

Nov. 29, 1932.

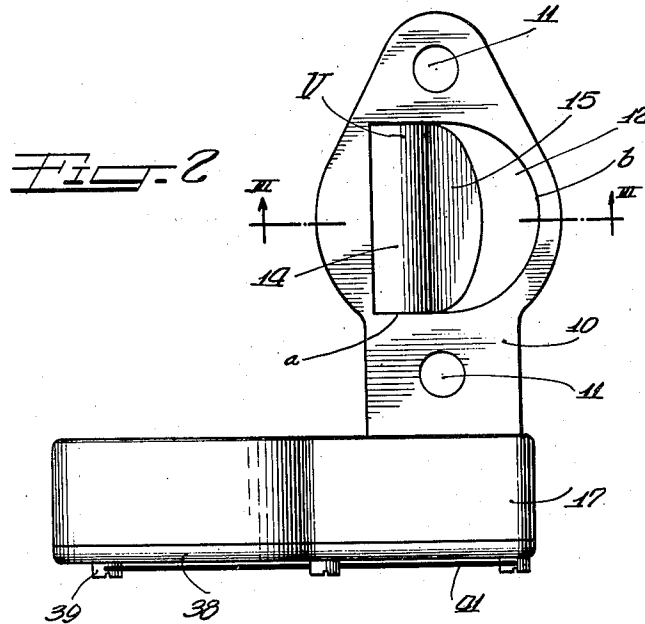
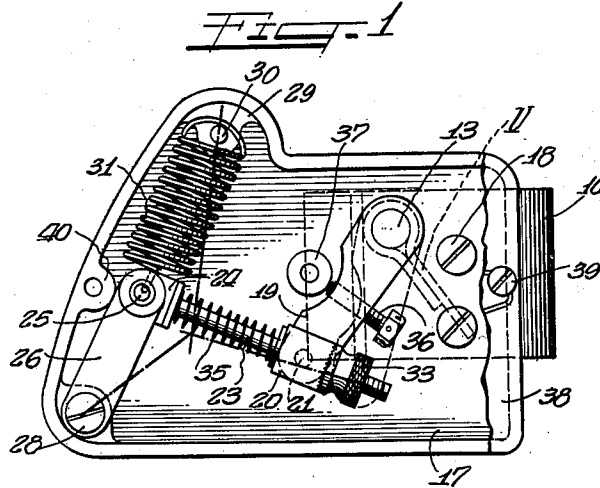
F. O. SINGER

1,889,706

GOVERNOR

Filed Jan. 7, 1931

2 Sheets-Sheet 1



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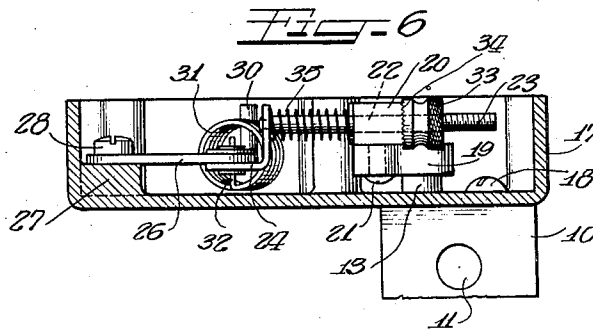
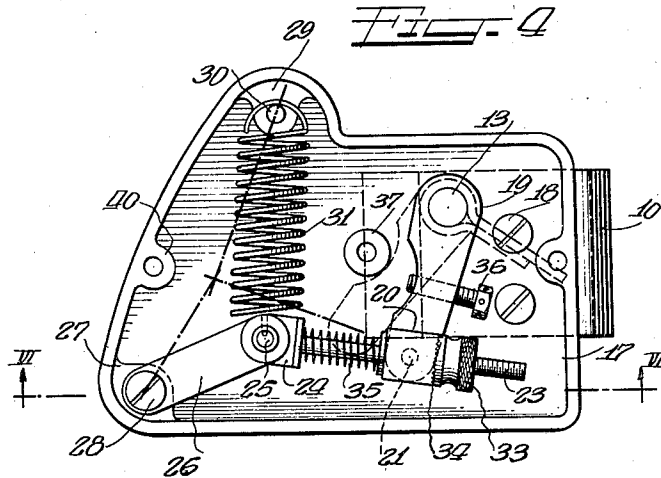
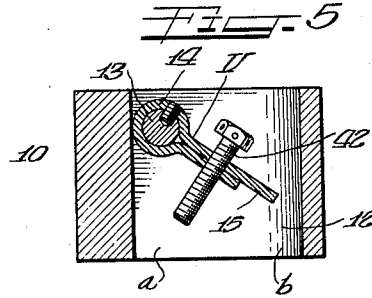
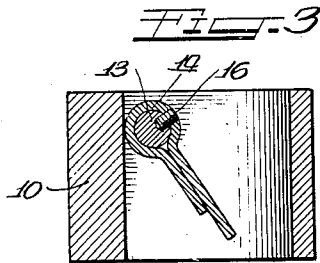
F. O. SINGER

1,889,706

GOVERNOR

Filed Jan. 7, 1931

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

FREDERICK O. SINGER, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO NATIONAL GOVERNOR CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION
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GOVERNOR

Application filed January 7, 1931. Serial No. 507,063.

My invention relates to governors, and particularly to governors for use with hydrocarbon engines for determining the maximum speed at which the engines may be operated.

My improved governor structure may be readily inserted between the fuel supply carburetor and the intake manifold of an engine, and comprises a member responsive to the suction in the manifold together with adjustable means for yieldingly resisting the response of said member to the suction to a degree depending upon the maximum speed to which the engine is to be limited.

An important object of the invention is to provide for a normal maximum opening of the suction responsive member so that it will not interfere with the proper flow of combustion fuel for the normal acceleration of the engine to the predetermined maximum speed, and the provision of improved resisting means which will hold the suction responsive member in such normal maximum opening position until the predetermined maximum speed of the engine is substantially increased and to permit movement of the suction responsive member towards passage closing position to prevent excess speed of the engine.

A further object of the invention is to provide an improved form of passageway and an improved form of valve in said passageway for more readily responding to the suction effect to more accurately and efficiently control the engine speed.

Still another object is to provide more simple and more accurately adjustable counterbalancing and resisting mechanism for the suction responsive valve.

The above enumerated features and other features of my invention are incorporated in the structures and disclosed on the drawings, in which drawings

Figure 1 is a front view of the governor with parts of the closure cover removed;

Figure 2 is a plan view of the governor;

Figure 3 is a section on plane III—III of Figure 2;

Figure 4 is a front view of the governor with the cover removed and showing the po-

sition of the resisting mechanism elements in response to suction on the valve;

Figure 5 is a sectional view of the valve and passageway showing a modified arrangement for adjusting the valve movements, and

Figure 6 is a section on plane VI—VI of Figure 4.

The governor shown comprises an oblong body 10 adapted to fit between the flanges at the outlet end of a carburetor and the flanges at the inlet of an engine intake manifold, the body being provided with the holes 11 for registering with the holes in the aforesaid flanges so that the governor body is readily clamped between the carburetor and intake manifold.

The body 10 has the vertical passage 12 therethrough for registering with the carburetor outlet passage and the manifold inlet passage. In cross-section, the passage 12 is of semi-ovate form, the part *a* being preferably rectangular the part *b* being preferably semi-circular as clearly shown in Figure 2. Extending through the passage 12 along the end of the rectangular section thereof and journalled in the body 10, is the shaft 13 on which is secured the suction responsive element *v*, this element being in the form of a valve having the hub 14 receiving the shaft 13. As shown, this valve may be constructed of sheet metal to form the hub which extends along and against the end wall of the rectangular part *a* of the passage and against the side walls of the passage, the end 15 of the valve being of semi-circular shape in accordance with the section *b* of the passage, the axis of the valve at right angles to its hinge axis being, however, shorter than the corresponding axis of the passage 12, in order that the valve may never entirely close the passage. In other words, the valve is shortened to leave a bypass when it is at or near its maximum restricting position.

The valve may be secured to the shaft by means of a set screw 16 or in any other suitable manner, so that it will always turn with the shaft. At its front end the shaft extends into a housing 17 secured against the front of the body 10 as by means of screws 18. Within the housing the shaft has secured

thereto the arm 19 which extends downwardly in the arrangement shown. On the free end of the arm 19 a block 20 is swiveled by means of the stud 21 extending therefrom through the arm, and this block has a transverse passageway 22 therethrough for an adjusting rod or link 23. At its inner end the link 23 is connected to the vertical leg of an L-shaped piece 24 whose horizontal leg is pivoted by means of a tubular pin 25 to the inner end of a link 26 which is pivoted at its outer end on a boss 27 by means of a screw 28. The boss 27 is at the bottom of the housing and at the top of the housing is a boss 29 from which a pin 30 extends for anchoring the outer end of a tension spring 31 whose inner end engages in the tubular pin 25 so that the rod 23, the link 27, and the end of the spring are pivoted together at a common point.

The outer end of the link 23 is threaded for receiving an adjusting nut 33 which engages the outer side of the block 20 so that by the turning of this nut the length of the rod between the end of the arm 19 and the pivot pin 25 may be adjusted. To fixedly lock the nut in adjusted position the base thereof and the adjacent face of the block 20 may be toothed or otherwise roughened as indicated at 34. A light spring 35 preferably encircles the rod 23 between the arm and the piece 24 to exert sufficient pressure against the arm to hold the adjusting nut 33 in engagement with the block 20 at all times.

In the arrangement of Figures 1 and 2, a stop screw 36 threads through the arm for engagement with a stop lug 37 formed on the housing 17, the engagement of this screw with the lug determining the normal opening position of the valve *v* in the passage 12. The operative parts within the housing are protected from unlawful access by a cover 38 which may be secured by screws 39 threading into lugs 40, and the stop lug 37 may also serve to receive one of the cover securing screws. A sealing wire 41 may extend through apertures in the screws after the cover has been applied so as to discourage unauthorized access to the operating parts within the housing.

Instead of having the stop screw for the valve located on the arm 19, a stop screw 42 could be supported directly by the valve to abut against the side of the passage 12 to limit the opening movement of the valve, this arrangement being shown in Figure 5.

Describing now the operation, the governor body 10, as has been explained, is inserted in the fuel feed line between the carburetor and the engine intake manifold so that, when the engine is operating, the suction effect on the valve will tend to swing the valve towards closing position against the resistance of the spring 31. Figure 1 shows the setting for comparatively slow maximum speed of

the engine. The adjusting nut 35 is in position to allow the spring 31 to assume a comparatively relaxed position, with the axis of the spring in or practically in the longitudinal axis of the link 26. The tension of the spring acting through the rod 23 will hold the arm 19 with its stop screw 36 against the lug 37 in which position the valve *v* is in its maximum passage opening position. Such maximum opening through the passage 12 will not interfere with the normal flow of combustion gas from the carburetor to the engine while the engine is being started and accelerated towards its determined maximum speed. With the setting shown in Figure 1, as the engine increases its speed after starting thereof, the suction will act on the valve *v*, and, as the initial resistance of the spring 31 is comparatively small, the valve will correspondingly readily respond to the suction, but as the suction increases and tends to further swing the valve, the axial inclination of the spring 31 and the expansion thereof increases with a corresponding increase of resistance to swing of the valve, and as the engine reaches its predetermined maximum speed, the resistance of the spring 31 will increasingly tend to counter-balance the valve movements and to hold the valve to maintain the proper passage for the desired maximum speed. Should the suction rise sufficiently to further swing the valve, then the valve will so restrict the passageway that the proper fuel supply cannot be maintained to the engine and the engine will then slow down. The resistance of the spring 31 thus cooperates with the suction effort on the valve to maintain a passage for the flow of combustion fuel up to a predetermined maximum speed and to restrict the flow in proportion with any tendency of the engine to overspeed. In Figure 1, the dot and dash lines indicate the location of the axes of the spring and of the link 26 and rod 23 when the valve is held for maximum speed operation of the engine.

It will be noted by referring to Figure 1 that normally the axis of the rod 23 is substantially at right angles with the axes of the link 26 and the spring 31, the resistance moment of the spring 31 being therefore at a minimum during the starting movement of the valve from its normally opened position. As the valve moves towards restricting position the resistance moment of the spring 31 increases as the link 26 is swung downwardly, the expansion and consequently the resistance of the spring 31 accelerating during such downward swing of the link by the rod 23 which is connected with the valve through the arm 19 and shaft 13. This accelerated resistance to the valve movement prevents abrupt movement of the valve to maximum restricting position and permits the engine to be properly brought up to the desired speed be-

fore restricting movement of the valve to stop the engine from exceeding the predetermined maximum speed.

In Figure 4, the setting is shown for a higher maximum speed, the full lines showing the positions of the resisting elements when the valve is in position to counterbalance the suction. For the higher maximum speed setting the adjusting nut 33 has been screwed up on the rod 23 to decrease the distance between the end of the arm 19 and the pivot pin 25. With this setting, when the arm is in the dotted position with its stop screw against the lug 37, the axes of the spring, link 26, and rod 23 will be positioned as indicated by the dot and dash lines, the spring 31 being primarily under some expansion so that the initial movement of the valve towards restricting position is correspondingly resisted. The valve being normally at its maximum opening position, the engine can be started and accelerated without interference, and as the engine approaches its predetermined maximum speed and the suction correspondingly increases, the valve will be swung farther towards restricting position but the resistance of the spring 31 to such movement will correspondingly accelerate as the leverage moment on the link 26 increases. In other words, for a higher maximum speed of the engine, adjustment or setting is made so that the valve must start towards restricting position against the resistance of the spring 31 from a greater initial expansion thereof, as illustrated in Figure 4, while, for a slower maximum speed, setting is made so that the valve starts its movement towards restricting position against the resistance of the spring under less initial expansion thereof. With the setting for higher maximum speed it requires a correspondingly higher suction effort to swing the valve to restricted position against the increased resistance of the spring while in the setting for the lower speed the valve moves towards the restricting position against a lessened resistance of the spring.

I have found that, with the shape of the passage 12 and the corresponding shape of the valve *v*, the valve may respond more freely to the suction.

By shortening the valve as has been explained, it can never extend across the passage 12 to entirely close this passage but there will always be a bypass. It will be noted that the length of the link 26 plus the distance between the pivot 25 and the end of the arm 19 determines the maximum closure position of the valve. For a setting for slow maximum speed this length will be greater so that the valve may move farther towards maximum closing position, but for higher maximum speed setting, as illustrated in Figure 4, this distance is less so that the maximum closing movement of the valve is

restricted. Therefore, under sudden suction increase during such higher speed setting of the governor, the valve cannot be suddenly closed too far so that the fuel supply would be too suddenly restricted.

The governor disclosed is of simple construction and can be economically manufactured. The controlling parts are of simple construction and assembly and function efficiently and accurately to govern and control the operation of the engine.

I have shown a practical and efficient embodiment of the various features of the invention, but I do not desire to be restricted to the details shown and described as changes and modifications in the construction, arrangement and operation of parts may be made without departing from the scope of the invention as defined in the appended claims.

I claim as my invention:

1. A speed governor for hydrocarbon engines comprising a frame having a passage therethrough for inclusion in the fuel feed path to an engine, a valve extending transversely in said passage, a shaft secured to said valve adjacent to one edge thereof whereby said valve may swing in response to intake flow in said passage and cause rotation of said shaft, an arm secured to and extending from said shaft, link members pivoted at their outer ends and extending toward each other and joined at their inner ends, one of said link members being elastic and extensible, the end of said arm being movable in a path extending transversely of a line connecting the pivotal points of said link members, a connecting link connecting the end of said arm with the inner ends of said link members whereby when said arm is swung by said valve when responding to intake flow said link members will be swung to cause extension of said extensible link member to resist the swing of said arm and said valve in response to intake flow.

2. In a speed governor for hydrocarbon engines, the combination of a frame having a passage therethrough, a shaft extending into said passage, a valve supported on said shaft to be unbalanced to be adapted to swing in response to intake flow in said passage and to rotate said shaft, an arm secured to and extending from said shaft, a spring link anchored at one end, a connecting link connecting the end of said arm with the free end of said spring link and extending at an angle with the axis of said spring link, and a second link anchored at one end and connecting with the juncture of said spring link and said connecting link for substantially maintaining the relative angularity of said spring link and said connecting link, swing of said arm by said valve in response to intake flow in said passage causing bodily swing of said spring link and said second link and extension of said spring link to resist the movement of

said valve in response to intake flow in said passage.

3. A speed governor for hydrocarbon engines comprising a frame having a passageway adapted for inclusion in the fuel path to the engine intake, a shaft extending into said passageway, an unbalanced valve secured to said shaft and extending transversely in said passageway for responding to the intake flow in said passageway to rotate said shaft, an arm secured to said shaft to be swung thereby, link members anchored on said frame at their outer ends and extending toward each other, one of said link members being elastic and extensible, a pull link connected at its inner end with the inner ends of said link members and with its axial line crossing the line joining the anchored ends of said link members whereby pull on said pull link will swing said link members and cause gradual distortion of said elastic link member to resist such pull, the outer end of said pull link being connected with the free end of said arm and said arm being swung to exert pull on said pull link when said valve responds to intake flow in said passageway.

4. A speed governor for hydrocarbon engines comprising a frame having a passageway adapted for inclusion in the fuel path to the engine intake, a shaft extending into said passageway, an unbalanced valve secured to said shaft and extending transversely in said passageway for responding to the intake flow in said passageway to rotate said shaft, an arm secured to said shaft to be swung thereby, link members anchored on said frame at their outer ends and extending toward each other, one of said link members being elastic and extensible, a pull link connected at its inner end with the inner ends of said link members and with its axial line crossing the line joining the anchored ends of said link members whereby pull on said pull link will swing said link members and cause gradual distortion of said elastic link member to resist such pull, the outer end of said pull link being connected with the free end of said arm and said arm being swung to exert pull on said pull link when said valve responds to intake flow in said passageway, a stop for adjusting the normal opening position of said valve, and means for adjusting the effective length of said pull link whereby to set said elastic link member for initial resistance to movement of said valve in response to intake flow.

5. A speed governor for hydrocarbon engines comprising a frame having a passageway therethrough adapted for inclusion in the fuel path to an engine intake, a shaft extending through said passageway, a valve extending transversely in said passageway and secured to said shaft to be unbalanced to be adapted to swing and rotate said shaft in response to intake flow through said pas-

sageway, an arm secured at one end to said shaft and extending in one direction, a link pivoted on said frame and extending substantially in the opposite direction, a connecting link structure connecting the free ends of said arm and said link and being normally at an angle with said arm and link, swing of said valve in response to intake flow through said passageway causing swing of said arm and movement of said link and connecting link structure toward parallelism with each other, and a spring pivoted at its outer end on said frame and connected at its free end with said connecting link structure to resist movement of said link and said connecting rod structure toward parallelism with each other and thereby resist swing of said valve in response to intake flow through said passageway.

In testimony whereof I have hereunto subscribed my name at Chicago, Cook county, Illinois.

FREDERICK O. SINGER.

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