

Feb. 8, 1938.

W. E. LEIBING

2,107,990

METHOD AND APPARATUS FOR GOVERNING FLUID FLOW

Filed Jan. 30, 1935

2 Sheets-Sheet 1

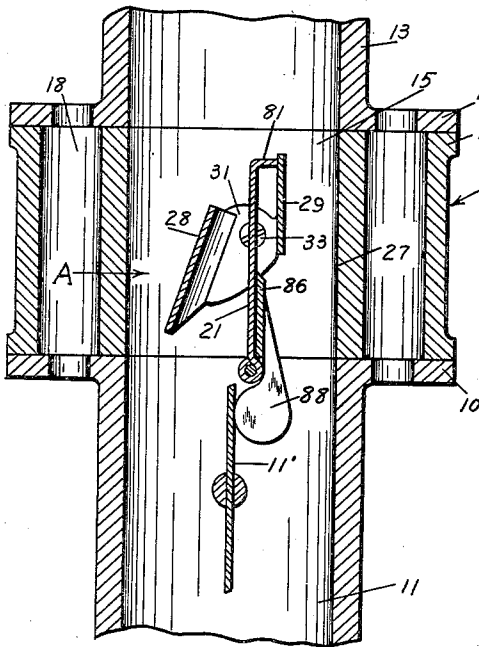


Fig. 1

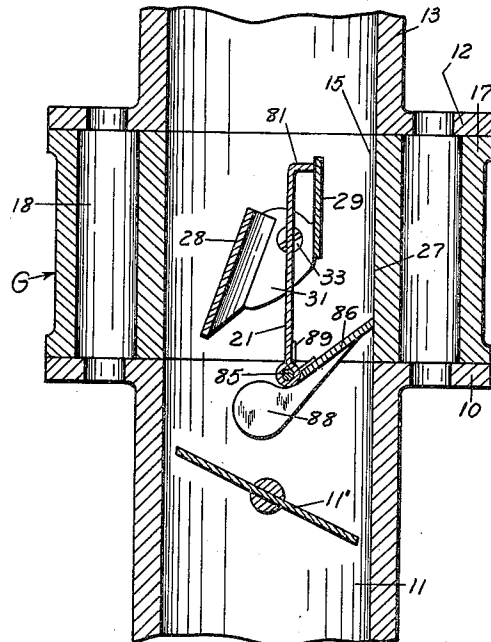


Fig. 2

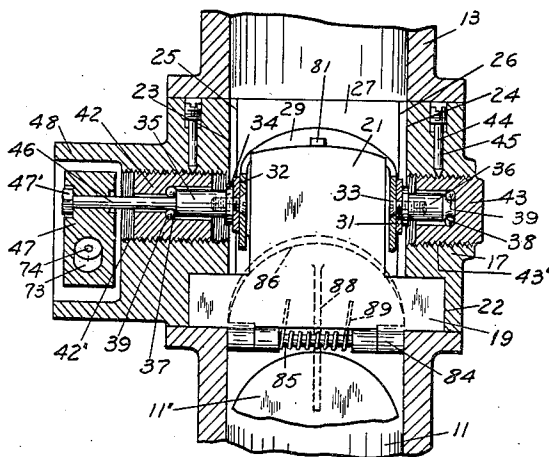


Fig. 3

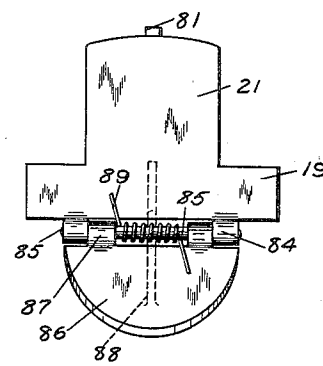


Fig. 4

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2 Sheets-Sheet 2

Fig. 6

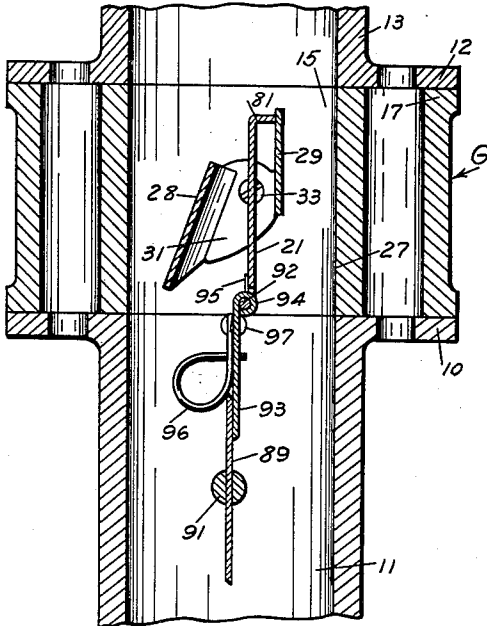


Fig. 7

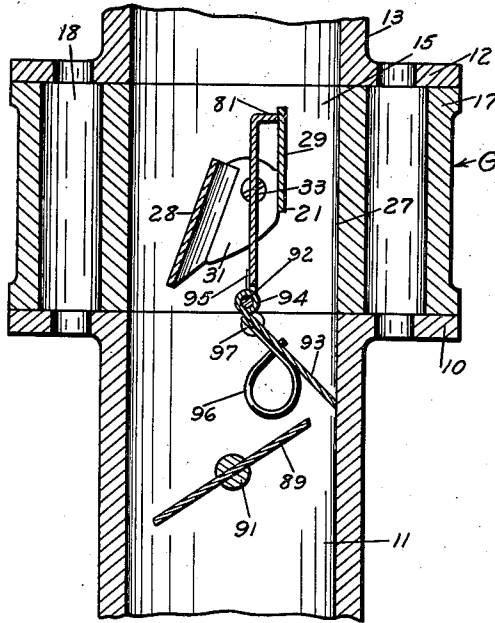
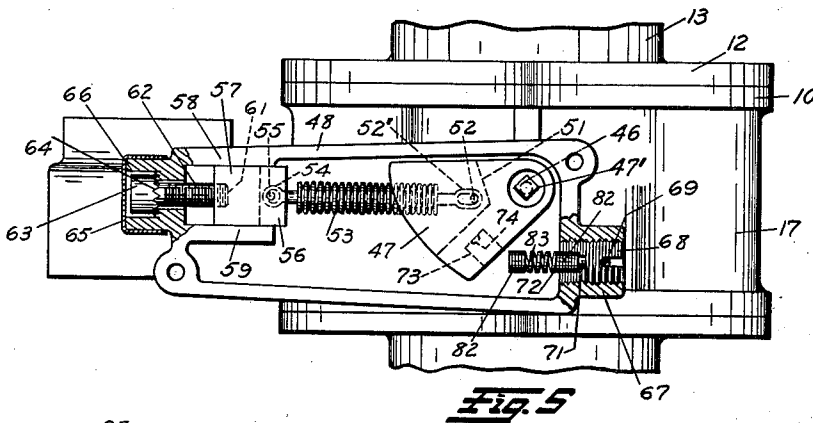


Fig. 5

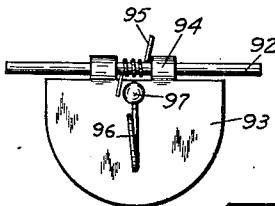


Fig. 8

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UNITED STATES PATENT OFFICE

2,107,990

METHOD AND APPARATUS FOR GOVERNING
FLUID FLOWWilliam E. Leibing, San Francisco, Calif., assign-
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Application January 30, 1935, Serial No. 4,154

13 Claims. (Cl. 137-152)

This invention relates to methods and apparatus for governing the rate or quantity of fluid flow through a conduit, and more particularly, to methods and apparatus designed for use in association with the intake manifold of a combustion engine for the purpose of automatically preventing the latter from operating above a predetermined maximum speed, and is intended as an improvement over the apparatus and methods disclosed in my copending applications S. N. 614,533, filed May 31, 1932, now Patent No. 2,026,947, granted Jan. 7, 1936; S. N. 659,893, filed March 6, 1933, now Patent No. 2,026,948, granted Jan. 7, 1936, and S. N. 738,114, filed August 2, 1934, and now Patent No. 2,081,825, granted May 25, 1937.

More specifically, this invention relates to improvements in fluid flow governing in response to fluid velocities, aided when desired by pressure differentials; and the preferred embodiment is of the throttle valve type inserted in a conduit conducting the fluid flow to be governed.

The disadvantages and objections attendant upon prior devices of this character have been discussed to some extent in the above identified application. In addition to such disadvantages and objections, further undesirable characteristics have appeared which are eliminated by the present invention.

In any governor of the so-called velocity type, two different conditions of operation occur which make it desirable to have two different settings in the governor.

Assuming a governor to be employed in connection with an internal combustion engine, the first of these conditions occurs when the engine is working under full and nearly full loads at speeds just below the governed speed. This condition requires that the governor elements offer the least possible restriction to fluid flow in order that full power may be developed and maintained, and also requires that the governor vane or vanes must remain in a full open position in order that these required flows may be maintained.

The second condition of operation is when the engine is operating under light or negligible loads and where very little fluid or fuel mixture is capable of taking the engine to speeds above the desired governed speed.

It is therefore apparent to one skilled in the art that a governor which may fulfill the requirements of the first condition, i. e., when the engine is working under full and nearly full loads at speeds just below the governed speed, will necessarily, under partial throttle and light load,

allow the engine to far exceed the governed speed.

To put the above differently, a true velocity governor, when set to trip at 1,000 units of mixture per second, should remain stationary, and in full open position at a flow of 950 units of mixture per second. Yet, it is apparent that if an engine requires 1,000 units per second under full load, 950 units per second will, under light load, drive the engine at a much higher R. P. M. than 1,000 units per second under full load.

This condition is aggravated by the diversion of fluid flows through the governor by the carburetor throttle in a manner that in throttled position tends to render the governor partially inoperative.

It is therefore obvious that at least two entirely different conditions of operation occur which must be met by different settings or adjustments of the governor. If it is attempted to change the governor springs or the adjustments of the same every time the throttle position or load on the engine varies, it is conceivable that satisfactory governor operation could be obtained under all conditions but such a manner of operation would be manifestly difficult and disadvantageous.

In my application S. N. 614,533, I take advantage of the diversion of flows by the carburetor throttle to assist the governor in its closing action, and in my application S. N. 659,893, I further assist the governor vane or vanes by adding a guide vane to the carburetor throttle in a manner to increase the closing effect of the flow of the fuel mixture when the carburetor throttle is in the so-called "throttle cheat" position. While both methods have proven to be satisfactory to some extent, I have found that many improvements may yet be made from the viewpoint of installation and operation.

Means, other than those above described, have been employed with a view to correcting the above described condition, such for instance as piston cylinder arrangements, the piston being operated by a differential between the vacuum within the governor or fuel conduit and a source of pressure such as the atmosphere and arranged to actuate the governor valve. Such arrangements are difficult to maintain in proper working order by reason of the accumulation of dirt and grit therein. Being operated by atmospheric pressure, a dishonest operator has only to apply adhesive tape or like sealing means to the exterior of such devices to shut off atmospheric pressure and render them inoperative, and thereby defeat the purpose of the entire governor.

In addition to overcoming the disadvantages and difficulties heretofore set forth, the present invention has as a major object, in combination with a throttle valve of the pivoted or butterfly type, the provision of a novel type of governor mounted in a conduit for fluid flow which insures the direction or concentration of a sufficient quantity of fluid flow at substantially all rates of flow, and particularly at relatively narrow throttle openings to the actuating portion of the governor to actuate the governor valve at any rate for which it may be set, the sensitivity of the governing mechanism being thereby increased, particularly at relatively low rates of flow.

A further object of this invention is to provide novel means in combination with a governor valve whereby a response of the governor valve at any desired rate of fluid flow or engine speed is assured by reason of a correct concentration or distribution of the fluid flow by said means.

Still a further object of this invention is to provide novel means in combination with a governor whereby adjustments within the governor need not be made for different throttle openings or different load conditions, said means acting in effect to produce different settings or adjustments on the governor whereby the latter is responsive under all conditions at which its action is desired.

A further object of my invention is to provide novel flow directing means associated with a governing valve of an engine in such manner as to concentrate the kinetic energy of the indrawn fuel effectively upon the governing valve in substantially all positions of the latter, the directing means being rendered substantially inoperative at stages of operation where it is not required.

Still a further object of my invention is to provide a novel type of governor for a fluid flow conduit whereby the fluid flow therethrough is directed, particularly at relatively narrow throttle openings, to the actuating portions of the governor valve and away from the remaining portions thereof, thereby increasing the differential or the velocity factors arising from the fluid flow, and increasing the sensitivity of the governor.

A further object of my invention is the provision of a novel method of governing of a fluid flow in combination with a fluid flow controlling means wherein at restricted positions of said latter means the fluid flow is concentrated upon the actuators or power elements of the governor employed, the concentration being discontinued after the fluid flow controlling means has been opened to a degree to permit a flow of fluid sufficient to operate the governor without the necessity of concentration.

Still a further object of my invention is the provision of a novel method of operating the governor for fluid flow control, the governor comprising a power or actuating element and a stabilizing or balancing element, wherein at stages where only relatively low fluid flows are permitted, said fluid flow is concentrated upon the power or actuating element of the governor and is diverted from the balancing or stabilizing element of the governor, whereby substantial increases in the closing force of the actuating or power element are effected.

A further object of my invention is to provide a combination of fluid flow controlling means such as a throttle valve, with a fluid flow controlled governor involving a power element, novel means being provided to positively concentrate the flow of fluid upon the power element through-

out a major portion of the range of operation of the fluid flow controlling means.

A further object of my invention is the provision of a combination of a fluid flow controlling means such as a throttle valve with a fluid flow controlled governor involving a power element, novel means being provided to concentrate the flow of fluid upon the power element throughout the major portion of the range of the fluid flow controlling means, the concentrating means being rendered inoperative and substantially removed as an obstruction to fluid flow when the fluid flow controlling means is set to permit relatively large flows.

Still a further object of my invention is the provision of fluid flow controlling means in combination with a fluid flow controlled governor involving a power element and a stabilizing element, novel means being provided to concentrate the flow of fluid upon the power element throughout the major portion of the range of operation of the fluid flow controlling means, the means serving to divert the fluid flow from the stabilizing or balancing elements, whereby substantial increases in the closing force of the actuating or power element are effected.

Still a further object of my invention is the provision of fluid flow controlling means in combination with a fluid flow controlled governor involving a power element and a stabilizing element, novel means being provided to concentrate the flow of fluid upon the power element throughout the major portion of the range of operation of the fluid flow controlling means, the concentrating means serving to divert the fluid flow from the stabilizing or balancing element and materially increase the torque effecting closing of the governor blade whereby in effect different settings or adjustments of the governor are accomplished in accordance with the position of the fluid flow controlling means thus avoiding the necessity of adjustments within the governor of the means normally tending to oppose closing movement thereof.

A further object of my invention is to provide a novel governor for fluid flow control, the governor being designed to operate under all conditions of operation and constructed in a manner whereby attempted tampering as by an unauthorized person to render the governor inoperative is defeated.

A further object of my invention is to provide a novel governor, particularly for use in internal combustion engines as employed in motor vehicles, wherein operation of the governor is assured under all conditions of operation, particularly under so-called "throttle-cheat" conditions.

Still a further object of my invention is the provision of a governor, particularly adapted for use on the engines of motor vehicles wherein novel means are provided for the insurance of operation of the governor under all conditions of operation, and particularly under throttle cheat conditions, the means being wholly mounted within the governor and being of a nature whereby substantially no obstruction is offered to fluid flows at stages where unobstructed free flow is desired.

A further object of my invention is to provide a novel governor, particularly for use on engines as employed in motor vehicles, wherein proper operation of the governor is assured under all conditions of operation, particularly under so-called "throttle cheat" conditions, the governor being self-contained and requiring no special ele-

ments attached to the carburetor or other element of the engine whereby the governor can be readily installed in existing devices.

Still a further object of my invention is the provision of a novel form of governor, particularly adapted for use on the engines of motor vehicles and automatic in operation under all conditions of operation of the motor vehicle, the elements of which are relatively simple and easily assembled and the cost of which is accordingly reduced.

Still a further object of my invention is to provide a novel governor for use on engines of motor vehicles, wherein under full loads, full mixture requirements are passed without obstruction thereof and under partial or no loads, the engine speed for which the governor is set at full load cannot be exceeded.

Still a further object of my invention is the provision of novel means for installation in prior types of governors wherein operation of such governors under all conditions is assured, the means being relatively cheap and comparatively easy to install.

A further object of my invention is to provide novel means for installation on governors to insure the correct operation thereof under all conditions, the means being capable of ready adjustment to the features of present installations as, for instance, the varying location of throttle valves.

Additional objects, many of a subordinate or more specific nature will appear from a study of the following detailed description and the claims appended thereto when taken in connection with the accompanying drawings, wherein:

Figure 1 is a side elevation taken in partial section of a preferred embodiment of the present invention and showing a governor arranged in combination with a portion of an intake manifold of an internal combustion engine and a portion of a carburetor containing a throttle valve, the throttle valve being shown in wide open position.

Figure 2 is a view similar to that of Figure 1, but with the carburetor throttle only partially open in approximately a so-called "throttle cheat" position, at which position, under light loads, the governed R. P. M. of the engine can be normally very much exceeded.

Figure 3 is a view of the device as shown in Figure 1 taken in the direction of the arrow A and shown partially in section.

Figure 4 is an elevation of the bridge of the governor of Figures 1 and 2 with the diverting vane or half-throttle shown in relaxed position to illustrate its manner of mounting.

Figure 5 is a view taken looking at the left side of Figure 3, illustrating the valve controlling and adjusting means of the governor controlling and adjusting mechanism.

Figure 6 is a view similar to that of Figure 1 showing a further preferred embodiment of the apparatus of the present invention, with the carburetor throttle shown in open position.

Figure 7 is a view similar to that of Figure 6 with the carburetor throttle shown in partially open position.

Figure 8 is an elevation of the diverting vane or half-throttle employed in the embodiment of the invention shown in Figures 6 and 7, and illustrating the manner of operation and mounting thereof.

With continued reference to the drawings, wherein like characters are employed to designate like parts and with particular reference to Figures 1 and 2:

Reference numeral 10 designates the apertured flange of the throttle passageway 11 of a carburetor (not shown). Flange 10 is designed for attachment to a flange 12 of an intake manifold 13 of an internal combustion engine (not shown), but is shown separated therefrom to provide a space for the reception of a fluid flow governor generally indicated at G.

Governor G has a cylindrical bore 15 therein aligned with carburetor passageway 11, bore 15 being formed within a governor block 17. In section block 17 is similar in shape to flanges 10 and 12 of the carburetor passageway and intake manifold, respectively, and cooperates therewith to form vertical bores 18 for the reception of 15 assembly bolts (not shown) employed to rigidly secure the governor in mounted position. A throttle valve 11', preferably of the butterfly type, is mounted in carburetor passageway 11 upon a suitable shaft so that upon rotation it can be employed to vary the permissible area for fluid flow through carburetor passageway 11. Throttle valve 11' is preferably arranged for manual operation by the operator of the engine.

Governor G comprises generally an adjustable valve mechanism for throttling passageway 15 when the engine upon which the governor is mounted reaches a predetermined maximum R. P. M. It is essential that this mechanism operate smoothly and with great sensitivity and yet present no substantial obstruction to fuel flow at engine speeds below the governed maximum. It is also essential that it operate to govern the speed of the engine under all conditions of load and fuel flow and particularly under the so-called "throttle-cheat" conditions. While these characteristics are present in the governors described in my copending applications, previously identified, the governor of the present invention has been found to be characterized by even greater sensitivity, smoothness and range of operation.

A substantially T-shaped member, comprising a pair of legs 19 interconnected by a relatively straight flat bridge member 21, is incorporated in the governor block 17 in slots 22 in such manner that bridge 21 extends horizontally across bore 15 with the side surfaces thereof in substantially vertical planes. Bridge 21 thus offers substantially no resistance to fluid flow. Legs 19 likewise have their surfaces in vertical planes and are so located as to position bridge 21 slightly offset from the axis of bore 15.

It will be noted that diametrically opposite sides 23 and 24 of bore 15 adjacent slots 22 extend upwardly throughout the length of the bore and are formed as slightly flat sides leading into notches 25 and 26, respectively, which bound a curved uninterrupted smooth surface 27 of bore 15. Associated with bridge 21 is a governing valve comprising a power vane 28 and a stabilizing or balancing vane 29 mounted for unitary oscillation about a horizontal axis that is offset in the same plane as that of bridge 21. Vanes 28 and 29 have short offset pivoted arms 31 and 32, respectively, which impart to them a U-shape when viewed edgewise. Arms 31 are spaced for disposition closely adjacent flat portions 23 and 24 of bore 15 and arms 32 are spaced to fit within arms 31.

A pair of screws 33 are employed to securely fasten the two pairs of engaged arms at a desired fixed angle relative to one another upon the enlarged portions 34 of a pair of rotatable supporting shafts 35 and 36. Shafts 35 and 36 are

formed with conical bearing portions 37 and 38 respectively, which engage bearings 39, in turn held in place by bearing cones 42 and 43 in such manner that both lateral and axial thrusts are taken by the bearings, and the pivoted governor valve is free to oscillate during its operation.

Bearing cones 42 and 43 are adjustably secured in tapped apertures 42' and 43' in block 17 and the outer ends of bearing cones 42 and 43 are preferably formed with screw driver slots or like means to provide convenient means of adjustment of play in bearings 39. Set screws 44 are preferably provided in bores 45 to lock the cones in their adjusted position. It will be noted that by reason of the specific shape of the cones wherein pockets of considerable depth are provided for the surfaces contacting the bearings, dirt, grit and other undesirable matter are prevented from collecting within the cones and if taken in around the threaded cones will immediately pass off into the fluid rather than retreat to the bearings and their cones by reason of the relatively low pressure within the conduit.

Shaft 35 is provided with a portion 46 of reduced cross section which extends through an aperture in bearing cone 42 and has an inertia member 47, pinned, threaded, or otherwise secured thereto for rotation therewith. Preferably a locking member 47' is employed which is suitably secured to the other end of shaft 46.

Inertia member 47 is housed within a housing 48 secured to and preferably formed integral with block 17 at one side thereof, housing 48 being preferably provided with a cover plate (not shown) to prevent the entrance of dirt or grit to the mechanism contained therein and to protect the mechanism from unauthorized tampering. Inertia member 47 is slotted as shown at 51 and a pin 52 is passed through the opposing walls of the slot thus formed. An eyed and threaded member 52' is mounted on pin 52 and in turn has secured thereto one end of a spring 53 which at its opposite end is secured to a threaded and eyed member 54. Member 54 engages a pin 55 mounted in a slotted portion 56 of an adjustment block 57 mounted to reciprocate in guides 58 and 59, preferably formed integral with housing 48.

Block 57 is formed with a tapped bore 61 in which is threaded an adjusting screw 62 having an enlarged head 63 thereon. It will be noted that head 63 is provided on its underside with a serrated formation 64 whereby head 63 is maintained in any desired position by reason of the serrations 64 engaging the adjacent portion of housing 48. Thus block 57 may be positioned at any desired point in guides 58 and 59. A cap 65 is preferably provided for the open portion 66 of housing 48 in which head 63 of screw 62 operates in order that suitable sealing means may be employed and unauthorized adjustment of screw 62 prevented. It is preferable that screw 62 be provided with a head of a special design such as to require the use of a special key or tool in the hands of only authorized persons for adjustment.

On the opposite end of housing 48, a projecting portion 67 is formed which is tapped to receive a threaded member 68. Threaded member 68 is preferably formed with screw driver slots or the like at the outer end thereof to facilitate adjustment and to enable it to be locked in place by a pin 69 passing through a slot into holes provided in the adjacent portion of housing 48. Member 68 at its inner end has a threaded pro-

jection 71 thereon to secure a resilient member or spring 72. Opposite member 72, a recess 73 is formed in inertia member 47 with abutting or projecting portion 74 thereon to center spring 72 when engaged in recess 73.

In connection with springs 53 and 72, it is preferred to employ special spring fastening means therewith as disclosed in my application S. N. 738,114, wherein the threads on the mounting portions are not formed of a pitch equal to the pitch of the coils of the springs employed, but are preferably formed of a pitch calculated to be greater than that of the coils of the springs when under their greatest degree of tension and fully expanded. By the employment of such an arrangement, it has been found that the possibility of the springs breaking loose is eliminated whereas with conventional threads as hitherto employed, the spring coils have evidenced a tendency to slip off the threads at the end of the threaded portion and wear the threads until it is no longer possible to keep the threads secured thereto.

The tension of spring 53 normally urges inertia member 47 to a position such as shown in Figure 5 which corresponds to the wide open valve position shown in Figures 1 and 2. In this position, the governing valve is yieldingly held in engagement with a spacing or stop element 81, preferably integrally secured to bridge 21 and arranged to position vane 29 in a substantially vertical position.

In this position pin 52 is in the end of the slot provided in member 52' and is preferably slightly offset from a horizontal plane through the shaft 46. By reason of this offset, it will be noted that when inertia member 47 rotates in a counter-clockwise direction with reference to Figure 5, in response to closing movement of the governor valve, the resistance to movement of the valve is uniformly increased due to the increasing length of the effective arm between pin 52 and shaft 46 as well as due to the continued stretching of spring 53. Spring 72 does not engage inertia member 47 until the governor approaches a closed position and is employed primarily to insure a smooth easy governing action and to prevent fluttering at points approximating closed position. It will be noted that spring 72 is not of the same pitch throughout, but is provided with a portion 82 of relatively fine pitch engaging recess 73 in inertia member 47 and a portion 83 of relatively coarse pitch immediately adjacent thereto and next to the threaded projection 71.

In adjusting the portion of the governor so far described, spring 72 may be adjusted by threaded member 68 and requires adjustment only for the characteristic of the governor which is determined by tests conducted at the factory at the time of manufacture. Adjustment of spring 72 bears substantially no relation to the particular speed or range of speeds over which the governor is designed to operate, and the adjustment of spring 72 need not be disturbed after the governor has left the factory. After the governor has been placed in association with the mechanism to be governed, such as the carburetor and manifold of an internal combustion engine, screw 62 may be adjusted to cause block 57 to reciprocate in guides 58 and 59 and so change the tension of spring 53. By this means, the governor may be accurately set to govern for any desired speed and screw 62 thereafter sealed as an insurance against unauthorized tampering.

With further reference to the structure of the governing valve, power vane 28 is given an approximately cylindrical curvature between pivot arms 31 so as to form a scoop for the fuel current to which it is subjected. In addition, it preferably has greater effective exposed area than has stabilizing vane 29, and is disposed at a greater distance from the pivotal axis than is the latter whereby the closing torque developed by the power vane is greater and more effective than that developed by the vane 29 in resistance to the closing movement of the valve.

Vane 29 is preferably flat, and in its normal open position adjacent the stop 31 on bridge 21 (as shown in Figures 1 and 2), its plane is substantially parallel to the axis of the conduit whereby it offers substantially no resistance to fluid flow. Vanes 28 and 29 are not parallel, vane 28 being preferably set at an angle of about 15° relative to bridge 21. Vane 28 opens toward the carburetor so that, in the fully open valve position, this vane will produce a rotative component. This angle is accurately maintained by the interlocking faces of arms 32 of vane 29, the faces abutting vane 28 in a manner whereby they may not be altered by the act of assembling screws 33.

To avoid so-called "throttle cheat" and to insure proper governing action under all conditions of engine operation, regardless of load, bridge 21 is formed on its lower end with two downwardly extending ears 84. Ears 84 are arranged to receive a shaft 85 for rotation therein. A half-throttle or guide vane 86 is mounted for rotation on shaft 85 through ears 87, vane 86 being formed with a cam shaped element or projection 88 on one side thereof as shown in Figures 1 and 2. If desired, shaft 85 may be mounted in the conduit walls instead of on the lower end of bridge 21.

In Figure 4, vane 86 is shown in a depending or relaxed position to show a spring 89 mounted on shaft 85, spring 89 being formed with projecting portions at the ends thereof, whereby it acts to resist counterclockwise rotation of vane 86 as viewed in Figures 1 and 2. In assembling bridge 21 in conduit 15, vane 86 is rotated to lie flat against bridge 21 as shown in Figure 1. Upon release of the vane after insertion of bridge 21 in the conduit, it will assume the position shown in Figure 2 and act to block a portion of conduit 15.

It will be noted that vane 86 and throttle valve 11' are so related that upon the clockwise rotation of throttle valve 11' to an open position, the upper portion of the throttle valve will strike cam 88 and rotate vane 86 in a counterclockwise direction. The front edge of vane 86 is shaped to the contour of the opposite wall 27 of conduit 15. Thus, in the position of vane 86 as shown in Figure 2, the portion of conduit 15 to the right of bridge 21 is closed against the flow of fluid and all fluid flow passes to the left of the bridge. When throttle valve 11' is rotated toward open position, vane 86 is rotated to an open position and is substantially removed as a concentrating or direction means in conduit 15.

With reference to the manner of operation of the device as shown in Figures 1 and 2, and assuming the governor and carburetor to be assembled with a running engine with substantially no load thereon and the throttle 11' of the carburetor in the position shown in Figure 2, throttle 11' does not contact cam 88, and valve 86 is therefore closed.

Thus all mixture passing through the conduit is compelled to pass to the engine on the left of bridge 21 and against power vane 28.

The resulting concentration of flow to the left of bridge 21 not only directly increases the power of the power vane 28, but also eliminates the fuel flow that would otherwise be acting on stabilizing vane 29 to hold the governor in open position. Thus the power or force of vane 28 as against the action of the springs tending to hold the governor in open position is increased approximately three times over the force exerted if the vane 86 were not present, since the fluid flow against vane 28 is virtually doubled by the diversion of the normal flow to the right of the bridge to the left of the bridge, and is increased again by removing the normal counterforce of the fluid flow against vane 29. Therefore in any throttled position where vane 86 contacts the governor wall 27, all flow is directed against operating or power blade 28, thereby increasing the force three fold, and no possibility exists of cheating the throttle and attaining a higher speed of the engine than that for which the governor is set.

The previously described concentration of flow upon the power vane and diversion of flow from the stabilizing vane, particularly when the carburetor throttle is in a partly open position, accomplishes, in effect, different settings or adjustments on the governor to meet the varying conditions. In terms, instead of adjustments of the springs or other adjustments within the governor mechanism to insure the desired operation under all conditions and particularly under the different conditions of light and heavy load, the necessary change in setting or adjustment of the governor is effected by an increase in torque upon the governor blade in the manner described. Obviously, this manner of adjustment or setting is of marked advantage in that it is automatic in action, instantaneously responsive to the correct degree and does not require any actual adjustment or change of elements of the governor.

As throttle 11' is opened, it contacts cam 88 and opens valve 86 until when the throttle is in wide open position as shown in Figure 1, valve 86 is folded against bridge 21 in a manner whereby substantially no obstruction is offered to the free flow of mixture called for by the open position of the carburetor throttle.

In Figures 6, 7 and 8, I have illustrated still a further preferred embodiment of the apparatus of the present invention. The governor blade is of the same design as that shown in Figures 1 and 2 and no further description thereof is deemed necessary. A throttle valve 89 similar to throttle 11' of Figure 1 is shown mounted to rotate on a shaft 91. Throttle 89 is mounted to rotate clockwise when going from open to closed position and counterclockwise when going from closed to open position as distinguished from the throttle 11' of Figure 1.

A shaft 92 is mounted in the governor conduit adjacent the lower end thereof and a directing vane or throttle 93 is mounted to rotate thereon as by ears 94. If desired, vane 93 may be mounted upon the lower end of bridge 21 or in the upper portion of the carburetor conduit, or if desired it may be mounted in suitable recesses in the contacting faces of the carburetor and governor flanges. A spring 95 is mounted on shaft 92 with projecting legs thereon to normally insure the retention of vane 93 in the position shown in Figure 7. A cam member or spring 96 is mounted on the face of vane 93 as by rivet 97 or similar fastening means and is shaped so as to be engaged by the upper end of throttle 89 when being moved to an open position.

The operation of this modification is somewhat the same as that of the modification shown in Figures 1 and 2. In the throttle position shown in Figure 7, the blade 93 acts to direct all fluid flow to the left of bridge 21 since the portion of the conduit to the right thereof is closed. Thus the resulting force on vane 28 is substantially three times that if vane 93 were not present. This insures operation of the governor at relatively narrow throttle openings and throttle cheat is thus prevented.

Upon rotation of throttle 89 to an open position, the upper edge of the throttle contacts cam 96 and vane 93 is rotated to a position as shown in Figure 6 wherein there is no diversion of flow and a substantially unobstructed flow is permitted to all elements of the governor in accordance with the full throttle opening.

The use of a cam 96 formed of spring wire is of advantage in that the cam may be readily adjusted to existing installations where the locations of the throttle valves may be different and particularly when the throttle valve is located at a relatively great distance from the lower edge of the governor bridge.

It is apparent from the foregoing description that the present invention provides novel methods and apparatus where insurance of the operation of a governor is provided under all conditions of operation. Moreover, the apparatus is exceedingly inexpensive since it virtually involves only the addition of a half throttle, a spring and a shaft to mount the same on existing governors. Devices heretofore employed, such as relatively expensive piston and cylinder arrangements, which due to dirt, dust or the like are difficult to maintain in proper working order, are eliminated. It is also apparent that the present invention is extremely efficient in overcoming in throttled positions the heretofore difficult problem of throttle cheat.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In combination with a governing means and a throttle valve for controlling fuel flows through a conduit, means mounted separately from said throttle valve adjacent said governing means for directing a sufficient portion of said fuel flow to said governing means to render the latter responsive to substantially all rates of fluid flow when said throttle valve is in early opening position, and a spring to maintain said directing means in such directing position independent of changes in pressure of said fluid except when said throttle valve goes to substantially fully open position.

2. In combination with means responsive to the rate of fluid flow in a conduit for governing said fluid flow through said conduit, a throttle valve, and means adjacent said governing means for insuring sufficient fluid flow against said governing means to render the latter responsive at substantially all rates of fluid flow, said fluid flow directing means comprising a guide means mounted for oscillation in said conduit on a pivot

spaced from said throttle valve and a spring to maintain said guide means in guiding position independent of changes in pressure of fluid except when said throttle means is in relatively wide open position.

3. In combination with means responsive to the rate of fluid flow in a conduit for governing said fluid flow through said conduit, a throttle valve, and means adjacent said governing means independent of the pressure within said conduit for insuring sufficient fluid flow against said governing means to render the latter responsive at substantially all rates of fluid flow, said fluid flow directing means comprising a guide vane mounted for oscillation in said conduit on a pivot spaced from said throttle valve, said guide vane and throttle valve being arranged so that said throttle valve upon moving to a relatively wide open position will contact and move said guide vane to an inoperative position.

4. In combination with means responsive to the rate of fluid flow in a conduit for governing said fluid flow through said conduit, a throttle valve, and means adjacent said governing means for insuring sufficient fluid flow against said governing means to render the latter responsive at substantially all rates of fluid flow, said fluid flow directing means comprising a guide vane mounted for oscillation in said conduit on a pivot spaced from said throttle valve, and a member on said guide vane positioned in the path of said throttle valve as said throttle valve moves to open position whereby said guide vane is rendered inoperative at predetermined openings of said throttle valve.

5. In combination with a governor responsive to the flow of fluid through a conduit and comprising a power element, a throttle valve in said conduit, a separately pivoted vane mounted in said conduit normally positioned to concentrate fluid flow upon said power element, and means to connect said throttle valve and said vane whereby the latter is rendered substantially inoperative as said throttle valve is opened.

6. In combination with a governor responsive to the flow of fluid through a conduit and comprising a power element, a vane pivotally mounted in said conduit adjacent said governor and extending in a direction opposite to that of fluid flow, said vane being of a size to obstruct said conduit except the portion thereof leading to said power element, means to normally maintain said vane in obstructing position to concentrate fluid flow upon said power element, and a butterfly valve in said conduit positioned relative to said vane to render the latter inoperative as an obstruction when said valve is rotated through open position, said vane being arranged to be adjusted for different locations of said butterfly valve.

7. In a throttling valve assembly for governing fluid flow through a conduit, a pivoted valve assembly mounted for oscillation within said conduit, said valve assembly comprising a power vane and a stabilizing vane on opposite sides of the valve pivot, a partition to separate said vanes passing through the plane of said pivot, a flow controlling valve, and a guide vane mounted on an axis removed from said flow controlling valve and on one end of said partition, said vane being arranged to oscillate in said conduit and insure the direction of fluid flow to said power vane at relatively narrow openings of said flow controlling valve.

8. In the combination defined in claim 7, 75

wherein means is provided to connect said guide vane to said flow controlling valve whereby the vane is moved to a position wherein it offers substantially no obstruction to fluid flow through said conduit when said flow controlling valve is in relatively wide open position.

9. In combination with a governor responsive to the flow of fluid through a conduit and comprising a power element, a vane pivotally mounted adjacent said governor and of a size to obstruct the conduit except the portion thereof leading to said power element, a spring to normally maintain said vane in obstructing position to concentrate fluid flow upon said power element independent of changes in pressure in said conduits, and a butterfly valve in said conduit positioned relative to the vane to render said vane inoperative as an obstruction when said valve is rotated to open position.

10. In a control for fluid flow through a conduit, a throttle valve movable from open to closed position, fluid deflecting means mounted separately from said throttle valve, means to normally maintain said deflecting means in deflecting position independent of changes in velocity or pressure of fluid in said conduit, and means on said deflecting means positioned in the path of travel of said throttle valve to be contacted thereby and effect movement of said fluid

deflecting means during a predetermined range of movement of said throttle valve.

11. In a control for flow of fluid through a conduit, a pivoted valve member, a pivoted vane member spaced therefrom and arranged to obstruct a predetermined portion of said conduit, and means on one of said members arranged to contact the remaining member whereby on movement of said valve member to open position, said vane member is removed as an obstruction in said conduit.

12. In a control for flow of fluid through a conduit, a butterfly valve, a guide vane for fluid pivoted adjacent said butterfly valve, and a projection on said vane arranged to engage said butterfly valve only in certain positions of the latter whereby said vane is actuated according to predetermined movements of said butterfly valve.

13. In a control for flow of fluid through a conduit, a pivoted valve member, a pivoted vane member spaced therefrom, and means on one of said members arranged to contact the remaining member whereby on predetermined movement of said valve member, said vane member is oscillated about its pivot, said latter means being adjustable to permit its use with valve members and vane members spaced at different distances from one another.

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