W. H. YOUNG.

GOVERNOR.

APPLICATION FILED MAR. 28, 1918.

1,346,521.

Patented July 13, 1920.

2 SHEETS—SHEET 1.

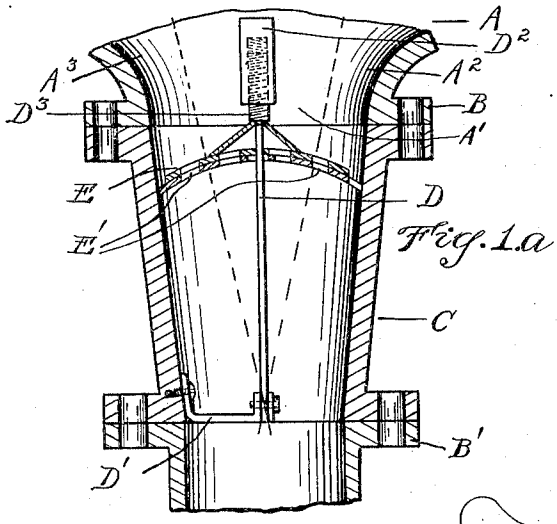



Fig. 1a

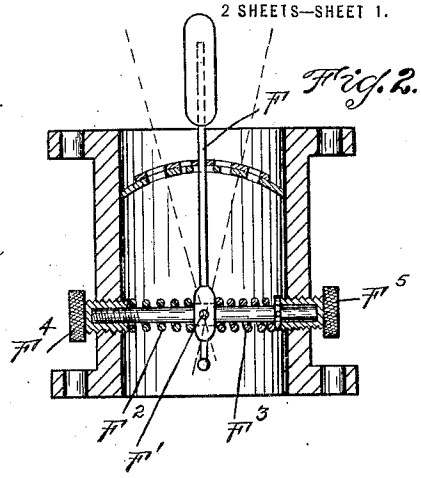



Fig. 2.

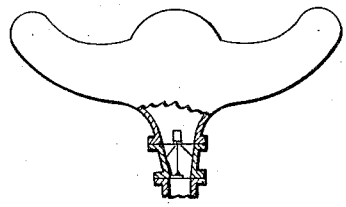


Fig. 1.

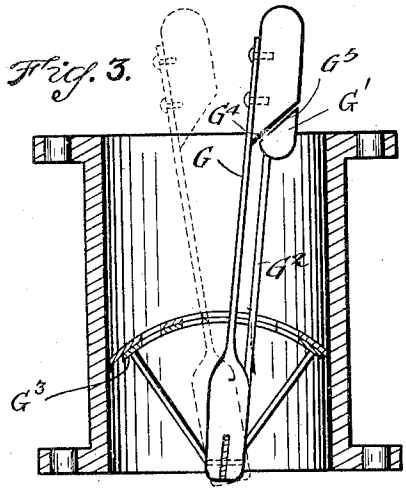



Fig. 3.

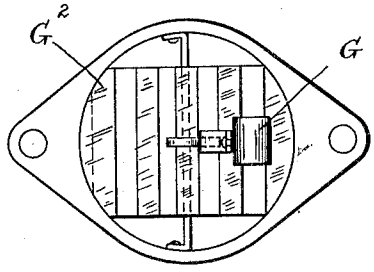



Fig. 4.

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2 SHEETS—SHEET 2.

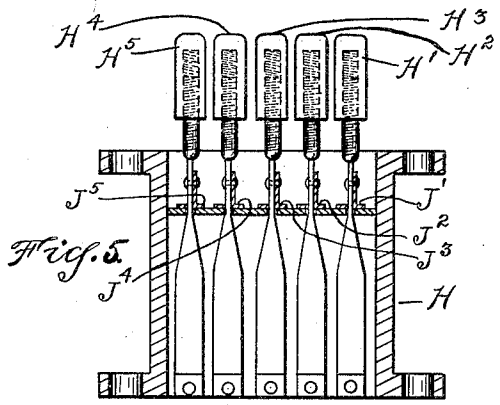



Fig. 5.

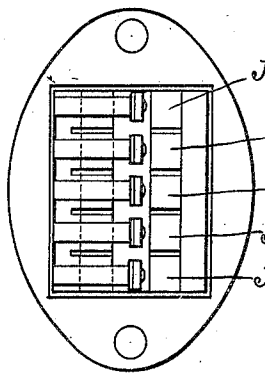



Fig. 6.

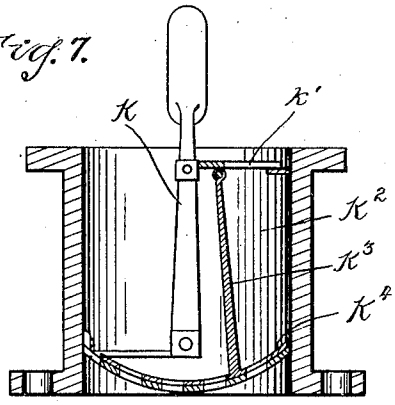



Fig. 7.

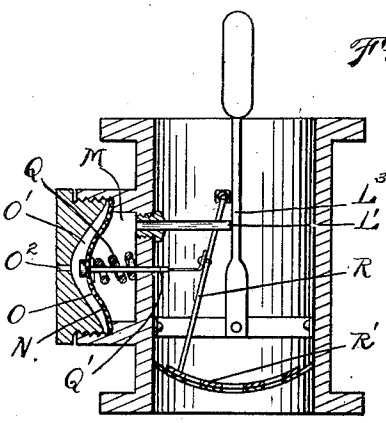



Fig. 8.

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# UNITED STATES PATENT OFFICE.

WALTER H. YOUNG, OF HIGHLAND PARK, MICHIGAN.

## GOVERNOR.

1,346,521. Specification of Letters Patent. Patented July 13, 1920.

Application filed March 28, 1918. Serial No. 225,168.

*To all whom it may concern:*

Be it known that I, WALTER H. YOUNG, a citizen of the United States of America, residing at Highland Park, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Governors, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to governors and refers more particularly to governors of the type capable of use in controlling the supply of fuel to internal combustion engines.

Among the objects of the invention are to provide a simple and efficient governor construction which will limit the supply of fuel when the speed of the engine exceeds a certain number of revolutions per minute; to provide a construction wherein the governing element consists primarily in a harmonic vibrator member preferably having adjustments to permit of a desired harmonic period, the size and proportioning of the vibrator member being so selected as to automatically bring the governor into action when the speed of the engine exceeds the desired maximum; to provide a construction which can be applied to ordinary manifolds and used in connection with gas engines and carbureters of various kinds and constructions; and in general to provide an accurate and comparatively simple construction which can be economically manufactured and readily applied.

The invention also resides in such further features of construction and in such arrangements and combinations of parts as will more fully hereinafter appear.

In the drawings:

Figure 1 is a vertical sectional view showing one embodiment of my invention;

Fig. 1ª is a fragmentary view of a portion of Fig. 1 enlarged.

Fig. 2 is a view showing a slight modification of the construction shown in Fig. 1;

Fig. 3 is a view similar to Fig. 1, showing another modification;

Fig. 4 is a top plan view of Fig. 3;

Figs. 5 and 6 are views similar to Figs. 3 and 4 showing still further modifications of the general type shown in Fig. 1;

Figs. 7 and 8 are vertical sectional views showing still further modifications.

The primary or control element of a governor built in accordance with my invention is an oscillator or vibrator member so placed as to be acted upon by the gas impulses caused by the suction strokes of an engine cylinder or cylinders. A convenient location for the vibrator on the ordinary multiple cylinder engine would be at the point of division or branching of the gas intake manifold, since in that position it would be acted upon from either side alternately as the gas flow alternates to either end or branch of the manifold, as the suction of the cylinders demand it. Thus these alternations or suction impulses would be applied to the vibrator with a frequency proportional to the speed of the engine.

The type of vibrator preferably used is known to mechanics as harmonic or synchronous. It is well known in physics that any vibrating element has a natural period of vibration, and vibrations may be originated and increased in amplitude by the application of a relatively small force applied in the direction of swing and in synchronism with the same. When using a vibrator of this type for governing purposes in the manner herein set forth, the surface upon which the gas impulses act should be so proportioned in relation to the vibrator spring tension that the vibrator will be but little disturbed at normal engine speed and will remain practically at rest; but should the speed of the engine increase to the point where the suction impulses are applied to the vibrator at a frequency equal to the natural period of vibration, said vibrator will start to swing. Then a slight increase of engine speed will so increase the amplitude of vibrations as to bring into action the throttling element, thus reducing the supply of fuel to the cylinder and preventing further acceleration of engine speed. Should the speed of the engine be so reduced that the suction impulses acting upon the vibrator have a frequency less than the natural or free period of the vibrator, then the impulses and vibrator would no longer synchronize so that the latter would come to a rest, thereby opening the throttle and giving the engine more fuel.

In the drawings I have illustrated some applications of this principle, the vibrating element being shown in pendulum form, placed in a section of the gas conduit between the carbureter and the dividing or branching point of the gas intake manifold. In the section or block in which the governing throttle is located, the lower part of the

vibrator extends parallel to the direction of the gas flow but the top or free end extends into the manifold a sufficient distance to be subjected to the cross currents, caused by the suction occurring alternately in either branch of the intake manifold.

By adjusting the proportion of spring tension to the weight or length of the vibrator the natural period of the latter can be altered and in this way the governor can be adjusted to act at any desired engine speed. As the operation of this governor depends upon gas or air impulses, it is obvious that the exact constructions and locations which I hereinafter describe in detail are not essential but can be varied as convenience would suggest without departing from the main principle or spirit of the invention.

Describing in detail the particular embodiments of my invention shown in the drawings and referring for reference characters to the construction shown in Fig. 1, A designates the inlet manifold of a gas engine having at its lower end an inlet opening A′ and on opposite sides of its center, branch conduits $A^2$ and $A^3$. The lower end of the manifold is generally connected to the carbureter but in the present construction I interpose between the manifold flange B and the carbureter flange B′ a governor C.

The invention broadly contemplates the provision of a new type of governor in which the supply of air from the carbureter to the engine is automatically governed by a vibrator member D formed of resilient material. At its lower end this member is carried by a bracket D′ while at its upper end it has an adjustable weight $D^2$ which can be raised or lowered on the threaded portion $D^3$ so as to increase or decrease the number of vibrations per minute which the member would normally make. By selecting the length and proportion of parts and setting the adjustable member $D^2$ at the desired height, the vibrator member D can be given a natural period of vibration corresponding to the maximum engine speed desired. When reaching this maximum speed the suction impulses will synchronize with the natural period of the vibrator member and cause said member to swing carrying with it a portion of the grate valve E and so restricting the gas flow at port E′ as to prevent excess speed of the engine.

In the construction shown in Fig. 2 the vibrator member F in place of being formed of resilient material is pivoted at F′ and normally held in its central position by springs $F^2$ and $F^3$, the tension of which can be varied by turning the adjustment members $F^4$ and $F^5$. In fact any class of springs, such as coil springs or others, can be used where the proportioning of parts is such that the desired vibrations per minute can be obtained.

Describing next the construction shown in Figs. 3 and 4 it will be noticed that in this case the vibrator member G is arranged to swing over a member G′ having a stationary mounting upon a rod $G^2$, said members having their adjacent faces inclined to the direction of flow of the mixture, as indicated at $G^4$ and $G^5$. The arrangement is such that when the number of suction strokes does not equal or exceed the normal vibration of the member G it will substantially cover the stationary plate G′. When, however, the engine develops an excessive speed the governor member G will swing so as to uncover the stationary plate G′ and the pressure of the mixture upon the beveled face of the member G will then force it temporarily to the position shown in dotted lines in Fig. 3 and thus throttle the supply of fuel to the engine.

In place of having the single vibrator member such as shown in Figs. 1, 2 and 3 I may employ the governor H shown in Figs. 5 and 6, wherein the governor member comprises a plurality of vibrator members H′, $H^2$, $H^3$, $H^4$ and $H^5$. These can be set to vibrate at slightly different speeds, such for instance as setting the members H′, $H^2$, $H^3$, $H^4$, and $H^5$ to vibrate so as to close their respective valves J′, $J^2$, $J^3$, $J^4$ and $J^5$ at speeds of 1000, 1020, 1040, 1060, and 1080. The figures last given are of course merely illustrative as adjustments can be made to make the number of vibrations for each control member of the unit approach very closely together or to actuate through relatively wide limits of vibration.

In the construction shown in Fig. 7 there is illustrated a modification wherein the vibrating governor member K closes a by-pass valve K′, whenever the speed of the engine is such as will cause a sufficient vibration of the member K. This will result in pressure building up in the by-pass chamber $K^2$ and forcing the plate $K^3$ and the main valve $K^4$ toward the left a sufficient distance to throttle the supply of fuel to the engine.

In the construction shown in Fig. 8 the vibrating governor member L normally rests over the port L′ leading to a diaphragm chamber M. The diaphragm is provided with a port O leading to the chamber O′ which receives a restricted amount of air through the port $O^2$. Said chamber acts as a dash-pot having a steadying effect on the governor and it will of course be understood that while I have shown this dash-pot construction in connection with the type of governor illustrated in Fig. 8 the same feature could be used in other constructions for the same purpose. The diaphragm N

is normally held to the left by a spring Q sleeved on the plunger Q′ which is connected to the plate R which carries the throttle valve R′. The arrangement of parts in this construction is such that at normal speed of the engine the stem $L^3$ of the vibrator member L will lie over the port L′ but when a predetermined speed is reached the member L will be caused to vibrate in a manner similar to that described in connection with the member D in Fig. 1 and thus uncover the port L′, allowing the suction of the engine to draw the diaphragm N toward the right and force the valve R′ to its throttle position.

While I have shown and described the invention in connection with several different types of control, it is obvious that in its broader aspects the invention is not limited to use with the particular modifications suggested and that various changes in the details of construction and arrangements and combination of the vibrator member and the control mechanism can be made.

What I claim as my invention is:—

1. The combination with a gas engine having a number of alternating suction operations proportional to its speed, of a governor for such engine comprising a vibrator member acted upon alternately from opposite sides by the suction of the engine.

2. The combination with a gas engine having a number of alternating suction operations proportional to its speed, of a governor for such engine comprising a vibrator member acted upon alternately from opposite sides by the suction of the engine, said member having a normal vibrating period corresponding to the maximum speed of the engine desired.

3. The combination with a gas engine having a number of alternating suction operations proportional to its speed, of a governor for such engine comprising a vibrator member acted upon alternately from opposite sides by the suction of the engine, said member having a normal vibrating period corresponding to the maximum speed of the engine desired and arranged to throttle the supply of fuel to the engine upon the speed of the engine exceeding the maximum desired.

4. The combination with a gas engine having a number of alternating suction operations proportional to its speed, of a governor for such engine comprising a vibrator member acted upon alternately from opposite sides by the suction of the engine, said vibrator member comprising a pendulum construction arranged to permit a normal number of vibrations corresponding to the maximum engine speed desired.

5. The combination with a gas engine having a number of alternating suction operations proportional to its speed, of a governor for such engine comprising a harmonic vibrator member acted upon alternately from opposite sides by the suction of the engine, said vibrator member comprising a pendulum having a normal number of vibrations corresponding to the maximum number of suction strokes for the engine, and throttle mechanism operated by the vibrator member upon the number of suction strokes exceeding the maximum desired.

6. The combination with a gas engine having a number of alternating suction operations proportional to its speed, of a governor for such engine comprising an adjustable vibrator member acted upon alternately from opposite sides by the suction of the engine, said member having a normal vibrating period corresponding to the maximum speed of the engine desired.

7. The combination with a gas engine having a number of alternating suction operations proportional to its speed, of a governor for such engine comprising a vibrator member acted upon alternately from opposite sides by the suction of the engine, said vibrator member comprising an adjustable pendulum construction which can be set to have a normal number of vibrations corresponding to the maximum engine speed desired.

8. The combination with a gas engine, and a suction conduit leading thereto, of a throttling means in said conduit comprising a plurality of independently operable valves, and automatic means for successively closing said valves upon predetermined increases of speed.

9. The combination with a gas engine and a suction conduit leading thereto, of throttling means in said conduit comprising a plurality of valves, and individual vibratory governors for said valves, having different rates of vibration whereby they act upon their valves successively and at predetermined engine speeds.

10. The combination with a gas engine having periodic suction operation, the rate of which is proportional to the engine speed, of a governor for such an engine comprising a vibrator member deriving alternating reversed periodic impulses from the section of the engine.

11. The combination with a gas engine having periodic suction operation, the rate of which is proportional to the engine speed, of a governor for such an engine comprising a vibrator member having a normal vibrating period corresponding to the maximum speed of the engine desired, said member deriving periodic impulses from suction of the engine.

12. The combination with a gas engine having periodic suction operation, the rate of which is proportional to the engine speed,

of a governor for such engine comprising a vibrator member having a normal vibrating period corresponding to the maximum speed of the engine, said member deriving periodic impulses from the engine suction, and being arranged to throttle the supply of fuel to the engine upon a speed thereof exceeding the maximum desired.

13. The combination with a gas engine having periodic suction operation, the rate of which is proportional to the engine speed, of a governor for such engine comprising a vibrator member deriving periodic impulses from suction of the engine, said member comprising a pendulum construction arranged to permit a normal number of vibrations corresponding to the maximum engine speed desired.

14. The combination with a gas engine having periodic suction operation, the rate of which is proportional to the engine speed, of a governor for such engine comprising a harmonic vibrator member deriving periodic impulses from the suction of the engine, said member comprising a pendulum having a normal number of vibrations corresponding to the maximum number of suction strokes for the engine, and throttle mechanism operated by the vibrator member upon the number of suction strokes exceeding the maximum desired.

15. The combination with a gas engine having periodic suction operation, the rate of which is proportional to the engine speed, of a governor for such engine comprising an adjustable vibrator member deriving periodic impulses from the engine suction, said member having a normal vibrating period corresponding to the maximum speed of the engine desired.

16. The combination with a gas engine having periodic suction operation, the rate of which is proportional to the engine speed, of a governor for such engine comprising a vibrator member deriving periodic impulses from suction of the engine, said member comprising an adjustable pendulum construction which can be set to have a normal number of vibrations corresponding to the maximum engine speed desired.

In testimony whereof I affix my signature.

WALTER H. YOUNG.