

Oct. 26, 1926.

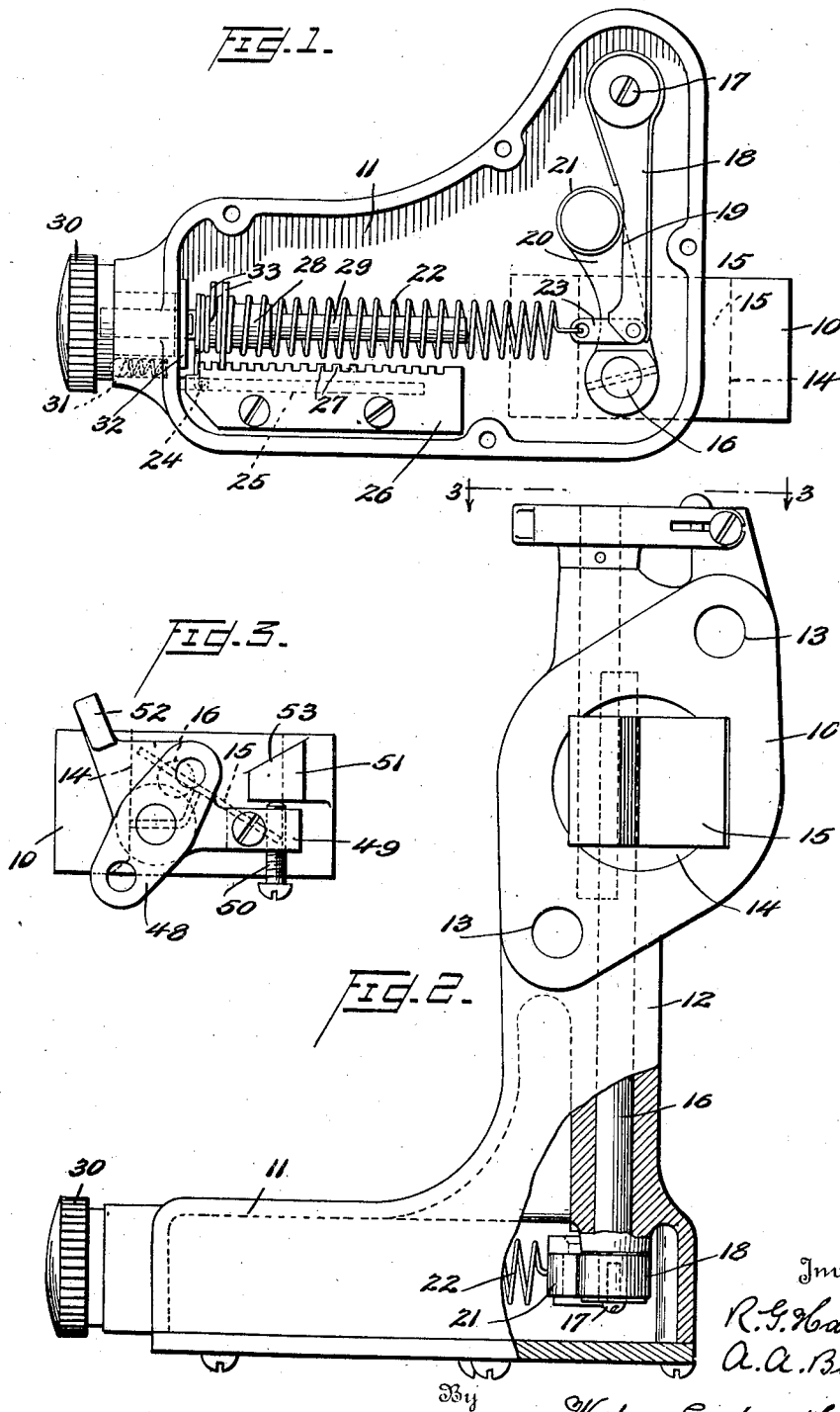
R. G. HANDY ET AL

1,604,283

GOVERNOR

Filed May 18, 1922

3 Sheets-Sheet 1



Inventor

R. G. Handy,
A. A. Bull,

Watson, Cox, Morse & Grindle,
Attorneys

Oct. 26, 1926.

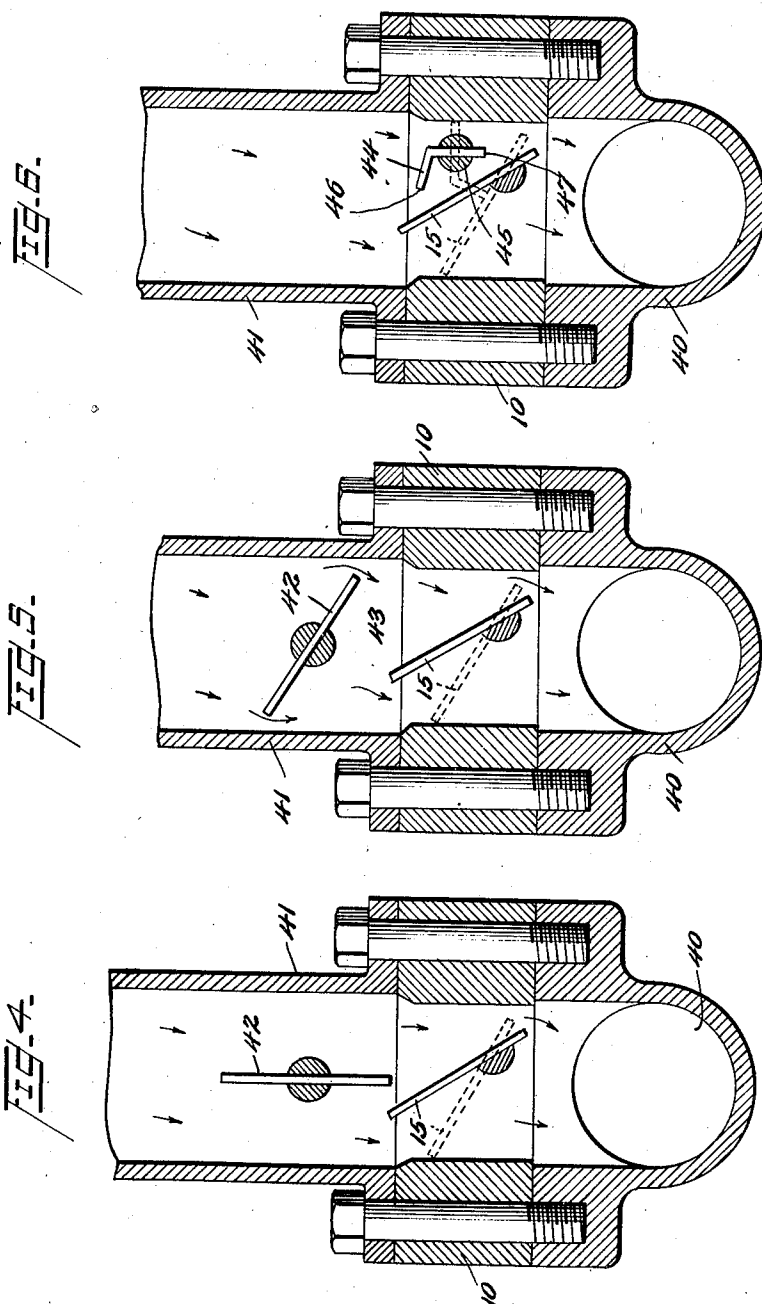
1,604,283

R. G. HANDY ET AL

GOVERNOR

Filed May 18, 1922

3 Sheets-Sheet 2



Inventor

R. G. Handy,
A. A. Bull,
By Watson, Cox, Morse & Grindle,
Attorneys.

Oct. 26, 1926.

1,604,283

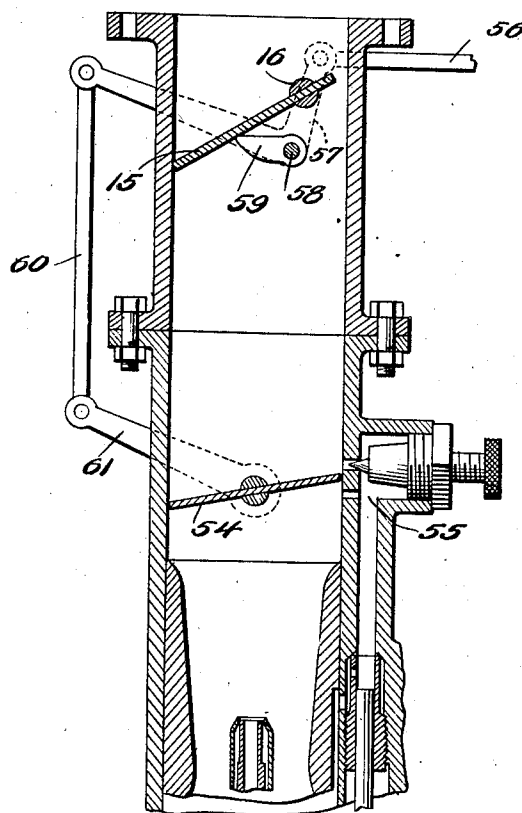
R. G. HANDY ET AL

GOVERNOR

Filed May 18, 1922

3 Sheets-Sheet 3

FIG. 7.



Inventor

R. G. Handy,
A. A. Bull,

By

Watson, Cox, Morse & Grindle,
Attorneys.

UNITED STATES PATENT OFFICE.

ROBERT G. HANDY AND ARTHUR A. BULL, OF DETROIT, MICHIGAN, ASSIGNORS TO
HANDY GOVERNOR CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF
MICHIGAN.

GOVERNOR.

Application filed May 18, 1922. Serial No. 561,917.

The present invention relates to governors, more particularly for hydrocarbon motors and of the type actuated in accordance with the flow of fluid in the intake of the motor. More particularly, the present invention is an improvement of the governor disclosed in Patent No. 1,584,929, May 18, 1926, and Patent No. 1,584,933, May 18, 1926.

The governor of said patents comprises a valve in the intake conduit, and operating mechanism for said valve and a member responsive to the suction in the intake manifold and means to exactly counterbalance the effort of said member, in all positions of said valve when the motor is operating at a predetermined speed, the member being unbalanced at other speeds. The preferred form includes an unbalanced butterfly valve in the intake and means to exactly counterbalance the turning effort of said valve at a predetermined speed of the motor, the effort being unbalanced at other speeds.

One of the objects of the present invention is to provide means for adjusting the resistance offered by the counterbalancing means. To this end, a novel device is employed to vary the force and elasticity or flexibility of the yielding means. If the valve of a governor of the type mentioned is used in connection with the usual throttle valve or any other obstruction in the intake manifold of the motor, said throttle valve or obstruction will interfere with the action of the governor in certain positions.

It is another object of the invention to provide means whereby this difficulty may be eliminated. To this end, in one form of the invention illustrated herein the throttle valve is omitted and means is provided for acting directly on the governor valve to move it manually in a closing direction when desired; in another form the throttle valve is retained and a mechanical connection is provided between the two valves compelling the governor valve to move with the throttle valve in the closing direction.

In the preferred form of governor, the butterfly valve of the governor or conduit is provided with means for slightly relieving the suction thereon. This may be ac-

complished by a passage through the valve or in the conduit around the valve, or in both.

A further object of the invention is to close the aforesaid passage at the same time that the governor valve is closed manually.

A further object is to provide a single device for manually closing both the pas-
sage and the butterfly valve.

Other objects and features of novelty will be apparent from the description taken in connection with the drawings in which:

Figure 1 is a front elevation of a governor constructed in accordance with the present invention, the front plate being removed.

Figure 2 is a top plan view of the governor, certain parts being shown in section.

Figure 3 is an end view looking in the direction of the arrows 3—3 of Figure 2.

Figure 4 is a sectional elevation illustrating an arrangement in which the governor is very close to the throttle valve of the motor, both the throttle valve and governor valve being shown in open positions.

Figure 5 is a view similar to Figure 4 but showing the throttle valve nearly closed.

Figure 6 is a similar view showing one means of avoiding interference with the action of the governor because of the proximity of the throttle valve, such as shown in Figures 4 and 5, and

Figure 7 is a sectional elevation illustrating an arrangement in which the usual manually actuated valve is retained and connections provided to actuate the governor valve in a closing direction when the manual valve is so moved.

Referring to the drawings, in one form of the invention shown, the governor includes a casting, consisting of a conduit part 10, a part 11 forming the counterbalance chamber, and a neck part 12 connecting the conduit part to the counterbalancing chamber. This form of casting is adapted particularly for use in connection with the Fordson tractor. In this tractor, the space permitted for the governor conduit is extremely short, as shown by the height of the part 10 in Figure 1. This part is provided with bolt holes 13 for securing the conduit in alignment with the intake of the motor and is also formed with the vertical conduit

14 in which is located the governor valve 15. As shown, this valve is of the butterfly or plate type and is secured to a spindle 16 which extends through the neck 12 and projects into the counterbalance chamber. The spindle 16 is positioned to one side of the axis of the conduit so that the butterfly valve is unbalanced. Furthermore, as described and claimed in Patent No. 1,584,933, May 18, 1926, the short side of the valve plate has a portion cut away so that a passage is formed even when the valve is in closed position. The object of this passage is to obtain a governor having a better action. In the form shown, the two functions of throttle valve and suction responsive, or motive element, are obtained with the single member 15. The invention, however, is not thus limited, but includes arrangements in which the suction responsive or motive element is separate from the throttle valve.

Pivoted on a pin 17 at the top of the counterbalance chamber is a depending arm 18 formed with a cam surface 19. A second arm 20 is secured to the end of the spindle 16 within the counterbalance chamber and at its free end has a roller 21 contacting with the cam on the other arm. The first arm is yieldingly forced in a clockwise direction as viewed in Figure 1 by a coiled or helical spring 22. One end of this spring is secured to the tip end of arm 18 by a short link 23. The other end is formed with a lug 24 which is slidable in a groove 25 formed in a plate 26 within the counterbalance chamber. The upper edge of this plate is formed as a rack 27.

It is an aim of the invention to provide means for varying the tension and flexibility of the spring 22. To this end a support 28 is slidably mounted on a spindle 29 and is constrained to turn with the spindle as by making the spindle square in cross section. The spindle projects outside the counterbalance chamber and has a finger nut 30 secured to the same for manual turning of the spindle. A spring-pressed pin as 31, carried by the casting, is adapted to engage in notches in the adjacent face of the finger nut to hold the parts in any adjusted position. A collar 32 is provided to prevent movement of the spindle in a left hand direction as viewed in Figure 1. The support 28 is formed with a helical flange 33 adapted to cooperate with a rack 27 so that, when the support is turned, it is caused to travel lengthwise of the spindle. As clearly shown in Figure 1, the support 28 fits within the coils of the spring and said coils pass through the flange 33 so that said flange, when it is turned, travels along the spring. This support with its flange constitutes a worm and divides the spring into two portions, an active portion and an inactive portion. The portion of the spring to the left

of the flange, as viewed in Figure 1, is inactive, while the portion to the right of the support is effective to counterbalance the throttle valve. It will be seen, therefore, that turning the finger nut 30 moves the spring support longitudinally of the spring, thereby varying its length and changing its tension and flexibility. It will be obvious that when the rack 27 is of the same pitch as the turns of the spring, only the flexibility of the latter will be varied, but if the rack is of a different pitch both tension and flexibility will be varied.

It will be understood that the cam surface 19 on the arm 18 is formed so that in conjunction with the spring 22 the closing effort of the governor valve is counterbalanced at a predetermined speed of the motor. If it is desired to change the value of the predetermined speed to some other amount, then the finger nut 30 is turned in the proper direction to thereby adjust the tension and flexibility of the spring 22. In this manner, the governor will be set to govern the motor at some other predetermined speed.

In the previous application, Patent No. 1,584,933, May 18, 1926, it was pointed out, for the best performance of the governor, there should be substantial differences of effort exerted by the counterbalance means for different speeds of the motor and for any two speeds of the motor the difference between the efforts of the counterbalance means at these two speeds should be substantially uniform for all angular positions of the valve. In other words, the governor can be constructed much more easily and give much more accurate and dependable action if the difference in effort of the counterbalance means, when the motor changes from 1200 to 1000 R. P. M., is 3 inch pounds rather than .03 inch pounds.

In connection with some motors, the space for the valve of the governor is very limited. For these motors a compromise in the proportions of the throttle parts has to be made. These changes modify the action on the governor valve at different speeds and tend to decrease the differences of effort at different speeds of the motor. According to the present invention, it has been discovered that it is advantageous to have different degrees of spring flexibility at different speeds.

Figure 4 of the drawings illustrates a motor which has very little space for the governor. As shown, the conduit part 10 of the governor is disposed between the intake manifold 40 and the conduit 41 from the carburetor, the direction of the flow of gases being indicated by the arrows. It will be noted that the governor valve 15 is very close to the hand throttle valve 42. When the manual valve 42 is in wide open position, it does not interfere materially with

the suction effect on the governor valve 15. When the hand throttle valve 42 is moved in a closing direction to a position such as indicated in Figure 5, the pressure in the space between the two valves may be reduced below atmosphere, thus interfering with the suction effect on the governor valve. This slight decrease in pressure lessens the closing effort of the valve with the result that the motor may increase its speed a small amount above the governed speed. It is found that practically no interference with the action of the governor valve occurs until the manual throttle valve is nearly closed. Since the passage through the hand throttle valve must be very small to obtain this interference, it follows that the increase in engine speed above the governed speed can only occur with practically no load on the engine, the maximum excess speed occurring with no load.

According to one form of the present invention, this exceeding of the governed speed is overcome by the structure shown in Figure 6. For this purpose the hand throttle valve is removed. The governor valve, as shown, is of the type having a passage at its short side even when the valve is closed. In place of the hand throttle valve is substituted a valve 44 consisting of two parts disposed at an angle to each other. This valve is carried on a spindle 45 in the conduit part 10, which is adapted to be connected to the means for actuating the throttle valve 42, so that now the throttle valve 44 will be actuated in the absence of the throttle 42. In Figure 6 the auxiliary throttle 44 is shown in its open position. If it is desired to reduce the speed of the motor, the operator through the usual connections manually turns valve 44 in a counter clockwise direction, as viewed in Figure 6. The tip 46 of one leg of the auxiliary valve will strike the governor valve 15, moving it in the closing direction. This will require only a slight force as the governor valve is nearly counterbalanced. At the same time, the other leg of the auxiliary valve will move upwardly, as shown in Figure 6, so that its tip end 47 will contact with the wall of the conduit and thereby, in conjunction with the governor valve 15, entirely close the conduit.

It will be understood, if the governor valve 15 itself, when in closed position, entirely obstructs the conduit, then the only function of the auxiliary valve would be to move the governor valve in a closing direction when the operator desires.

The manual connections for operating the auxiliary valve are secured to the member 48 on the end of said spindle. This member has an arm 49 carrying adjusting screw 50 adapted to abut a block 51 to adjustably limit the extent of movement

of the auxiliary valve in one direction. Its movement in the other direction is limited by a second arm having an abutment 52 adapted to engage an abutting surface 53 on the block 51.

As already explained, where the usual carburetor throttle valve is employed in addition to a governor valve which is controlled by the suction in the intake passage, the throttle valve when nearing closed position will cause a decrease in the suction or turning effort on the governor valve from the predetermined value for which the governor has been adjusted, with the result that the engine may exceed its governed speed under light loads; and this is true whether the two valves be situated closely together as shown in Figures 4 and 5 or further apart as shown in Figure 7.

The construction shown in Figure 6 is particularly adapted to be applied in the power plant of a Fordson tractor, wherein lack of space makes it desirable to eliminate the manual throttle valve and substitute the auxiliary throttle shown. However, in some cases it is not convenient or desirable to remove the manually operated carburetor throttle. This is particularly true for the case of those carburetors that are provided with idling devices which depend on the high suction adjacent the manual throttle valve to cause the flow of gasoline mixture to the cylinders at low speeds. In order to retain the carburetor functions in such cases, it may be desirable to leave the manual throttle valve undisturbed and mechanically interconnect therewith the governor valve. Figure 7 illustrates an arrangement of the kind referred to. Herein the carburetor throttle is designated by numeral 54 and the adjustable idling device, by 55. A manually operated link 56 is connected to a bell crank 57, rigid with a shaft 58, which projects into the intake passage and carries a cam arm 59 adapted to contact the underside of governor valve 15 and move the same in a closing direction. A link 60 connects the arm of bell crank 57 with an arm 61 rigid with the spindle of valve 54. From the construction illustrated it will be evident that when the carburetor throttle is operated manually towards closed position the governor valve will also be moved by cam arm 59 in the same direction. It will be apparent therefore, that the carburetor functions for idling will not be disturbed; that the carburetor throttle may effect complete closing of the intake passage to decrease the engine speed as low as desired; and that the mechanical connections prevent the governor valve from opening, due to the decreased suction effects caused by the throttle when nearing closed position, thereby preventing the engine speed exceeding the governed speed. It may be pointed

out that if the governor valve 15 were constructed to substantially close the intake passage, the idling functions of the carburetor might be retained by continuing the idling passage to said governor valve so that the idling hold would bear the same relation to the governor valve that it bears to the throttle valve in the construction of Figure 7; the throttle valve would then be omitted and manual means provided to operate the governor valve towards closed position for the purpose of reducing the engine speed below the governed speed.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In a suction responsive governor for hydrocarbon motors, a suction responsive member, yielding means resisting movement of said member in response to increased suction, said means counterbalancing the effort of said member at a predetermined speed in all positions thereof, and means to adjust the flexibility and resistance of said yielding means, whereby the governor may be set for another predetermined speed.

2. In a suction responsive governor for hydrocarbon motors, in combination, an unbalanced butterfly valve adapted to be subjected to the suction in the intake of the motor, means, including a spring, counterbalancing the effort of said valve at a predetermined speed of the motor in all positions thereof, and means to adjust the tension and flexibility of said spring.

3. In a suction responsive governor for hydrocarbon motors, in combination, an unbalanced butterfly valve adapted to be subjected to the suction in the intake of the motor, means, including a spring, counterbalancing the effort of said valve at a predetermined speed of the motor in all positions thereof, and means to adjust the active length of said spring.

4. In a suction responsive governor for hydrocarbon motors, in combination, an unbalanced butterfly valve adapted to be subjected to the suction in the intake of the motor, means, including a coiled spring, counterbalancing the effort of said valve at a predetermined speed of the motor in all positions thereof, and means to vary the number of active turns of said spring.

5. A governing device for the intake of hydrocarbon motors, including in combination, an intake conduit, means in said conduit adapted to be actuated to obstruct said conduit in accordance with the flow of fluid therein, yielding means, and mechanism transmitting the effort of said yielding means to oppose the obstruction of said conduit, said transmitting mechanism being constructed and arranged to increase the effort exerted on said obstructing means by said yielding means as the obstruction of

the conduit increases, said mechanism including two arms, one having a cam surface and the other a roller bearing on said surface.

6. A governor for hydrocarbon motors, including in combination, a conduit, means for controlling the flow of fluid in said conduit actuated in a closing direction in accordance with the flow of fluid, and means opposing said closing movement with an equal and opposite resistance when the motor is running at a predetermined speed, including yielding means and mechanism to transmit the force of said yielding means to the controlling means, including a cam associated with one of said means and a pivoted arm associated with the other, said arm having a roller bearing on said cam.

7. A governor for hydrocarbon motors, including in combination, a conduit, an unbalanced butterfly valve therein, and counterbalancing means connected to balance the turning effort of said valve at a predetermined speed of the motor, including an arm secured to turn with said valve, a second arm, one of said arms having a cam and the other a roller bearing on the cam, and yielding means acting on said second arm.

8. A governor for hydrocarbon motors, including in combination, a conduit, an unbalanced butterfly valve therein, and counterbalancing means connected to balance the turning effort of said valve at a predetermined speed of the motor, including an arm secured to turn with said valve, a second arm, one of said arms having a cam and the other a roller bearing on the cam, yielding means acting on said second arm, and means to adjust the force of said yielding means.

9. A suction responsive governor for hydrocarbon motors, including in combination, an unbalanced throttle valve, means to counterbalance the suction effect on said valve in all positions thereof at a predetermined speed of the motor, means to slightly relieve the suction effect on said valve, and manual means to move said valve in a closing direction and render said suction relieving means inoperative.

10. A suction responsive governor for hydrocarbon motors, including in combination, a conduit member, an unbalanced throttle valve member in said conduit, one of said members having a passage from one side of the valve to the other, means to counterbalance the suction effect on said valve in all positions thereof at a predetermined speed of the motor, and manual means to move said valve in a closing direction and close said passage.

11. A suction responsive governor for hydrocarbon motors, including in combination, a conduit member, an unbalanced throttle valve member in said conduit, one of said members having a passage from one

side of the valve to the other, means to counterbalance the suction effect on said valve in all positions thereof at a predetermined speed of the motor, a second valve to control said passage, and means associated with said second valve to move the first valve in a closing direction simultaneously with the second valve.

12. A suction responsive governor for hydrocarbon motors, including in combination, an unbalanced throttle valve, means to counterbalance the suction effect on said valve in all positions thereof at a predetermined speed of the motor, means to slightly relieve the suction effect on said valve, and manual means to render said suction relieving means inoperative.

13. A suction responsive governor for hydrocarbon motors, including in combination, a conduit member, an unbalanced throttle valve member in said conduit, one of said members having a passage from one side of the valve to the other, means to counterbalance the suction effect on said valve in all positions thereof at a predetermined speed of the motor, and manual means to close said passage.

14. A suction responsive governor for hydrocarbon motors, including in combination, a conduit member, an unbalanced throttle valve member in said conduit, one of said members having a passage from one side of the valve to the other, means to counterbalance the suction effect on said valve in all positions thereof at a predetermined speed of the motor, and a second valve to close said passage.

15. A suction responsive governor for hydrocarbon motors including in combination, an intake conduit an unbalanced butterfly valve in said conduit and constructed to provide a passageway from one side to the other thereof when the valve is in closed position, said valve adapted to be subjected to the suction in the motor intake, means to counterbalance the suction effect on said valve in all positions thereof, and manual means to move said valve in the closing direction and close said passageway.

16. In a governor for hydrocarbon motors, a valve in the intake conduit and means to move said valve in an opening or closing direction in accordance with decrease or increase respectively of the speed of the motor relative to a predetermined speed, said means including a spring, a cam device, and means to adjust the tension, and flexibility of said spring.

17. In a governor for hydrocarbon motors, a valve in the intake conduit and means to move said valve in an opening or closing direction in accordance with decrease or increase respectively of the speed of the motor relative to a predetermined speed, said means including a spring, a cam device,

and means to adjust the flexibility of said spring.

18. A suction responsive governor for hydrocarbon motors, including in combination, an unbalanced governor valve in the intake conduit, means to counterbalance the suction effect on said valve in all positions thereof at a predetermined speed of the motor when the carburetor side of the intake conduit is unobstructed, means to slightly relieve the suction effect on said valve, and manual means to move said valve in a closing direction and completely obstruct the intake conduit.

19. A suction responsive governor for hydrocarbon motors, including in combination, an unbalanced governor valve in the intake conduit, means to counterbalance the suction effect on said valve in all positions thereof at a predetermined speed of the motor, and manually operated means for obstructing the intake passage and moving said valve towards closed position only.

20. A suction responsive governor for hydrocarbon motors, including in combination, a conduit member, an unbalanced throttle valve member in said conduit, one of said members having a passage from one side of the valve to the other, means to counterbalance the suction effect on said valve in all positions thereof at a predetermined speed of the motor when the carburetor side of the intake conduit is unobstructed, and manual means to move said valve in a closing direction and close the intake conduit.

21. A suction responsive governor for hydrocarbon motors, including in combination, an unbalanced throttle valve, means to counterbalance the suction effect on said valve in all positions thereof when the carburetor side of the intake conduit is unobstructed, manually operated means for obstructing the carburetor side of said conduit and simultaneously preventing said throttle valve from opening due to the decreased suction effect thereon caused by said obstructing means.

22. A suction responsive governor for hydrocarbon motors, including in combination, an unbalanced throttle valve, means to counterbalance the suction effect on said valve in all positions thereof when the carburetor side of the intake conduit is unobstructed, manually operated means for obstructing the carburetor side of said conduit and simultaneously moving said throttle valve towards closed position.

23. A suction responsive governor for hydrocarbon motors, including in combination, an unbalanced throttle valve, means to counterbalance the suction effect on said valve in all positions thereof at a constant speed of the motor when the carburetor side of the intake conduit is unobstructed, means to slightly relieve the suction effect on said

valve, manually operated means for completely obstructing the carburetor side of said conduit and simultaneously preventing said throttle valve from opening due to the
5 decreased suction effect thereon caused by said obstructing means. 10

24. In a suction responsive governor for hydrocarbon motors an unbalanced throttle valve in the intake conduit, means re-
sisting the suction effect on said valve, manually operated means for obstructing said
conduit between the carburetor and said
valve and for simultaneously moving said
throttle valve towards a closed position.
In testimony whereof we hereunto affix
our signatures. 15

ROBERT G. HANDY.
ARTHUR A. BULL.