

April 4, 1961

T. F. CRAMER
GOVERNOR

2,977,945

Filed Feb. 2, 1959

3 Sheets-Sheet 1

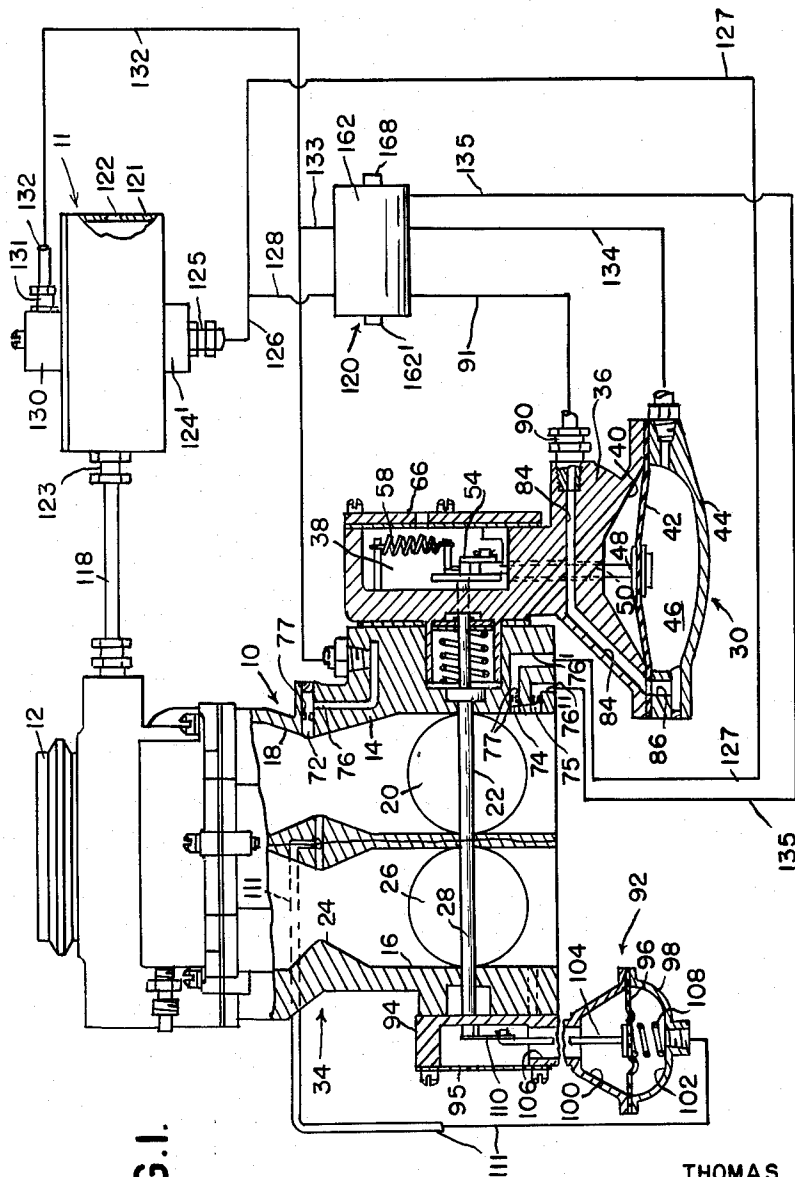


FIG. 1.

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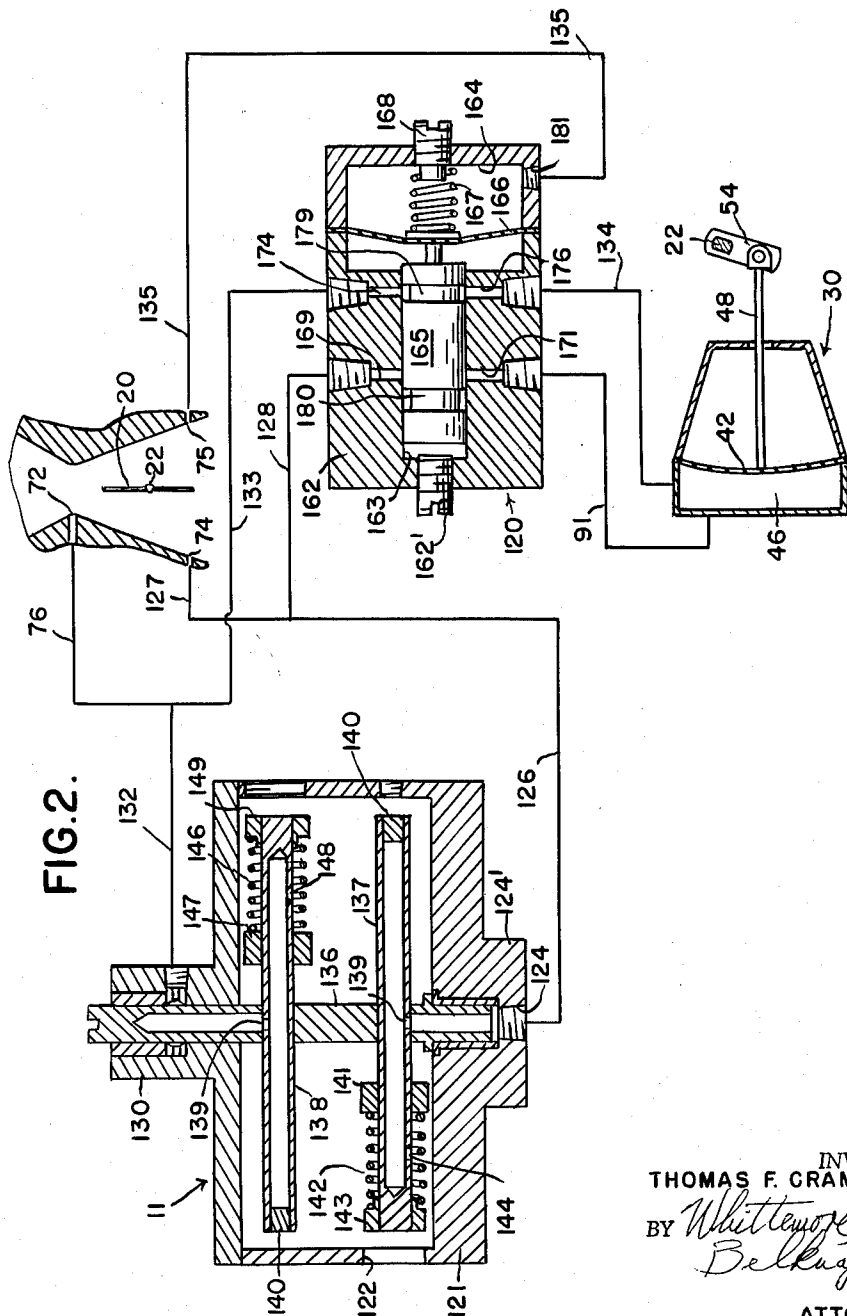
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3 Sheets-Sheet 2



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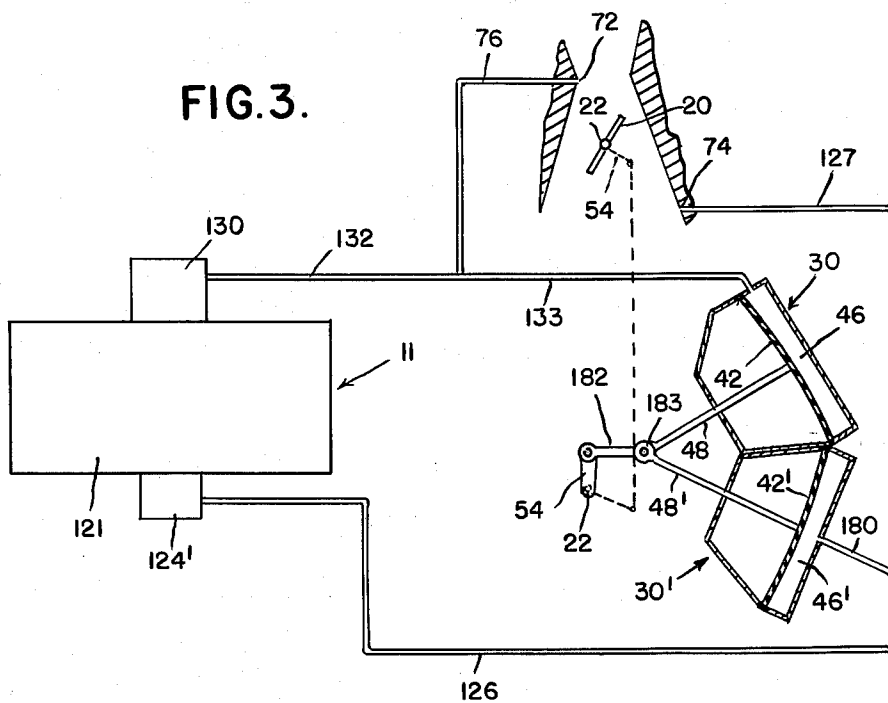
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3 Sheets-Sheet 3



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GOVERNOR

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23 Claims. (Cl. 123—103)

The present invention relates to improvements in a governor for the speed control of an internal combustion engine, in particular an engine employing a multiple stage carburetor system. The improvement enables an instantaneous response of the governor in regulating speed through the entire governor unloading range, under the successive but independent control actions of venturi and manifold vacuum.

Vacuum responsive governors heretofore employed or proposed operate in general on one or another of the theories that venturi vacuum alone should be used to accomplish the governing action, that manifold vacuum alone should be used, or that venturi and manifold vacuum should be intercommunicated and used in combination, so as to create a so-called "governor vacuum," which in turn is applied to a diaphragm or like vacuum responsive unit in order to accomplish the governing action.

The present invention provides a governor in which venturi vacuum is employed by itself to start the governing action, and in which manifold vacuum, isolated during all times, from the venturi vacuum, serves to complete the governing action. Each of these effects is carried out quite independently of the other. This, in general, is for the reason that venturi vacuum alone does not suffice to operate the governor over the entire governing range. Hence, the invention contemplates its supplementation by independent manifold vacuum in the spread of the range in which the venturi source is insufficient for the purpose.

It is a general object of the invention to provide an improved governor, separately sensitive to venturi and manifold vacuum effects as described, in which, in one embodiment, the independent application of these effects to a vacuum responsive unit is controlled by a suitable valve, such as a spool type, acting in conjunction with an improved centrifugal spinner valve. In another embodiment the improvement involves a system featuring conjointly acting diaphragm sub-assemblies coupled with the spinner valve to accomplish an independent, staged application of the two sources of vacuum.

In further explanation of the above, a multiple stage carburetion system comprises an operator-controlled primary throttle plate assembly and a venturi vacuum controlled secondary throttle plate assembly which is operable to supply additional combustible mixtures to the combustion chambers at high air flows. A great many vacuum governing systems for carburetors of this type employ a single centrifugal spinner valve operating in response to engine speed to variably bleed air into vacuum lines connected to both the venturi and manifold vacua. However, in an engine in which vacuum available for governor cut-off is not particularly great, the higher venturi vacuum is reduced by the bleeding effect of the manifold pick-up; and it is therefore more difficult to govern successfully at the lower engine speeds without the use of a vacuum pump.

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It is therefore another general object of the invention to provide improvements in a governor system, of the type employing pick-ups located both at the venturi and below the carburetor throttle (for manifold vacuum), in which the two vacuum effects are applied independently, and without in any degree bleeding into each other. This is done through the agency and control of an improved dual spinner valve which isolates the two vacuum sources from one another. The governor is thus independently responsive to engine load and speed conditions to adjust a control member of the engine, herein shown as a throttle plate of the carburetor.

Each pick-up line, venturi and manifold, is in effect equipped with its own speed-sensitive spinner valve. As shown, these valves are on the same shaft and driven identically. They are, however, entirely independent of each other as far as air bleeding and vacuum control are concerned, coming into vacuum cut-in and cut-out operation at different successive phases in the governing range.

Another object is to provide a dual spinner valve type control which, under the regulation of a suitable further valve, may apply vacuum to a single diaphragm unit to effect the governing action, or which may be associated with independent diaphragm units, each responsive to one of two spinner valves of the spinner unit.

More generally, it is an object of the invention to provide a full range governor control, responsive to the independent effects of venturi vacuum and manifold vacuum, in which a governor speed spread of regulation to any desired amount can be obtained. This is possible because in both the unloading or loading actions of both or either of the venturi and manifold vacuum control operations the regulation can be as sharp or as broad as may be obtained by simple adjustments in regard to selection of spring rates, mechanical adjusting devices, hole sizes and restrictions, etc. Furthermore, the point of transition at which control by manifold vacuum takes over from venturi vacuum control can be set as desired by a simple adjustment of spring action.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating preferred embodiments of the invention, wherein:

Fig. 1 is a side elevational view of a four-barrel carburetor provided with a governor embodying the invention, with portions shown schematically, as well as in vertical cross section;

Fig. 2 is a schematic type of view of an application of one embodiment of the invention, involving the use of the improved spinner valve, shown in axial section, with a control valve (also sectioned) to operate a single diaphragm assembly; and

Fig. 3 is a similar schematic view illustrating another adaptation in which two independent diaphragm assemblies are employed.

Referring first to Fig. 1, a four-barrel carburetor 10, of the type referred to above and having an air intake 12, is sectioned to expose one of the primary barrels 14 and one of the secondary barrels 16. The primary barrel 14 is provided with a restriction or venturi throat 18 and a conventionally operated throttle plate 20 mounted on the shaft 22 which extends through the other primary barrel in which is mounted a throttle plate identical to plate 20. The secondary barrel 16 is also provided with a venturi throat 24 and a throttle plate 26 mounted on the shaft 28 which extends through the other secondary barrel in which is mounted another secondary plate.

While a particular four-barrel carburetor which is in the main conventional is shown for purposes of illus-

tration, it will be apparent that the invention is equally applicable to any single or multi-stage carburetor. The carburetor being conventional, a general description of its structure and its governed operation will suffice. The reference numeral 11 generally designates the improved dual acting spinner valve of the invention, details of which appear in Fig. 2.

A vacuum type governor diaphragm assembly or device 30 is mounted on one side of a carburetor throttle body 34 of carburetor 10. To this end a further body 36, preferably being a casting providing upper and lower recesses 38 and 40, is secured to body 34. Recess 40 has a bottom wall constituted by a flexible diaphragm 42 suitably secured to the body 36 and defining a chamber 46, of which the flexible diaphragm 42 forms an upper wall.

The diaphragm 42 has a rod 48 secured to the center thereof in conventional manner, the rod passing through a vertical bore or passage 50 in the body 36 and being pivoted at its top to a lever 54 secured on an end of the primary throttle shaft 22, which end extends into the chamber 38. A tension spring 58 tends to bias the shaft 22 and primary throttle plate 20 to the open position. A cover plate 66 has an opening venting the chamber 38 to the atmosphere.

The operation of the improved governor involves the use of an orifice 72 at the primary venturi 18 and a pair of orifices 74, 75, below the primary throttle plate 20. These three orifices are respectively connected by passages 76, 76', 76'', each having a fixed restriction 77, with vacuum lines or conduits (to be described) which communicate the same with the improved spinner valve 11 of the invention, as well as with a control valve (in the embodiment under consideration), which control valve is generally designated 120 and will be hereinafter described. Passages 84 and 86 in the body and cover members 36, 44 lead from the chamber 46 through the clamped periphery of diaphragm to an external threaded fitting 90. Fitting 90 is connected by a vacuum tube or line 91 with the control valve 120 of the invention, hereinafter described in detail.

In the type of carburetor control chosen for illustration, a secondary throttle diaphragm assembly 92 is mounted at the opposite side of the carburetor throttle body 34 from the governor diaphragm assembly 30. Assembly 92 comprises a body 94 having a recess vented to the atmosphere through an apertured plate 95 secured to the body 94. The lower portion of body 94 receives a flexible diaphragm 96 which is secured to the body 94 by means of a cover 98, the diaphragm 96 providing a flexible wall separating oppositely disposed chambers 100 and 102 in the assembly 92. A rod 104 is secured to the center of the diaphragm 96, extending upwardly through a bore 106 in body 94, and a coil spring 108 in chamber 102 urges the rod 104 and diaphragm 96 upwardly. Rod 104 is pivoted on a lever 110 secured to the secondary throttle shaft 28, and so urged upwardly it biases shaft 28 in a direction to close the secondary throttle plates 26.

A conduit 111 extends between the chamber 102 and the primary and secondary venturis 18 and 24, and enables primary and/or secondary venturi vacuum to evacuate the chamber 102 and displace the diaphragm 96 downwardly to open the secondary throttle 26. The force of the spring 108 is selected so that the secondary throttle plate 26 will open at any predetermined venturi vacuum.

An air supply conduit or tube 118 connects from the carburetor intake 12 to the spinner valve assembly 11 for a purpose to be described.

It is now in order to refer to Fig. 2 of the drawings for details of the improved dual-acting spinner valve unit 11, as operated in association with the control valve 120 to isolate venturi vacuum from manifold vacuum; in accordance with the embodiment of the invention under

consideration. Valve 120 is shown as a simple spool type by which the transition of control by spinner valve 11, as between the vacuum effect at the venturi, alone, and at the manifold, alone, is brought about and regulated automatically.

As illustrated in Fig. 2, the spinner valve 11 includes a suitably closed housing or casing 121 provided with air openings 122 in a wall thereof, one of which openings is equipped with a fitting 123 (Fig. 1) to which the air intake line or conduit 118 from the carburetor intake 12 is connected. Housing 121 is suitably supported in fixed position on the engine by means not shown.

The housing 121 also has an axial opening 124 in a boss 124' at its bottom threaded to receive a fitting 125, through which fitting the opening 124 is communicated by a bleeder line 126 with the control valve 120 and, under control of the latter, with the line or conduit 91 leading through passages 84, 86 to diaphragm chamber 46. Manifold vacuum applied through orifice 74, passage 76' and a connecting line 127 is adapted to be bled by line 126 under the control of spinner valve 11, the lines 126, 127 having a common connection into a further conduit 128 leading to control valve.

The housing of spinner valve 11 has a further tubular top boss 130 to which a radial fitting 131 is applied and a second venturi vacuum bleed line 132 connects this fitting with venturi orifice 72, through the body passage 76 of that orifice. A common connection of these lines extends through a conduit 133 to the control valve 120; and another line or conduit 134 connects the valve, at a point opposed to conduit 133, with the diaphragm chamber 46 of assembly 30.

Finally, operating vacuum is applied to control valve 120 through a conduit 135 connecting the latter, in a manner to be described, with the below-throttle manifold vacuum orifice 75 and its passage 76''.

Spinner valve 11 internally comprises an upright shaft 136, of hollow tubular section at its ends, suitably journaled in the bottom and top housing bosses 124', 130; and shaft 136 is driven at a top connection in accordance with engine or vehicle speed, in a known manner.

A pair of hollow tubular centrifugal weight rods or stems 137, 138 extend radially through the shaft, being equipped at their midpoints with similar radial ports 139.

The respective ports 139 communicate with the interior of the shaft 136 below and above the respective rods 137, 138, hence with the manifold vacuum bleed line or conduit 126 and the venturi vacuum bleed line or conduit 132, respectively. It is to be clearly understood that the lines 126, 132 otherwise have no connection with one another, and that the valving actions at the respective rods 137, 138 (to be described) are independent of one another in their successive cut-in, intermediate regulation and cut-out of venturi and manifold vacuum, and vice versa. The rods 137, 138 are sealed and stopped at their outer ends, as by plugs 140.

A weight 141 is mounted to slide outwardly on lower rod 137 under centrifugal force, in opposition to a coil spring 142 acting between it and the end abutment 143 on rod 137; and rod 137 is provided with a radial valve bleed port 144 adapted to be restricted by weight 141 in this movement. Thus, as governed speed is approached and reached, the weight 141 passes onto valve port 144, progressively cutting off the air bleed effect from intake 12 on the interior of the rod and on manifold vacuum-connected conduit 126.

Similarly, the upper centrifugal weight rod 138 has a radial valve bleed port 148 correspondingly restricted progressively as a centrifugal weight 147 on rod 138 travels outwardly against the force of a coil spring 146 acting between it and an abutment 149 on rod 138.

The sequencing action of this improved dual spinner valve 11 will be explained at a later point; and it is evident that although the dual spinner shown herein embodies two different, axially spaced and tubular weight

rods 137, 138, an equivalent effect can be obtained by a tubular member or members rotating in a single plane, so long as provision is made to establish independent communication therethrough of the vacuum responsive assembly 30 and the manifold and venturi vacuum bleed lines 126, 132, respectively.

Now referring again to Fig. 2 in conjunction with Fig. 1, the spool type control valve unit 120 has the function of successively sequencing the desired cut-off and cut-in of air bleeding action, i.e., on venturi vacuum acting on diaphragm 42 of assembly 30 through the centrifugal rod 138 and lines 133 and 134, and on manifold vacuum acting through rod 137 and line 126, in an independent way.

Valve 120 (Fig. 2) comprises an appropriate block-like body 162 suitably mounted on the engine and having a horizontal axial bore 163 of uniform cylindrical outline, this bore opening at the right hand end of the body 162, as viewed in Fig. 2, to an enlarged vacuum chamber 164. A set screw 162' is threaded through the left hand end of body 162 to extend axially into the bore 163 and act as an adjustable limiting stop for a valve plunger 165 which is slidable in the bore.

At its right hand end, the plunger 165 extends into the chamber 164 and has secured thereto a flexible diaphragm 166 responsive to manifold vacuum applied to the chamber through line 135. A coil spring 167 acts between the diaphragm and an adjustable set screw 168 threaded axially into the right hand end of body 162, thereby enabling the force of spring 167 to be adjusted.

The body 162 is provided with a plurality of radial passages, each adapted to receive a fitting (not shown) by which the passages communicate the valve bore 163 with the exterior of valve unit 120.

These passages include a passage 169 communicated by the line or conduit 128 with the bleed line 126 and through line 127 with manifold vacuum at orifice 74; a passage 171 directly opposed radially to the passage 169 and adapted to be communicated through the line 91 with the diaphragm space or chamber 46 in the diaphragm assembly 30; a passage 174 axially spaced from the passage 169 and adapted to be communicated through the line or conduit 133 with the spinner valve bleed line 132 as well as with venturi vacuum at the orifice 72; and a passage 176 radially opposed to the passage 174 and adapted to be communicated through the line or conduit 134 with the diaphragm chamber 46 of assembly 30, in the same way that the line 91 is.

The valve plunger 165 is, in the main, of uniform cylindrical cross section, but is formed between its ends to provide two grooves, one an annular groove 179 adapted to communicate radial body passages 174 and 176 with one another, when the plunger 165 is in the position of Fig. 2, and the other an annular groove 180 adapted to communicate the passages 169 and 171 with one another, when the plunger is urged to the right against the force of spring 167 under manifold vacuum applied to the chamber 164. Such vacuum is applied from manifold pick-up orifice 75 through the line or conduit 135, which communicates with chamber 164 through a radial opening 181.

In the operation of the above system, full advantage is taken of the ability to employ high venturi vacuum or cut-off, supplemented by manifold vacuum. As the engine comes up to governed speed, the upper weight 147 moves centrifugally outwardly against the force of spring 146 until it begins to cover the valve port 148 in its rod 138. This allows the vacuum available from venturi port or orifice 72 through line 133 to increase, the bleeding effect through line 132 being decreased.

At this point, the valve plunger 165 of valve unit 120 is in the position shown in Fig. 2, communicating radial passages 174, 176 through plunger groove 179, and allowing vacuum to increase in diaphragm chamber 46 and

effect cut-off by swinging throttle plate 20 towards closing position.

As this occurs, air is entering the valve bleed port 144 of the lower centrifugal weight rod 137, thus reducing vacuum from the pick-up at orifice 74 through line or conduit 128. However, this vacuum is prevented from acting upon throttle control diaphragm 42 due to the blocking of communication between passages 169 and 171 by the center portion of valve plunger 165.

Venturi vacuum alone is not sufficient to control the governor over the full unloading range, since the force required to close the throttle is increasing as venturi vacuum decreases due to reduced air flow. Therefore, in accordance with the invention, manifold vacuum is employed for this part of the unloading; and the application of such vacuum to the diaphragm 42 is accomplished through control valve 120.

To this end, manifold vacuum from the pick-up orifice 75 is communicated through line 135 and chamber opening 181 with the vacuum chamber 164 of control valve 120, causing its diaphragm 166 to move to the right against the opposition of spring 167. As the diaphragm is thus moved to the right, it moves the plunger 165 in the same direction, interrupting communication of venturi vacuum passages 174, 176 and opening communication of manifold vacuum passages 169, 171 through the annular groove 180 in plunger 165. Manifold vacuum then accomplishes the remainder of the unloading over the governed range. As the lower weight 141 moves outwardly against spring 142, its position over bleed port 144 of lower rod 137 adjusts manifold vacuum from pick-up orifice 74 to a value in diaphragm chamber 46 of assembly 30 suitable to allow the remainder of the unloading to take place.

It is seen from the above that by making the venturi vacuum and manifold vacuum independent of each other it is possible to obtain a governor speed spread or regulation in any desired amount, and that simple adjustments, as in regard to chosen spring rates, setting of adjusting devices, selection of stem hole and restriction sizes, and the like, enable any part of the unloading or loading action to be made as sharp or broad as is desired.

Initial loading of the control valve plunger spring 167 is determined by the setting of the adjusting set screw 168; and the point of transition, at which control by venturi vacuum is transferred to control by manifold vacuum, may be set as desired by adjusting set screw 168. The opposite set screw 162' limits movement of plunger 165 by spring 167 to the position in which communication of passages 174 and 176 is established.

If desired, of course, all or any part of the structure shown herein may be incorporated into a single, compact carburetor unit adapted for placement in a vehicle engine compartment.

Fig. 3 of the drawings very schematically illustrates a modification of the invention wherein venturi vacuum and manifold vacuum are independently employed, through independent bleed control by a spinner valve 11 identical to the one described above, but without resort to a sequencing control valve like the valve 120 of the embodiment of Figs. 1 and 2. As in that form, under no situation is manifold vacuum bled through a venturi port, or vice versa.

The system of Fig. 3 operates identically to that of Figs. 1 and 2, save for the fact that manifold and venturi vacuum are isolated from one another by the use of a further diaphragm assembly identical to the assembly 30, hence indicated, and having its parts indicated, by corresponding reference numerals, primed.

In this installation, the line 133 communicating with venturi orifice 72 and the spinner valve bleed line 132 is connected directly to the chamber 46 of the diaphragm assembly 30, rather than to any sort of sequencing control valve. Similarly the line 127 from the manifold vacuum orifice 74 is brought, as through a connector

conduit length 180, to the corresponding chamber 46' of the second diaphragm assembly 30'. The bleed line 126 to spinner valve 11 is correspondingly connected with the chamber 46' through the length 180.

As schematically shown in Fig. 3, and for simplicity of illustration, the throttle plate 20 has its operating lever or arm 54 connected, as by a link 182 and common pivot 183, to the actuating rods 48, 48' of the respective assemblies 30, 30', for independent operation by either thereof. A conventional, dotted line gang representation indicates the actual pivoting of these rods to a single arm or lever 54.

Thus, venturi and manifold vacuum are successfully employed over the entire governing range for independent operation of the governor in response to engine speed and load, as in the embodiment first described. It will be perceived by those skilled in the art that, though illustrated as applied to a governor associated with an engine carburetor, the principles of the invention are also well suited for application to other types of fuel control devices.

The drawings and the foregoing specification constitute a description of the governor in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means having conduit means operatively connecting the same between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another.

2. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means including a centrifugal valve device driven in accordance with engine speed and having conduit means operatively connecting the same independently between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another.

3. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means including a centrifugal valve device driven in accordance with engine speed and having conduit means operatively connecting the same independently between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another, said valve device comprising centrifugally urged valve members controlling communication of said vacuum responsive means with said respective sources.

4. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means including a centrifugal valve device driven in accordance with engine speed and having conduit means operatively connecting the same

independently between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another, said valve device isolating said sources from one another and comprising centrifugally urged valve members controlling communication of said vacuum responsive means with said respective sources.

5. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means including a centrifugal valve device driven in accordance with engine speed and having conduit means operatively connecting the same independently between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another, said valve device isolating said sources from one another and comprising centrifugally urged valve members controlling communication of said vacuum responsive means with said respective sources, said valve members being mounted for rotation on a common axis.

6. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means including a centrifugal valve device driven in accordance with engine speed and having conduit means operatively connecting the same independently between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another, said valve device isolating said sources from one another and comprising centrifugally urged valve members controlling communication of said vacuum responsive means with said respective sources, said valve members being mounted for rotation on a common axis and having valve ports rotating therewith and controlled thereby under centrifugal action.

7. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means having conduit means operatively connecting the same between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another, said vacuum responsive means comprising means providing a vacuum chamber, and a control valve to control communication of one or the other of said sources with said chamber.

8. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means having conduit means operatively connecting the same between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another, said vacuum responsive means comprising means providing a vacuum chamber, and a control valve in said

conduit means movable in response to one of said vacua to control communication of one or the other of said sources with said chamber.

9. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means having conduit means operatively connecting the same between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another, said vacuum responsive means comprising means providing a vacuum chamber, a control valve in said conduit means movable in response to one of said vacua to control communication of one or the other of said sources with said chamber, said valve means comprising a centrifugally responsive valve device in said conduit means communicated with said chamber and said respective vacuum sources under the control of said control valve.

10. A governor for the control of an engine having an adjustable control member and sources of venturi vacuum and manifold vacuum, comprising vacuum responsive means operatively connected to said control member to adjust the latter, and valve means having conduit means operatively connecting the same between said respective vacuum sources and said vacuum responsive means for the independent application of said respective vacua to the latter, whereby to operate said control member by said vacuum responsive means in response to venturi vacuum and manifold vacuum, independently of one another, said vacuum responsive means comprising a pair of independent vacuum chambers, and a centrifugally responsive valve device to independently communicate said chambers with said respective vacuum sources.

11. Control structure for an engine governor responsive to engine manifold vacuum and venturi vacuum, comprising a centrifugal valve unit driven in response to engine speed and having means providing a pair of non-communicating passages adapted to be communicated, respectively and independently, with said venturi vacuum and with said manifold vacuum, and centrifugally responsive means acting to control the independent communication of said respective passages with said venturi vacuum and manifold vacuum.

12. Control structure for an engine governor responsive to engine manifold vacuum and venturi vacuum, comprising a centrifugal valve unit driven in response to engine speed and having means providing a pair of internal, non-communicating passages rotating in response to engine speed and adapted to be communicated, respectively and independently, with said venturi vacuum and with said manifold vacuum, and centrifugally responsive means acting to control the independent communication of said respective passages with said venturi vacuum and manifold vacuum.

13. Control structure for an engine governor, operating in response to venturi vacuum and manifold vacuum and including a vacuum-responsive device operable to control fuel supplied to the engine, said structure comprising a centrifugal valve unit rotatively driven in response to engine speed and having means providing a pair of internal, non-communicating passages adapted to be communicated, respectively and independently, with said venturi vacuum and with said manifold vacuum, and centrifugally responsive means acting to control the independent communication of said respective passages with said venturi vacuum and manifold vacuum, and means including a valve device to control a sequence of independent communications of said respective passages with said vacuum-responsive device.

14. Control structure for an engine governor, operat-

ing in response to venturi vacuum and manifold vacuum and including a vacuum-responsive device operable to control fuel supplied to the engine, said structure comprising a centrifugal valve unit rotatively driven in response to engine speed and having means providing a pair of internal, non-communicating passages rotating in response to engine speed and adapted to be communicated, respectively and independently, with said venturi vacuum and with said manifold vacuum, and centrifugally responsive means acting to control the independent communication of said respective passages with said venturi vacuum and manifold vacuum, and means including a valve device to control a sequence of independent communications of said passages with said vacuum-responsive device, thereby to independently operate said vacuum-responsive device under control of the venturi and manifold vacuum conditions.

15. Control structure for an engine governor, operating in response to venturi vacuum and manifold vacuum and including a vacuum-responsive device operable to control fuel supplied to the engine, said structure comprising a centrifugal valve unit rotatively driven in response to engine speed and having means providing a pair of internal, non-communicating passages rotating in response to engine speed and adapted to be communicated, respectively and independently, with said venturi vacuum and with said manifold vacuum, and centrifugally responsive means acting to control the independent communication of said respective passages with said venturi vacuum and manifold vacuum, and means including a valve device to control a sequence of independent communications of said passages with said vacuum-responsive device, thereby to independently operate said vacuum-responsive device under control of the venturi and manifold vacuum conditions, said valve device comprising vacuum-sensitive means in communication with and responsive to one of said vacua, and a valve element movable by said vacuum sensitive means to control communication between said vacuum-responsive device and said respective venturi and manifold vacua.

16. Control structure for an engine governor, operating in response to venturi vacuum and manifold vacuum, said structure comprising a centrifugal valve unit having a tubular shaft rotatively driven in response to engine speed, means rotating with said shaft and having internal, non-communicating passages in communication with the interior of said shaft, said passages being adapted to be respectively and independently communicated through said shaft with said venturi vacuum and with said manifold vacuum, and centrifugal speed-responsive weight means acting to control the independent communication of said respective passages with said venturi vacuum and manifold vacuum.

17. Control structure for an engine governor, operating in response to venturi vacuum and manifold vacuum, said structure comprising a centrifugal valve unit having a tubular shaft rotatively driven in response to engine speed, means rotating with said shaft and having internal, non-communicating passages in communication with the interior of said shaft, said passages being adapted to be respectively and independently communicated through said shaft with said venturi vacuum and with said manifold vacuum, and centrifugal speed-responsive weight means acting to control communication of said respective passages with said venturi vacuum and manifold vacuum.

18. Control structure for an engine governor, operating in response to venturi vacuum and manifold vacuum and including a vacuum-responsive device operable to control fuel supplied to the engine, said structure comprising a centrifugal valve unit having a tubular shaft rotatively driven in response to engine speed, means rotating with said shaft and having internal, non-communicating passages in communication with the interior of said shaft, said passages being adapted to be respectively and inde-

pendently communicated through said shaft with said venturi vacuum and with said manifold vacuum, centrifugal speed-responsive weight means acting to control communication of said respective passages with said venturi vacuum and manifold vacuum, and means including a valve device to control the independent communication of said respective passages with said vacuum-responsive device and said respective venturi and manifold vacua, thereby to independently operate said vacuum-responsive device.

19. A governor for an internal combustion engine equipped with a member to control the flow of air to said engine, comprising pressure responsive means operatively connected to said member to operate the same, first means for sensing the rate of air flow to said engine, second means for sensing engine vacuum, said first and second means each being operatively connected to said pressure responsive means to at different times position the latter, and further means operatively connected to engine vacuum and to at least one of said first and second means to control the positioning of said pressure responsive means by one of said first and second means.

20. A governor for an internal combustion engine equipped with a member to control the flow of air to said engine, comprising pressure responsive means operatively connected to said member to operate the same, first means for sensing the rate of air flow to said engine, second means for sensing engine vacuum, said first and second means each being operatively connected to said pressure responsive means to at different times position the latter, and further means operatively connected to engine vacuum and to at least one of said first and second means to control the positioning of said pressure responsive means by one of said first and second means, said further means comprising a device having fluid pressure responsive means actuating the same which is responsive to engine vacuum and is operatively connected to at least one of said first and second means.

21. A governor for an internal combustion engine equipped with a member to control the flow of air to said engine, comprising pressure responsive means operatively connected to said member to operate the same, first means for sensing the rate of air flow to said engine, second means for sensing engine vacuum, said first and second means each being operatively connected to said

pressure responsive means to at different times position the latter, and further means operatively connected to said first and second means and responsive to engine vacuum for determining the periods during which said first and second means are permitted to position said pressure responsive means, said further means comprising a valve device having fluid pressure responsive means actuating the same which is responsive to engine vacuum and is connected to said first and second means.

22. A governor for an internal combustion engine equipped with a member to control the flow of air to said engine, comprising pressure responsive means operatively connected to said member to operate the same, first means for sensing the rate of air flow to said engine, second means for sensing engine vacuum, said first and second means being each operatively connected to said pressure responsive means to at different times position the latter, and further means operatively connected to at least one of said first and second means and responsive to engine vacuum to control the positioning of said pressure responsive means by said first and second means, said further means comprising a pair of devices each having fluid pressure responsive means actuating the same which is responsive to engine vacuum and is operatively connected to one of said first and second means.

23. A governor for an internal combustion engine equipped with a throttle valve for controlling the flow of air to said engine, comprising first pressure responsive means operatively connected to said throttle valve, second means for sensing the rate of air flow to said engine and adapted to at times position said pressure responsive means, third means for sensing engine vacuum and adapted to at times position said pressure responsive means, and further valving means connected with said second and third means and responsive to engine vacuum for determining the periods during which said second and third means are permitted to position said pressure responsive means.

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