the oil in the cylinder 41 will be allowed to flow back to the crank case by means of the conduit 46. However, as soon as circuit B is interrupted the holding magnet 64 releases the arm 62 which will then be biased by the spring 65 toward the arm 63 whereupon contact points 39 and 40 will meet and will close a new circuit C. Energy in circuit C will flow from the contact points 37, 38 through the conductor 67 to contact points 39, 40, thence through conductor 68 to the solenoid 69, mounted in the end of the cylinder 54 and thence to the ground. The solenoid 69 upon being energized will attract to itself the piston 70 and thereby block the flow of oil attempting to return to the crank case via the conduit 46. Thus the pressure in cylinder 3 will be slightly, though not greatly reduced and consequently a slight change will be made in the butterfly valve setting with resultant diminution of the motive force. This slight reduction in automotive force may not be sufficient to slow the rotor 9 and thereby halt the upward movement of the tube 15 and bifurcated arm 17, in which event end of the arm 20, on the lower half of the bifurcated arm 17, will engage the end 18 and cause the arm 59 to turn about its pivot point 66, as illustrated in Fig. 1, which will separate the contacts 37, 38 and break the recently established circuit C. When circuit C is broken, solenoid 69 is de-energized whereupon the spring 71 biases the piston 70 to its normal position in the cylinder 54 which permits the oil from the conduit 46 to flow freely to the crank case. Normal position is illustrated in Fig. 3.

As the oil flows from cylinders 3 and 41, the piston 4 promptly returns to its initial position which naturally tends to slow the vehicle unless it be on a down grade. As soon as the speed of the vehicle falls to that set on the dashboard control unit 60 circuit C is re-established and the piston 70 prevents any additional oil from returning to the crank case. Should the vehicle speed fall below the speed set on the dashboard control unit circuits A and B are re-established and circuit C is broken whereupon the full or partial cycle may again be repeated.

The action of the circuit C and the holding solenoid 70 in large measure tends to smooth out speed adjustments and eliminates the "hunting" effect which is otherwise apparent.

The speed setting may be made in any convenient manner but, as shown, I use a thumb knob 72 and indicator dial 73 on the dashboard. The thumb knob 72 is connected by flexible shafting 74 to a worm 75 which engages the teeth 76 cut into the screw 77 engaging and passing through the governor housing 1 as shown in Figs. 2 and 4. The screw 77 abuts a disk 78 against which the spring 16 rests. By turning the screw 77 down against the spring 16 the force required to move the disk 14 and tube 15 increases and thus the speed setting is varied.

The driver must necessarily have complete control of his vehicle at all times and I have therefore provided means for by-passing the speed regulator as may be necessary or desirable. Thus, the brake pedal 79 and clutch pedal 80 are equipped with microswitches which are in series, electrically, with the dashboard switch 36, the floor board switch 81 and the make and break contacts 29—30, 37—38, and 18—19. The use of either the brake pedal or clutch pedal interrupts the flow of energy into the conductor 33 and thus de-energizes the solenoid 2 and eliminates the use of the speed regulator. This is to say, by depressing the clutch pedal 80 the arm 82 moves away from the point 83 into contact with the point 84. The flow of energy from the battery 32 and conductor 31 into the conductor 85 is thus interrupted and an optional circuit comprising conductor 31 and 86, the solenoid 87 and a ground line is established. Energization of the solenoid 87 in the clutch cylinder 56 attracts the piston 88 and permits the oil to flow easily and freely from the cylinder 3 through the conduits 47 and 55 to the crank case. The conduit 55 provides an additional return route to the crank case thereby allowing the throttle valve 6 to be closed promptly. Depression of the brake pedal 79 likewise interrupts the flow of energy to conductor 33 and establishes the circuit comprising the conductors 31, 85 and 86 together with the solenoid 87 provided, of course, that the clutch pedal has not already been depressed. Even should the clutch solenoid 87 fail, nonetheless, the throttle valve 6 will be rapidly retarded when either the brake or clutch pedal is used as the main circuit will be interrupted and the oil in the cylinder 3 will return via conduits 47 and 46 to the crank case.

I also provide a floor board switch 81 in series with the dash board switch 36 which may be conveniently used as a cutout whenever desired. Switch 36 or 81 is equally effective for eliminating the speed regulator but it is expected that the switch 81 will be used whenever the operation of the speed regulator is to be cut out for a short period.

It is to be noted also that the main circuit will be interrupted and the operation of the speed regulator eliminated whenever the rotor 9 is stopped and the contacts 29—30 separated. Thus, should the vehicle be brought to a stop by the use of the brake pedal and the brake and clutch pedals thereafter be released, the speed regulator will not thereupon begin to operate as the rotor 9 would be at a standstill and the circuit would remain broken at points 29—30 until such time as the vehicle should get under way. Provision may also be made for the gap between points 29 and 30 to be sufficiently great and the spring 28 to be sufficiently strong so that contact between the points 29 and 30 will not be made until the vehicle reaches a speed of, say, fifteen miles per hour. At this speed, under the conditions above noted, the speed regulator will take over and bring the vehicle's speed up to that set on the dial 73. Likewise, the gear shift may be included in the electric circuit in order that the circuit only be closed and the speed regulator in operating order when the vehicle is in high gear.

Should the occasion arise when a burst of speed is needed, as when passing another vehicle, the driver need only depress the accelerator pedal **89** in order to override the speed regulator. Thus, the accelerator pedal **89** is linked with the bell crank **90** one end of which joins the flexible member **50** and the accelerator rod **51**. By depressing the accelerator pedal **89** the bell crank moves clockwise about the pivot point **91** against the bias of the spring **92** thereby drawing the accelerator rod **51** in the direction of the pedal **89** which thereby opens wider the throttle valve **6**. While the vehicle is proceeding at the increased speed the electric circuits A, B and C will all be open as heretofore explained. When the pedal **89** is released, the spring **92** will promptly bias the pedal toward idling position and the vehicle will then slow down until it reaches the speed set whereupon circuit C will be established and the speed regulator will function as before.

In order to balance out and control the speed of acceleration and de-acceleration, I may insert an adjustable restrictor in both the inlet conduit **45** and the outlet conduit **93**. This restrictor, as illustrated in Fig. 6, consists of a container **94**, a needle **95** having a thumb adjustment **96**, and a closure member **97** fitting into the seat **98** formed in the structure **99**. By proper adjustment, the flow of oil coming from the pressure line **100** may be materially reduced and thus the pressure in the cylinder **3** would tend to build up somewhat more slowly than it might otherwise do. To balance out the system it would be necessary to install a similar restrictor in the return conduit. With these restrictors in the system the clutch solenoid system providing the bypass **55**, must be added for the quick return of the throttle valve to idle position whenever the brake or clutch is used, otherwise there may be some delay or lag in closing the throttle valve **6**.

The speed setting on the dial **73** may be varied at will regardless of whether the speed regulator is in operation or not and regardless of whether or not the vehicle is stopped or under way.

Having described my invention, I claim:

1. In a speed regulator for an internal combustion engine, a fuel delivery passage containing a valve for controlling the flow of fuel through said passage, a source of liquid under pressure, a primary cylinder containing a liquid actuated, spring-biased piston, a secondary cylinder having a solenoid and a liquid controlling piston and connected to said primary cylinder and to said source of

liquid under pressure, a tertiary cylinder connected to a discharge reservoir and to said secondary cylinder and having a solenoid and a liquid discharge control piston, a source of electric current, an electric circuit leading from said source of current through the solenoid of said secondary cylinder, a second electric circuit leading from said source of current through the solenoid of said tertiary cylinder, means providing operative connection between the piston of said primary cylinder and said valve for moving said valve toward open position upon closing of said first named electric circuit and toward partly closed position upon opening of said first named electric circuit and toward closed position upon opening of both of said electric circuits and a speed responsive means connected to said electric circuits for opening and closing said circuits.

2. In a speed regulator for an internal combustion engine, a primary cylinder containing a liquid chamber and a piston therein, a plurality of secondary cylinders containing pistons having heads spaced one from the other by piston rods and liquid chambers between said spaced heads, liquid under pressure within said internal combustion engine, conduits connecting said cylinders and carrying said pressurized liquid therebetween, and speed responsive means for controlling the flow of liquid to and from said liquid chambers.

3. In a speed regulator for an internal combustion engine, a fuel delivery passage containing a valve for controlling the flow of said fuel and means for controlling the position of said valve in said passage, said means including a primary cylinder containing a spring biased piston operatively connected to said valve, a secondary cylinder and a pair of tertiary cylinders each containing a spring biased, magnetically responsive piston, a source of liquid under pressure, conduits connecting said liquid with said primary and secondary cylinders and other conduits connecting said primary cylinder with said tertiary cylinders, and magnetic means actuated by a speed responsive device for shifting the pistons in said secondary and tertiary cylinders for adjusting the piston in said primary cylinder.

References Cited in the file of this patent

UNITED STATES PATENTS

1,578,882	Earle	Mar. 30, 1926
2,127,454	Wolfe et al.	Aug. 16, 1938
2,260,576	Maybach	Oct. 28, 1941
2,361,206	Hoppe	Oct. 24, 1944