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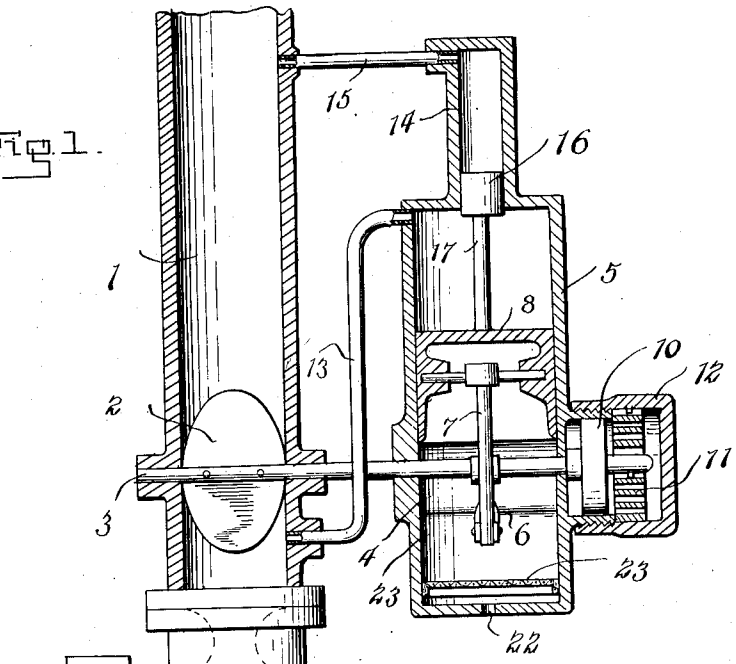
F. E. DUNN ET AL

ENGINE GOVERNOR

Filed June 29, 1927

Fig. 1.



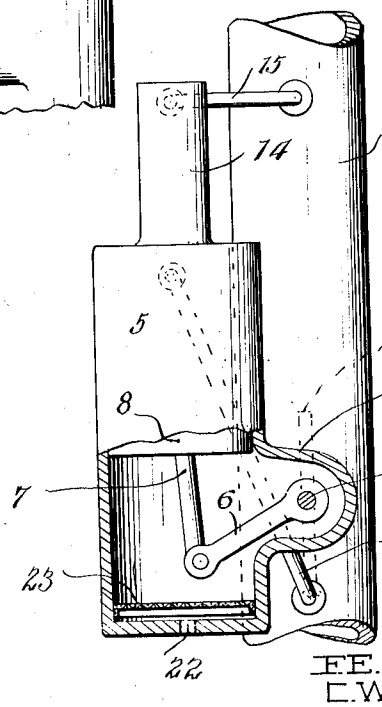


Fig. 2.

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UNITED STATES PATENT OFFICE.

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ENGINE GOVERNOR.

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This invention is a device intended primarily for governing the speed of an internal combustion engine but which may be advantageously employed as an automatic volumetric regulator in connection with pumps, blowers, compressors and other mechanisms. The invention is illustrated in the accompanying drawing and will be hereinafter fully set forth.

In the drawing:

Figure 1 is a vertical section, with parts in elevation, of a device embodying our invention, and

Fig. 2 is a detail sectional elevation taken at a right angle to Fig. 1.

The reference numeral 1 indicates the fuel conduit or pipe extending from the carbureter to the intake manifold of an internal combusiton engine, the carbureter being indicated conventionally at 100 and being of any preferred construction. Within the conduit or pipe 1 is a governor valve 2 which is preferably of the butterfly type and has its stem or governor shaft 3 extended beyond one side of the pipe to be journaled in a housing 4 which forms an offset from a cylinder 5 which is supported in any convenient manner upon the engine alongside the conduit 1. Within the housing 4 the valve stem or shaft 3 is formed with or has secured thereto a crank arm 6 extending into the cylinder 5 and having pivoted to its free end the lower end of a pitman 7 rising within the cylinder and connected to the piston 8 which may be of any approved construction and fits closely within the cylinder but may reciprocate therein. At one end of the housing 4, the shaft or stem 3 is mounted in an anti-friction bearing, indicated conventionally at 10, and to the adjacent extremity of the shaft or stem is secured one end of a volute spring 11, the other end of which is secured to a cap 12 secured over the bearing 10. The spring tends to hold the valve 2 normally open and exerts a constant torque upon the governor shaft at a given speed of the engine regardless of the load. The upper end of the cylinder 5 is in communication through a pipe 13 with the fuel conduit 1 at a point below the governor valve 2, and rising from the upper end or head of the cylinder is a smaller cylinder 14 which has its upper end in communication through a pipe 15 with the fuel conduit 1 at a point above the governor valve. A piston 16 of less diameter than the piston 8 but of proper diameter to fit closely within the cylinder 14 is mounted in said cylinder and is connected rigidly with the piston 8 by a piston rod 17, as shown. In the lower end of the cylinder 5 is a breather opening 22, and above the said opening a screen or air filter 23 is secured within the cylinder.

When the engine is running under no load, the governor valve 2 is partly open and it is held in that position by the action of the spring 11. The drawing shows the pistons at the lower limit of their movement with the governor valve wide open indicating that the engine is at rest or working under full load. Should the speed of the engine increase, due either to reduction of load or opening of the throttle and consequent increased flow through and from the carbureter, suction through the fuel conduit is increased, and this suction also acts through the pipe 15 on the piston 16 so that it tends to lift the said piston. The suction is also communicated to the cylinder 5 through the pipe 13 and acts on the piston 8 so that it tends to lift said piston. The lifting action of the pistons, of course, swings the crank arm 6 upwardly so that the shaft or valve stem 3 is rocked and the governor valve 2 turned toward closed position, the extent of the turning movement of the valve being proportionate to the suction created by the engine. Should the speed of the engine slacken, the suction through the fuel conduit and, consequently, the suction on both of the governor pistons would be reduced so that the spring 11 and the weight of the pistons would then act to lower the pistons and open the governor valve to admit more gas to the engine. At heavy loads, the suction on the upper smaller piston decreases, while the suction on the lower larger piston increases, offsetting the loss on the smaller piston and maintaining a substantially constant balance upon the governor spring regardless of the position of the governor valve.

With governors of the suction type, as heretofore constructed, it was found that the power line, or the line representing the increase of suction, rises very slowly for several degrees but rises very rapidly toward the extreme closing point of the valve. In order to balance the suction on the piston at any point of opening of the valve, under these conditions, it is necessary to employ a system of levers to utilize the power of the spring or provide a specially designed conical spring, the larger coils of which would cease to function as the spring was compressed but it has

not been commercially feasible to produce such a spring. Our device avoids the use of cams and levers and simplifies the spring requirements.

We have demonstrated that the suction in the chamber below the valve is of lower average power than the suction in the chamber above the valve and as one falls the other rises, and we provide a proportionately larger piston to be acted upon by the suction from below the valve thereby obtaining a nearly horizontal power line which can be almost perfectly balanced by the use of a common spiral spring, the differential pressures across the valve varying so as to compensate for the change in vacuum occasioned by the operation of the valve.

Having thus described the invention, we claim:

1. The combination with a fuel conduit, and a governor valve therein, of alined cylinders disposed adjacent the fuel conduit, means for establishing communication between one of said cylinders and the fuel conduit at a point below the governor valve, means for establishing communication between the upper cylinder and the fuel conduit at a point above the governor valve, pistons in the cylinders subjected to the suction through the fuel conduit, means operatively connecting the pistons with the governor valve, and yieldable means acting on the last-mentioned means in opposition to the suction.

2. The combination with a fuel conduit, and a governor valve therein, of alined cylinders of unequal capacities disposed adjacent the conduit, pipes connecting the larger cylinder with the fuel conduit below the valve and the smaller cylinder with the conduit above the valve, pistons in the respective cylinders, and operative connections between the pistons and the governor valve.

3. The combination of a fuel conduit, a governor valve therein, a shaft carrying said valve and extending to one side of the conduit, a housing for said shaft, a cylinder connected with said housing, a lesser cylinder rising from the upper end of the first-mentioned cylinder and in communication therewith, a crank on the said shaft extending into the lower cylinder, a pitman connecting said crank with the piston in the lower cylinder, a rod connecting the pistons in the two cylinders, a pipe establishing communication between the upper end of the lower cylinder and the fuel conduit at a point below the governor valve, a pipe establishing communication between the upper end of the lesser cylinder and the fuel conduit at a point above the governor valve, and means acting on the shaft to yieldably hold the valve in opened position.

4. The combination with a fuel conduit, and a governor valve therein, of reciprocating elements mounted at one side of the fuel conduit, passages connecting said elements with the conduit to apply to said elements the suction through the conduit at opposite sides of the valve, and operative connections between said elements and the valve to actuate the valve whereby differential pressures across the valve will vary to compensate for change in vacuum caused by operation of the valve.

In testimony whereof we affix our signatures.

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