

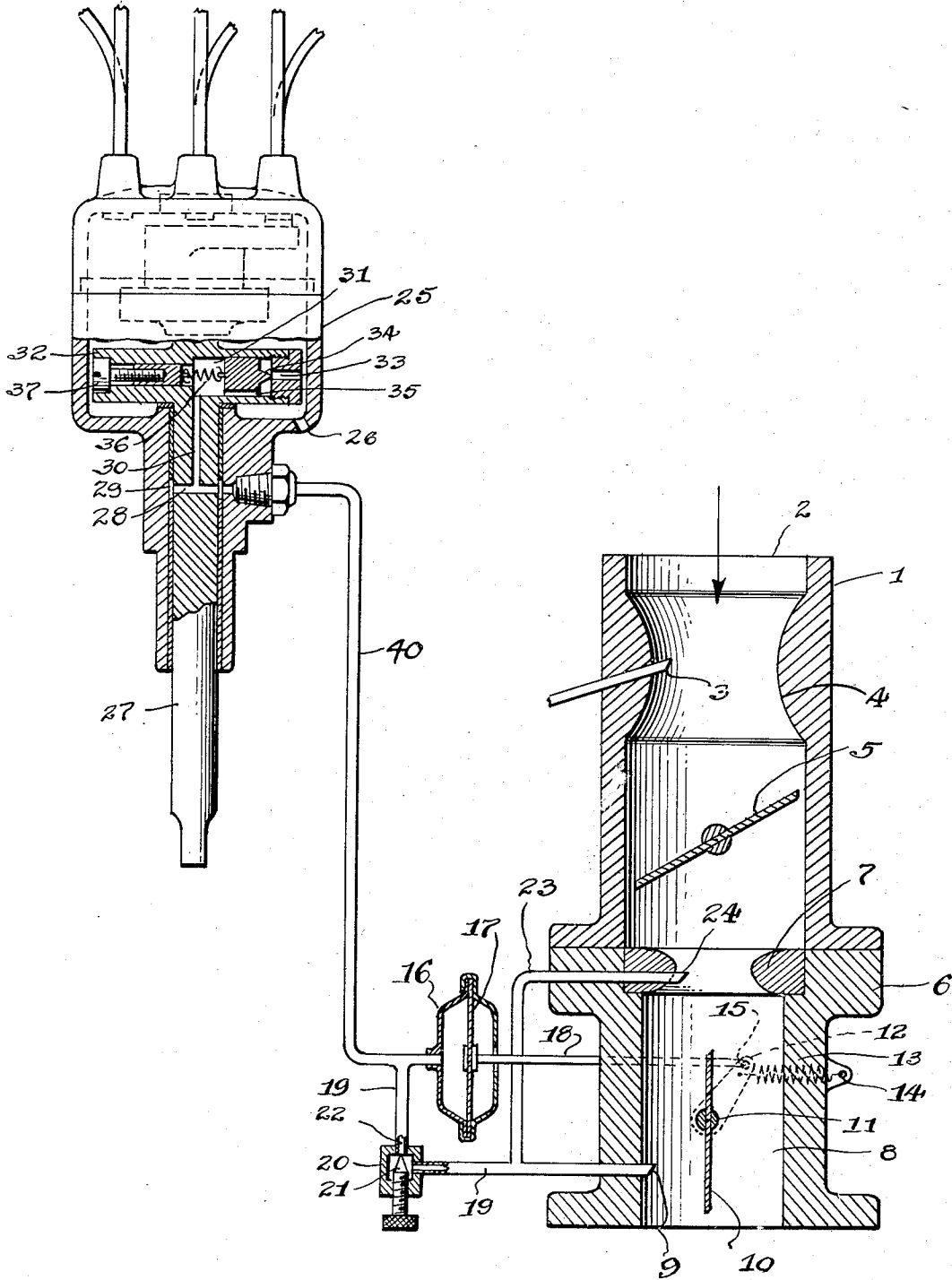
Feb. 6, 1945.

M. MALLORY

2,368,995

GOVERNOR

Filed Jan. 21, 1943

INVENTOR.
W. J. J.

INVENTOR
Marion Mallory

BY *Barnes, Kisselle, Laughlin & Rairch*
Attorneys.

UNITED STATES PATENT OFFICE

2,368,995

GOVERNOR

Marion Mallory, Detroit, Mich.

Application January 21, 1943, Serial No. 473,062

9 Claims. (Cl. 123—103)

This invention relates to a governor for controlling the speed of an internal combustion engine.

It is the object of this invention to produce a governor for controlling the speed of an internal combustion engine which is considerably more efficient in operation and more simple in structure than governors heretofore known.

The invention also contemplates a governor which is particularly well adapted for installation between the carburetor and engine of an engine burning carburetted mixture.

The drawing is a vertical section partly in elevation showing my governor used with a carburetor.

Referring more particularly to the drawing there is shown a carburetor 1 having an air inlet 2, a fuel nozzle 3, a venturi 4 and a manually controlled throttle valve 5 of the conventional butterfly type.

The governor comprises a housing 6 mounted at the outlet end of the carburetor and between the carburetor and the engine. The ordinary engine has a carburetor with a venturi large enough to pass sufficient charge at extreme high engine speeds. Such a carburetor, due to its being so large, has very low suction at low engine speed. The suction created by fluid flow through the venturi of such a large carburetor would be too low to control my type of governor valve, especially if the engine is to be governed at low speed.

For example, supposing an engine had a carburetor on it that was large enough to permit a full charge to flow into the engine at 3000 R. P. M. engine speed and it was desired to use my governor principle to govern the engine at 1000 R. P. M. If the throttle valve 5 in the carburetor was opened wide at low engine speed, the air would flow in so freely there would be little vacuum created by Venturi suction, as well as little vacuum created in the passageway 8 between the venturi and engine. Naturally, there would be not enough suction created in the suction device 16 to overcome spring 13 and start governor valve 10 to move towards a closed position until the engine reached a speed far beyond the 1000 R. P. M. at which it was to be governed.

In order to obtain a higher suction so that my governor will start to close at an earlier engine speed, I provide the inlet end of housing 6 with a choke ring 7. The inside diameter of this ring can be varied to suit the conditions at which the engine speed is to be governed. The lower the

governor speed, the smaller will be the inside diameter of the choke ring 7, and vice versa. This choke ring maintains a higher velocity past orifice 24, as well as higher suction at orifice 9 even though the carburetor 1 is large and both the carburetor throttle 5 and governor throttle 10 are wide open.

If it were not for the choke ring, and the engine was governed at 1000 R. P. M., the speed of the engine perhaps would run up to 2000 R. P. M. before enough suction was created in the intake passageway to start the governor valve 10 to close. The speed would drop to 1000, but there would be the 1000 overrun speed, which would be objectionable as well as cause the speed of the engine to surge.

Even though conduit 23 and orifice 24 are omitted, very good results can be obtained by using only conduit 19 and orifice 9, because the choke ring 7 maintains sufficient vacuum at low engine speeds to start the governor valve 10 to close and prevents excessive surging of the governor valve 10, because the choke ring 7 keeps the vacuum around orifice 9 more stabilized. For example, the choke ring 7 prevents a complete collapse of the vacuum around orifice 9 when the governor valve 10 and throttle valve 5 are wide open. However, I prefer using orifice 24 and conduit 23 in conjunction with conduit 19 and orifice 9 because with this setup the governor valve 10 operates much smoother due to the fact that when throttle valve 5 and governor valve 10 starts toward an open position, the vacuum around nozzle 9 will not drop so rapidly. The velocity by orifice 24 prevents such a rapid drop in the vacuum.

The governor housing is provided with a governor throttle valve 10 of the butterfly type fixed on shaft 11 which is journaled in housing 6, arm 12 is fixed on one end of shaft 11 on the outside of housing 6. A tension spring 13 having one end fixed to the housing 6 as at 14 and the other end fixed to the arm 12 as at 15 tends to hold valve 10 open. Valve 10 is also unbalanced so that the manifold suction or velocity of the fuel mixture flowing through the passageway 8 tends at all times to open or hold valve 10 open. In other words, the area of the portion of valve 10 below shaft 11, as shown in the drawing, is greater than the area of that portion of valve 10 above the shaft 11.

The governor is provided with a suction device comprising a housing 16, a flexible diaphragm 17 connected to arm 12 by rod 18. The inside of housing 16 to the right of diaphragm 17 is open

to atmosphere whereas the inside of housing 16 to the left of the diaphragm 17 communicates with orifice 9 by means of conduit 19 and communicates with atmosphere through conduit 40.

An adjusting valve comprising a housing 20 and a needle valve 21 is mounted in conduit 19 for controlling the vacuum impressed on the suction device 16. The needle valve 21 has a screw or threaded fit in housing 20 so that it can be adjusted relative to orifice 22 to control the effective size of that orifice. Preferably, but not necessarily, conduit 19 is also connected into Venturi or choke ring 7 by conduit 23. It should be noted that adjusting valve 21 is inserted in conduit 19 between suction device 16 and orifices 9 and 24. Thus, by screwing valve 21 inwardly to restrict orifice 22, the vacuum impressed on diaphragm 17 is decreased, and by screwing valve 21 outwardly to enlarge the effective size of orifice 22, the vacuum impressed on diaphragm 17 is increased.

Communication between suction device 16 and atmosphere through conduit 40 is controlled by a centrifugal valve. The centrifugal valve includes a housing 25, the interior of which communicates with atmosphere through orifice 26, a rotary shaft 27 which may be the ignition distributor shaft, a diametrical passageway 28 in the shaft which communicates with a circumferential passageway 29 at all times. Passageway 28 communicates with axial passageway 30 in shaft 27 and with chamber 31 in valve housing 32 rigidly mounted on the upper end of shaft 27 to rotate therewith. Shaft 27, of course, is rotated in accordance with the speed of the engine. Chamber 31 is provided with an orifice 33 which communicates with the inside of housing 25 and with atmosphere through port 26. This orifice 33 is controlled by a conical valve 34 provided with a groove 35 to permit communication between passageway 30 and port 33. Tension spring 36 tends at all times to hold valve 34 off seat 33. The tension of spring 36 can be varied by turning of adjusting screw 37. The centrifugal valve is shown in my copending application Serial No. 466,961.

The operation of this device is as follows: The velocity of the fuel mixture flowing through choke ring 7 and past orifice 9 creates a vacuum in conduit 19. Vacuum is increased where a branch conduit 23 is used to connect conduit 19 with orifice 24 in choke ring 7. However, this vacuum in conduit 19 is not impressed upon suction device 16 as long as centrifugally unbalanced valve 34 is open to bleed conduits 19 and 40 to atmosphere. Valve 34 is set to close at a predetermined engine speed depending upon the speed at which it is desired to govern the engine. As soon as the engine reaches its governed speed, valve 34 does close orifice 33 but only momentarily so that enough suction or vacuum will be created in the suction device to start valve 10 moving towards closed position. As soon as valve 10 moves toward closed position the vacuum increases in conduit 30 and chamber 32 and holds valve 33 a slight distance off from its seat. The centrifugal force of the rotating valve 34 tends at all times to close the valve but this force is counteracted by the tension of spring 36 plus the suction acting on valve 34. The velocity or vacuum imposed on valve 10 as it closes, due to the fact that valve 10 is unbalanced, opposes the vacuum impressed on diaphragm 17 which tends to close valve 10. This arrangement prevents valve 10 from plastering closed and also prevents surging in the speed of the engine.

It is also important that the suction orifice 9,

as well as orifice 24 when used, are located in the intake passageway 8 through which all of the fuel mixture charge for the engine passes. All of this charge creates a much higher suction on the orifices 9 and 24 than would be the case if only a portion of the charge flowed by these orifices.

As the suction device 16 swings valve 10 toward closed position, the charge to the engine is cut down to maintain the governed speed. If the speed of the engine begins to decrease due to an increased load, the manifold vacuum will drop and valve 34 will also move further open to increase the effective area of orifice 33 air bleeding suction device 16. This causes a decrease in the vacuum in suction device 16 and permits tension spring 13, plus the engine or manifold pull on unbalanced valve 10, to move valve 10 toward open position to again increase the charge flowing into the engine.

I claim:

1. A governor for controlling the speed of an internal combustion engine including an intake passageway, a throttle valve mounted in said passageway, a suction device connected to said valve for controlling the opening and closing of the same, a conduit connecting the suction device into the intake passageway on the engine side of said throttle valve, an air bleed directly to atmosphere for said suction device, said air bleed being independent of said intake passageway, a centrifugally unbalanced valve for controlling said air bleed to atmosphere and arranged to shut off the air bleed when the engine reaches a predetermined speed whereby a vacuum is impressed on the suction device which tends to move the throttle valve toward closed position, a restriction in said conduit between the intake passageway and the suction device adjustable to control the vacuum impressed upon said suction device, and a second conduit connected into said first mentioned conduit between the restriction and the intake passageway and connected into the intake passageway on the atmosphere side of said throttle valve.

2. A governor for controlling the speed of an internal combustion engine including an intake passageway, a throttle valve mounted in said passageway, a suction device connected to said valve for controlling the opening and closing of the same, a conduit connecting the suction device into the intake passageway on the engine side of said throttle valve, an air bleed directly to atmosphere for said suction device, said air bleed being independent of said intake passageway, a centrifugally unbalanced valve for controlling said air bleed to atmosphere and arranged to shut off the air bleed when the engine reaches a predetermined speed whereby a vacuum is impressed on the suction device which tends to move the throttle valve toward closed position, said governor valve being unbalanced so that fluid flow through the intake passageway and engine suction tends to open said valve in opposition to the vacuum impressed upon the suction device which tends to close the throttle valve and a second conduit connecting said suction device with the intake passageway on the atmosphere side of said throttle valve.

3. In combination with an internal combustion engine having a carburetor and a throttle valve therein, a governor including a housing having a passageway therethrough mounted between the carburetor and the engine, a governor valve mounted in the passageway in said housing, a suction device, a Venturi restriction in the pas-

sageway of said housing on the atmosphere side of the governor valve, an orifice in said venturi, a second orifice in the housing on the engine side of said governor valve, conduits connecting said orifices with said suction device, a valve mounted between said orifices and the suction device adjustable to control the communication between said orifices and the suction device, a connection between said suction device and the governor valve whereby the vacuum impressed on said suction device tends to close said governor valve, an air bleed to atmosphere for said suction device, and a centrifugally unbalanced valve controlling said air bleed, said centrifugally unbalanced valve tending to close said air bleed when the engine reaches its governed speed whereby the suction device tends to move said governor valve toward closed position.

4. In combination with an internal combustion engine having a carburetor provided with a throttle valve, a governor in the form of a housing having a passageway therethrough and mounted between the engine and the carburetor, a governor valve in said housing, a suction device connected to said governor valve, a conduit connecting the suction device with the intake passageway on the engine side of said governor valve whereby the manifold suction acts on said suction device and tends to close said governor valve, an air bleed to atmosphere for said suction device including a centrifugally unbalanced valve arranged to close when the engine reaches a predetermined speed whereby the manifold vacuum impressed on the suction device tends to move said governor valve toward closed position, a restriction in said governor housing on the atmosphere side of the governor valve for increasing the suction acting on said suction device, and a second conduit communicating with the suction device and having one end terminating in said restriction whereby suction created by the fluid flow through said restriction is also impressed on the suction device to control the governor valve.

5. A governor for controlling the speed of an internal combustion engine comprising a governor valve housing, a governor valve in said housing, a suction device for controlling said valve, an orifice in said housing located between the governor valve and the engine, an orifice in said housing located between said governor valve and atmosphere, a conduit connecting said orifices together, a second conduit connecting said first named conduit to the suction device, a restriction in said second conduit, a third conduit connecting the suction device to atmosphere and a centrifugal valve controlling said third conduit and tending to close the same to atmosphere when the engine reaches its governed speed whereby the suction device tends to move said governor valve toward closed position.

6. In combination with an internal combustion engine having a carburetor provided with a passageway therethrough, a throttle valve in said carburetor passageway, a governor in the form of a housing having a passageway therethrough and arranged to be positioned between the carburetor and the engine, the said passageways forming an intake passageway for the motive fluid, a governor valve in said housing, a suction responsive device, a mechanical connection between the suction device and the said governor valve, a conduit connecting the suction device with the passageway in the governor housing on the engine side of the governor valve whereby the intake passageway suction acts on said suction device and tends

to close said governor valve, a restriction positioned in the said intake passageway between the carburetor throttle valve and the governor valve in the form of a member having an opening therethrough smaller than the cross sectional area of the carburetor passageway whereby the vacuum is raised in the intake passageway on the engine side of said restriction to thereby increase the suction acting on said suction device, said restriction creating a vacuum in the intake passageway on the engine side of said restriction even when the governor valve and the throttle valve are substantially wide open.

7. In combination with an internal combustion engine having a carburetor provided with a passageway therethrough, a throttle valve in said carburetor passageway, a governor in the form of a housing having a passageway therethrough and arranged to be positioned between the carburetor and the engine, the said passageways forming an intake passageway for the motive fluid, a governor valve in said housing, a suction responsive device, a mechanical connection between the suction device and the said governor valve, a conduit connecting the suction device with the passageway in the governor housing on the engine side of the governor valve whereby the intake passageway suction acts on said suction device and tends to close said governor valve, a restriction positioned in the said intake passageway between the carburetor throttle valve and the governor valve in the form of a member having an opening therethrough smaller than the cross sectional area of the carburetor passageway whereby the vacuum is raised in the intake passageway on the engine side of said restriction to thereby increase the suction acting on said suction device, and a second conduit communicating with the suction device and having one end terminating in the intake passageway upstream from said governor valve and in the area subjected to the vacuum created by said restriction whereby when the vacuum decreases in the intake passageway on the engine side of the governor valve due to the governor valve moving toward wide open position the velocity of the motive fluid flowing through said restriction will maintain a sufficiently high vacuum around the end of the second conduit which terminates in the intake passageway to control the opening of the governor valve and effect a smooth opening of the same.

8. In combination with an internal combustion engine having a carburetor provided with a passageway therethrough, a throttle valve in said carburetor passageway, a governor in the form of a housing having a passageway therethrough and arranged to be positioned between the carburetor and the engine, the said passageways forming an intake passageway for the motive fluid, a governor valve in said housing, a suction responsive device, a mechanical connection between the suction device and the said governor valve, a conduit connecting the suction device with the passageway in the governor housing on the engine side of the governor valve whereby the intake passageway suction acts on said suction device and tends to close said governor valve, an air bleed to atmosphere for said suction device including a centrifugally unbalanced valve tending to close said air bleed when the engine reaches its governed speed, a restriction positioned in the said intake passageway between the carburetor throttle valve and the governor valve in the form of a member having an opening therethrough smaller than the cross sectional area of the carburetor passageway

whereby the vacuum is raised in the intake passageway on the engine side of said restriction to thereby increase the suction acting on said suction device, said restriction creating a vacuum in the intake passageway on the engine side of said restriction even when the governor valve and the throttle valve are substantially wide open.

9. In combination with an internal combustion engine having a carburetor provided with a passageway therethrough, a throttle valve in said carburetor passageway, a governor in the form of a housing having a passageway therethrough and arranged to be positioned between the carburetor and the engine, the said passageways forming an intake passageway for the motive fluid, a governor valve in said housing, a suction responsive device, a mechanical connection between the suction device and the said governor valve, a conduit connecting the suction device with the passageway in the governor housing on the engine side of the governor valve whereby the intake passageway suction acts on said suction device and tends to close said governor valve, an air bleed to atmosphere for said suction device including a centrifugally unbalanced valve tending to close said

5 air bleed when the engine reaches its governed speed, a restriction positioned in the said intake passageway between the carburetor throttle valve and the governor valve in the form of a member having an opening therethrough smaller than the cross sectional area of the carburetor passageway whereby the vacuum is raised in the intake passageway on the engine side of said restriction to thereby increase the suction acting on said suction device, and a second conduit communicating with the suction device and having one end terminating in the intake passageway upstream from said governor valve and in the area subjected to the vacuum created by said restriction whereby 10 when the vacuum decreases in the intake passageway on the engine side of the governor valve due to the governor valve moving toward wide open position the velocity of the motive fluid flowing through said restriction will maintain a sufficiently high vacuum around the end of the second conduit which terminates in the intake passageway to control the opening of the governor valve and effect a smooth opening of the same. 15 20 25

MARION MALLORY.