

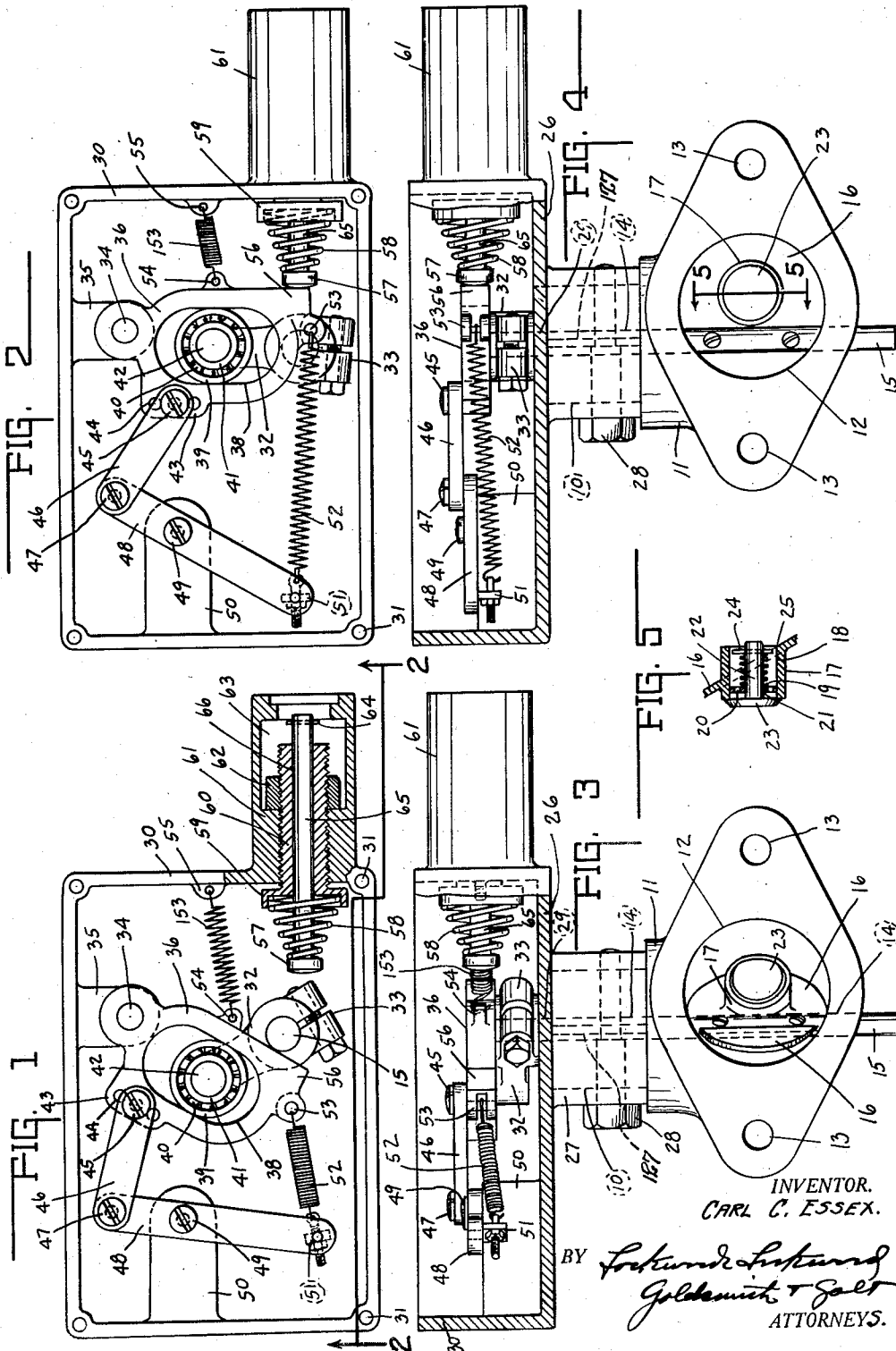
Aug. 25, 1931.

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1,820,384

AUTOMATIC GOVERNOR

Filed May 5, 1928



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## UNITED STATES PATENT OFFICE

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## AUTOMATIC GOVERNOR

Application filed May 5, 1928. Serial No. 275,387.

This invention relates to an automatic governor which will maintain a predetermined engine speed substantially independent of load.

5 The chief object of the invention is to provide a governor which will be automatically operable by an engine controlling movement for controlling an engine so that a substantially predetermined engine speed can be  
10 maintained substantially independent of the load applied to the engine and particularly without any surging such as is found to occur with present day automatic governors.

The chief feature of the invention consists  
15 in controlling the fuel intake of an engine and having that controlling member responsive to the engine and transmit such response to a control mechanism which, in turn, is responsive to the aforesaid and controls the  
20 fuel controlling member of the intake so that substantially constant engine speed is attained independent of load and without surging.

A particular feature of the invention consists  
25 in forming the engine controlling member as an elliptical butterfly valve and mounting the same upon an axis eccentric of the elliptical valve axis and eccentric of the intake axis.

30 Another feature of the invention consists in the semi-scissor and toggle type leverage associated with the valve supporting member and an incidental feature thereof consists of the elliptical cam connection therebetween  
35 and also the frictionless character thereof.

The full nature of the invention will be more clearly understood from the accompanying drawings and the following description and claims.

40 In the drawings Fig. 1 is a top plan view of leverage mechanism with cover removed, and parts being broken away to show other parts in detail. Fig. 2 is a view similar to Fig. 1  
45 in a second and constrained position for prohibiting excessive speed. Fig. 3 is a side elevation of the entire governor construction including a portion of the engine intake with parts broken away and in section to show  
50 other parts in detail, the position of the parts

corresponding to that shown in Fig. 1. Fig. 4 is a view similar to Fig. 3 but shows parts in position corresponding to that shown in Fig. 2. Fig. 5 is a central sectional view through the relief valve mechanism and is taken on the line 5—5 of Fig. 4.

In the drawings 10 indicates a cylindrical portion projecting laterally of an adaptor 11 including a cylindrical intake passage 12 extending therethrough and transverse to the  
60 cylindrical extension 10. The adaptor 11 is elliptical in outline and includes the bolt openings 13 adapted to register with openings in and is positioned between the intake and carburetor flanges.

Extending through and preferably coaxially through the adaptor 11 and extension 10 is an opening or bore 14 which communicates with intake 12. Oscillatably mounted in said bore and extending through the intake is a  
70 pivot member or valve stem 15. Said stem within the intake supports an elliptically outlined butterfly valve 16, the connection to which is parallel to but offset from the minor axis of the ellipse and, as shown in Figs. 3  
75 and 4, the bore is offset from the central axis of the intake 12 and is transverse thereto. It has been determined that the elliptical valve should close the intake completely when positioned between 30 and 35 degrees and preferably about 32 degrees, deviation from the normal plane of closing.

In view of the eccentricity of the mounting of the elliptical valve and also its eccentric position within the intake the same is subject  
85 to suction of the intake and will move proportional to the suction since the butterfly valve is not balanced, as has heretofore been the practice. To relieve the suction when the butterfly closes the intake at the 32 degree  
90 angle or thereabouts, said butterfly is provided with a tubular housing 17 defining an opening 18 in said valve.

The axis of the tubular housing 17 lies parallel to the axis of the intake when the  
95 butterfly valve is closed. Therefore, the tubular housing 17 is cocked at an angle of approximately 32 degrees to the plane of the butterfly valve. Positioned in the housing 17 is an apertured plate 19 having the air  
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passages 20 therethrough and a central passage 21, which supports a slidable stem 22. Stem 22 mounts upon the side nearest the engine a valve 23 and upon the opposite end  
 5 a retaining member 24 and interposed between said retaining member 24 and the plate 19 and concentric with said stem is a coil spring 25. The relief valve thus formed is not operative until the suction becomes an  
 10 amount equal to and slightly exceeding that of the spring 25. When that occurs, valve 23 opens and remains open as long as the suction force exceeds that for which the spring is set. The tension of the spring 25 may be  
 15 adjusted if desired. The operation of this relief valve is as follows: The suction initially closes the butterfly valve 16 and when the valve closes completely closes the intake, the suction becomes effective on the valve 23 and  
 20 opens the same to relieve the vacuum created between the butterfly 16 and the engine, by reason of the closing of the butterfly.

The mechanism for loading the valve 16 and holding the same in predetermined position as long as the engine does not exceed a  
 25 predetermined speed is mounted upon a base plate 26. This plate has a tubular extension 27 adapted for telescopic reception of the cylindrical extension 10 of the adaptor and  
 30 is split as at 127. Suitable means, such as bolt 28, secures clampingly the two together in adjusted position.

The base 26 includes an opening 29 to receive the upwardly extending and projecting  
 35 end of the shaft 15. Control mechanism is mounted within a box, the walls of which are indicated by the numeral 30 and said walls are adapted to support a cover not shown, the cover being mounted by screws or the like secured as at 31.

An arm 32 is clampingly mounted, as at 33, upon the projecting end of shaft 15 so that the lever arm 32 will oscillate with the oscillation of the butterfly valve 16. Pivotaly supported at 34 within a bracket 35 is another  
 45 lever 36. Said lever 36 includes an elliptical opening 38 or rather an internal cam surface comprising two semi-circular portions connected by two common tangential walls.  
 50 Said internal cam opening mounts a roller 39, in turn, mounted in the opposite end of the lever 32. As shaft 15 rotates clockwise, reference being had to Fig. 1, in the closing movement of the butterfly valve 16, the lever 36  
 55 moves counter-clockwise and lever 32 moves clockwise with a scissor-like or toggle movement and with a varying effective lever arm, as will be apparent from examination of Figs. 1 and 2.

The lever 36 supports a projecting bracket or tongue 43 provided with a plurality of openings 44 therein, any one of which is adapted to rigidly receive, and thus adjustably support, a pivot member 45 which pivotally supports one end of a link 46, the other

being pivotally mounted at 47 to link 48, in turn, pivotally mounted at 49 on a stationary bracket 50. The other end of the link 48 is extended and adjustably mounts at 51 a spring 52, also mounted at 53 upon lever 36.

In the clockwise movement of lever 32, which results in counter-clockwise movement of lever 36, spring 52 is elongated and since the effective leverage gradually increases as the movement from Fig. 1 to Fig. 2 obtains, the force of the suction which is transmitted from the plate 16 through the shaft 15 as oscillatory movement, has an increasing effect and this force also is opposed by the continued extension of spring 52. Such movement is assisted by the spring 153 connected at 54 to lever 36 and at 55 to a stationary mounting. The tension of this spring may be such that a maximum leverage exerted by lever 32 attains just when the parts assume the position shown in Fig. 2 and the butterfly is closed. Continued closing movement of the butterfly is opposed by the lever 36 having an abutment 56 formed thereon engaging a bumper 57 yieldingly mounted through a conical spring 58 retained in position by a cupped spring seat member 59 having a threaded extension 60 for threaded mounting in an extension 61 of the wall 30. The position at which the bumper is engaged may be adjusted by the nut 62 being threaded along the threaded body 61, said nut being mounted in chamber 63 formed in said extension. A suitable retaining member 64 limits the sliding movement of the bumper under the influence of the spring 58 and in the projecting position. Movement of the bumper 57 in the opposite direction is opposed by the spring 58 and progressively opposed as the movement continues.

The stem 65 carries the bumper 57 and the retaining member is slidably mounted in the bore 66 of the threaded extension of the cupped spring retainer. The force of spring 58 is proportioned to the lever members and the position of initial engagement is adjusted to suit the particular needs of each installation.

The formation of the housing with the tubular extension and the detachable association of the same with a standard telescopic connection with the intake adaptor permits the mechanism shown in Figs. 1 and 2, to be of standard construction and the adaptor to be varied as necessary or required for each type of installation.

The operation of the device as an entirety is as follows:

The incoming air to the engine passes through the intake 12 and the suction becomes stronger as the engine speed increases. This suction as aforesaid is effective upon the eccentrically mounted elliptical valve and attempts to close it. If the engine speed exceeds the predetermined speed, the suction caused by such increase in the engine speed

closes the elliptical valve. Closure of the valve produces a vacuum between the engine and the valve which is broken by the relief valve and when the same is broken the suction again becomes operative upon the butterfly valve. The butterfly valve is normally maintained in a position corresponding to the predetermined speed desired to be maintained by the loading mechanism, previously described, and such loading is attained as follows:

Oscillation of the butterfly valve 16 and the closing movement thereof causes the toggle linkage or scissor-like construction, levers 32 and 36, to move from position shown in Fig. 1 toward the position shown in Fig. 2, and such movement, as before stated, is in opposition to spring 52 but is assisted by the spring 153. As soon as pre-determined engine speed obtains, the abutment 56 engages the bumper 57 which starts to compress spring 58, the tension of spring 52 constantly increasing and opposing such movement. This loads the valve so that the continued suction does not completely close the butterfly and since the valve is not completely closed, the motor slows down under the load imposed. The suction in the intake decreases so that spring 52 becomes effective to return the parts, the levers 36 and 32, to the initial position which relieves the butterfly of the load imposed upon it. As the motor or engine builds up under load, the motor speed will increase until it reaches that for which the governor is set, whereupon abutment 56 engages the bumper 57 and the operation is the same as before, so that the motor will be positively restrained to a pre-determined maximum speed, no matter what the load of the engine might be, provided the engine has enough power to handle the load.

This automatic device is operable by the engine and is responsive to the same and automatically controls the engine. It is so arranged that the operator of the vehicle can run the engine at any reduced speed if desired but he cannot run the engine at any speed greater than that for which the governor is set. The device as before stated, permits the engine to run at a constant speed independent of the load when it is automatically controlled. The governor device herein described does not cause surging in the engine speed, that is, wide variations of oscillating character about the predetermined engine speed such as heretofore has been the case with automatic governors. The reason for this is that the scissor-like or toggle leverage arrangement is employed and also associated therewith is a substantially frictionless and movable bearing connection, so that friction is relatively negligible in this part of the device wherein the lever arm 32 actually is a fixed length while its effective length is gradually increased as said lever moves into

the speed controlling position. Immediately upon release from the speed controlling position the parts are returned in a reverse direction and the engine can continue to operate at a predetermined speed but never exceed the same. The aforesaid arrangement is such that immediately upon the engine returning to the predetermined speed or slightly below the same, the parts are relatively free from control and returned to the initial position.

The invention claimed is:

1. In an intake for an internal combustion engine the combination of a cylinder intake passage, a butterfly valve pivotally mounted therein upon an axis transverse to the passage and offset an appreciable distance therefrom, and suction operable relief valve means carried by the valve and normally in longitudinal alignment with the intake passage axis when the butterfly valve is in closed position, said valve being of substantially elliptical outline and adapted to completely close said intake passage when inclined therein.

2. In an automatic governor the combination of an engine responsive speed controlling oscillatable member, a lever having an elliptical internal cam and pivotally supported eccentrically of the cam portion, a lever rigid with said oscillatable member, a cam follower supported by the last mentioned lever and engaging said cam, means normally tending to position the levers and member in predetermined position, stop means, including a yielding arrangement, progressively opposing movement of the member and for limiting movement of the member in one direction, and means for adjusting the initial position of said stop means.

3. In an automatic governor the combination of an engine responsive speed controlling oscillatable member, a pair of levers pivotally connected at adjacent ends, one of said levers being oscillatable by and with said oscillatable member, and the other of said levers being pivotally mounted, a link connected to one of said levers, a lever pivotally supported intermediate its ends and having one end pivotally connected to said link in predetermined ratio to the opposite end, and yielding means connecting the initial link connected lever and the opposite end of the pivotally supported, and the last mentioned lever for obtaining progressively increased opposition to relative movement between the first mentioned pair of levers in one direction.

4. An automatic governor for an internal combustion engine including an intake adaptor, an automatic governor mechanism, a base independent of the adaptor for supporting the mechanism, and an adjustable complementary connection between said adaptor and said base for multiple connection therebetween.

5. In an automatic governor, the combination of an engine responsive speed controlling

oscillatable member, a pair of levers having predetermined variable connection therebetween, one being oscillatable by and with the oscillatable member, a third lever for yieldingly imposing opposition to lever movement in one direction, and a link adjustably connecting the pair of levers and the third lever for positively maintaining a predetermined engine speed.

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10 6. In an automatic governor, the combination of an engine responsive speed controlling oscillatable member, a pair of levers having predetermined variable connection therebetween, one being oscillatable by and with the  
15 oscillatable member, and an additional and adjustable leverage connection between said levers for yieldingly opposing lever movement in one direction and positively maintaining a predetermined engine speed.

20 In witness whereof, I have hereunto affixed my signature.

CARL C. ESSEX.

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