Jan. 24, 1939. A. C. HOOF 2,145,086

GOVERNOR

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Fig. 1.

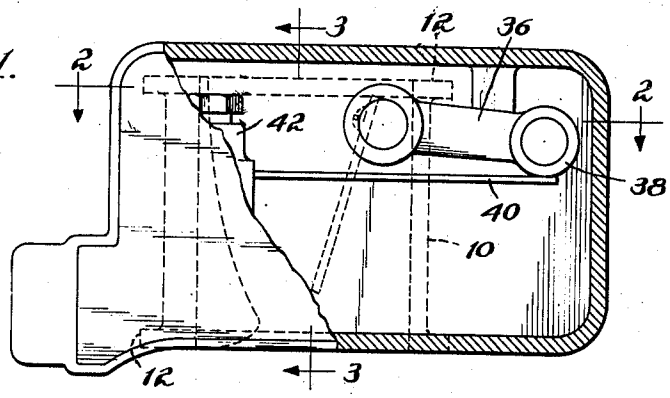
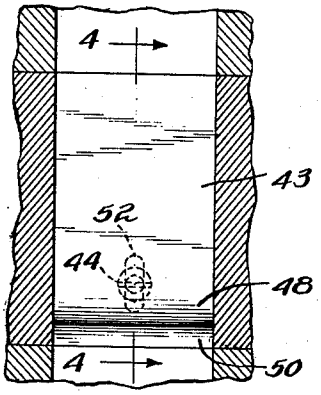



Fig. 3



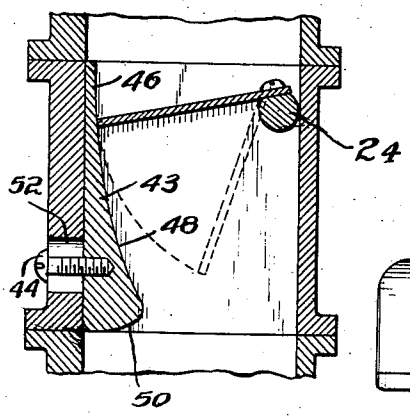




Fig. 4.

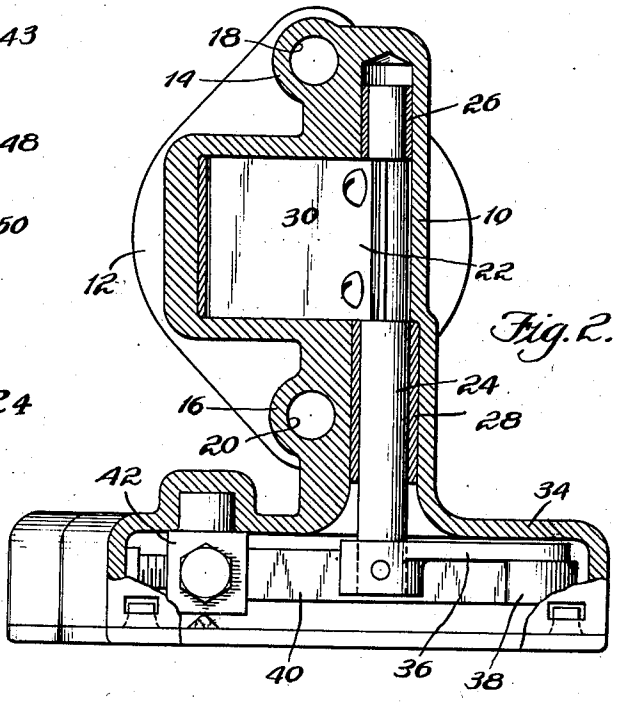



Fig. 2.

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GOVERNOR

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Fig. 6.

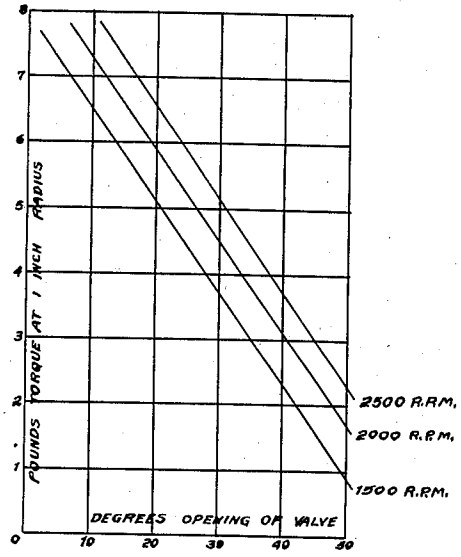



Fig. 5.

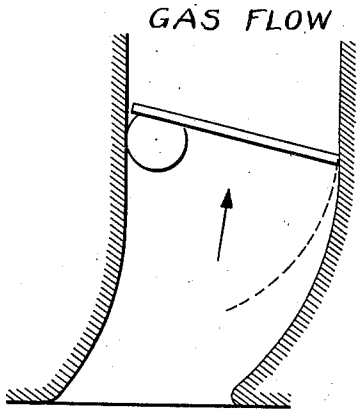



Fig. 8.

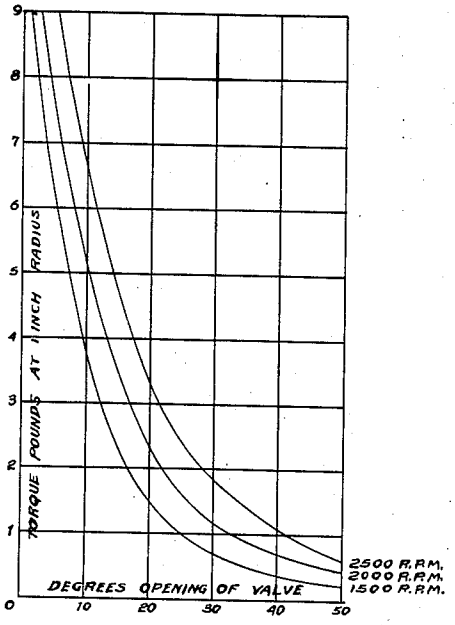
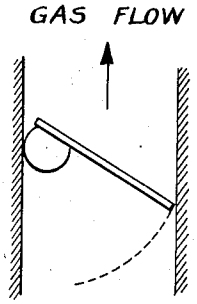



Fig. 7.




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# UNITED STATES PATENT OFFICE

2,145,086

## GOVERNOR

Addison C. Hoof, Hinsdale, Ill.

Application May 21, 1934, Serial No. 726,670

3 Claims. (Cl. 137—152)

My invention relates to governors, and more particularly to governors of the suction type for use with internal combustion engines.

The principal object of my invention is to provide an improved and simplified governor capable of functioning efficiently and accurately in connection with internal combustion motors. My invention relates particularly to governors of the unbalanced valve type which are well known in the prior art and which function to close off the fuel passageway in proportion to the suction of internal combustion engines, and which are all provided with a force resisting element usually of the spring or suction controlled type.

In the design of a governor of the type which I have described, it has been recognized that the resistance member which operates to balance the valve at a desired open position, must follow a certain curve of effort produced by the suction of the motor. This curve, as recognized in the art, is not regular at any point, and therefore considerable difficulty has been experienced in designing a force resistance means capable of meeting the curve of effort required.

The principal object of my invention is to provide a governor of the type described which is so constructed that the suction effort produced by the motor can be plotted as a straight line, as a result of which the resistance force necessary to balance the valve at any desired open position can also be plotted as a straight line of effort.

A further object of my invention is to provide a governor of the type described so constructed that the configuration of the conduit through the governor cooperates with the valve plate to provide a straight line of effort for operating the governor.

A further object of the present invention is to provide a governor which is so simple in construction that the number of working parts are reduced to a minimum and one which will have long life even though subjected to hard usage.

A further object of my invention is to provide in governor construction a conduit having a removable wall so constructed that the results hereinbefore mentioned can be achieved by the use of this wall in present day governors.

A further object of my invention is to provide a wall section in governor construction capable of adjustment to meet different requirements.

Other objects and advantages will be more apparent from the following description wherein reference is had to the accompanying two sheets of drawings, upon which

Fig. 1 is a front elevational view of one type of governor embodying my invention with a part of the cover plate thereof broken away to show the valve movement resisting elements.

Fig. 2 is a plan sectional view thereof taken on the lines 2—2 of Fig. 1.

Fig. 3 is a fragmentary view through the passageway of the governor taken generally on the lines 3—3 of Fig. 1.

Fig. 4 is a fragmentary sectional view through the governor passageway taken generally on the lines 4—4 of Fig. 3.

Fig. 5 is a diagrammatic view illustrating generally the action of the valve in the passageway.

Fig. 6 is a graph illustrating the lines of effort produced by my invention at different speeds.

Fig. 7 is a diagrammatic view illustrating a valve in the ordinary passageway, and

Fig. 8 is a graph illustrating the curved lines of effort produced at different speeds by the use of a construction such as is shown in Fig. 7.

In carrying out my invention, I provide a block or casing 10 which is formed with the rectangular passageway 12 therein, and which may be provided with flanges 14 and 16 containing openings 18 and 20. Suitable bolts may pass through the openings 18 and 20 and through flanges upon adjoining sections of the conduit between the carburetor and the manifold of an internal combustion member so that the governor may be suitably positioned in operative position.

A valve member 22 may be provided in the rectangular passageway 12 and comprise the shaft member 24 which extends through suitable bearings 26 and 28 in the housing 10, and a flat plate member 30 mounted upon a flattened portion 32 of the shaft 24. The shaft 24, as clearly shown in Fig. 4, is positioned substantially against a wall of the passageway and may extend outwardly from the block 10 and enter a housing portion 34 within which a lever or arm 36 is securely fastened thereto. The arm 36 carries a roller 38 adjacent its extended end for a purpose which will be more clearly understood hereinafter.

In order to provide a force for opposing the closing movement of valve 30 in the passageway 12, I provide an ordinary flat spring member 40 which may be mounted for adjustment in a block 42 in the housing 34. The construction of the block and associated parts may be similar to those shown in my co-pending application, filed September 17, 1932, and bearing Serial No. 633,695, and now Patent No. 1,999,758, granted April 30, 1935.

The passageway 12 is rectangular in shape, as has been noted, and I provide a plate member 43 secured by suitable screw members 44 to one wall of the passageway. The plate 43 may be formed with a flat portion 46 and an arcuately shaped portion 48 terminating in a slight radius and an oppositely sloping portion 50.

The screw member 44 may pass through a slotted opening 52 in the wall of passageway 12, so that lateral adjustment of the plate 43 may be easily made.

The operation of my improved governor will now be described:

In order to understand the principles of operation of suction controlled or velocity type governors, it is necessary to clearly understand what takes place between the principal components. Accordingly, when a governor is interposed between the carburetor and the engine manifold with the engine rotating at a constant speed, the action of the pistons and valves is similar to that of an air compressor, taking what air exists in the manifold into the cylinder on the down-stroke of the piston, and on an up-stroke expelling this air into the exhaust passage.

This action naturally reduces the amount of air in the inlet manifold and causes a partial vacuum to exist therein. As a result of this action, a lower pressure exists on the manifold side of the governor valve than the pressure on the carburetor side of the governor valve. This difference in pressure naturally exerts a force on the valve to move it to a closed position.

By making an actual experiment to determine the force of the effort of the valve to remain closed, I have shown the line of effort upon the graph shown in Fig. 8. In this graph, units of weight are used as ordinants on the left, and degrees of opening of the valve for the horizontal lines of the graph.

Drawing a line through the points which have been charted, indicating the different units of weight necessary to open the valve to the different number of degrees, it has been found that the line of effort is a curved line, and therefore, in designing a governor to meet the requirements of opening the valve at a desired speed to a desired degree, a spring member was necessary which could meet the sudden and unrelated changes of the curve. It is interesting to note from this graph that with the ordinary square opening in the conduit, and an unbalanced valve plate that there is comparatively little change in the effort upon the valve to close from 40 to 50 degrees open; that there is a relatively high degree of change of the effort of the valve to close between 10 degrees and 0 degrees opening of the valve, and that there is a gradual uneven change between the two first mentioned conditions.

In Fig. 6 I have illustrated an actual test of the line of effort required to close the governor valve where my improved governor construction has been employed. This graph is similar to Fig. 8 in that pounds of effort are used as ordinants on the left and degrees of opening of the valve are used as horizontal abscissa.

Due to the gradual curve of the wall of the governor passageway resulting from the use of the curved plate 43, I have found that the effort needed to close the valve may be charted as a straight line from 0 degrees opening of the valve to 50 degrees, or wide open.

On the graph as shown, the line of effort is charted at three different speeds—1500, 2000, and 2500 R. P. M. The importance of straightening out the curve of effort as shown by tests of governors of the prior art, lies in the fact that with my construction it is not necessary to employ spring or piston members with a resistance built up to meet the particular curve. Rather, a spring or other resistance element having a resistance directly proportional to the foot-pounds of pressure employed to flex the same may be employed, thus obviating the necessity of using cams, levers with changing centers, or other unnecessary mechanical devices heretofore employed.

The curvature of this plate, or rather the curvature of the wall of the conduit, is necessarily governed by the requirements of the particular combustion engine with which it is desired to employ the same. The result, however, of using a curved wall such as I have shown, is to definitely straighten out the curve of effort by which the valve is drawn to a closed position, thereby necessarily straightening out the curve of effort required from a resistance unit for balancing the valve in a desired open position.

It is believed to be obvious from the foregoing description that a highly simplified governor has been provided, one which will cut down the cost of governor construction very materially, and one which employs fewer parts and parts which do not need the refinement of special selection or test before they can be successfully employed.

While I have illustrated and described a specific embodiment of my invention, it will be understood that changes and modifications may be made therein; and I do not wish to limit myself in any particular, rather what I desire to secure and protect by Letters Patent of the United States, is:

1. A governor for an internal combustion engine, said governor having a conduit therein, an unbalanced valve plate pivoted substantially against one wall of said conduit and adapted to swing in a radius in a valve closing movement under suction from the engine against an opposite wall, said wall having a profile curve greater than the radius of the arc through which the valve plate is swung and engageable only by the valve plate at the point of origin of said curve; said valve plate pivoted above the point of origin of said curve.

2. A governor for an internal combustion engine, said governor having a conduit therein, an unbalanced valve plate pivoted substantially against one wall of said conduit and adapted to swing in a radius in a valve closing movement against an opposite wall under suction from said engine, said wall having a profile curve greater than the arc through which the valve plate is swung and engageable only by the valve plate adjacent the point of origin of said curve, said wall being adjustable to change the location of said profile curve portion.

3. A governor for an internal combustion engine, said governor having a conduit therein, an unbalanced valve plate pivoted substantially against one wall of said conduit and adapted to swing in a radius in a valve closing movement under suction from the engine against an opposite wall, spring means normally holding said valve plate against closing, said wall having a profile curve greater than the radius of the arc through which the valve plate is swung and engageable only by the valve plate at the point of origin of said curve, said valve plate pivoted above the point of origin of said curve.

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