H. L. HORNING.

GOVERNOR FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED MAY 19, 1913.

1,104,119.

Patented July 21, 1914.

2 SHEETS—SHEET 1.

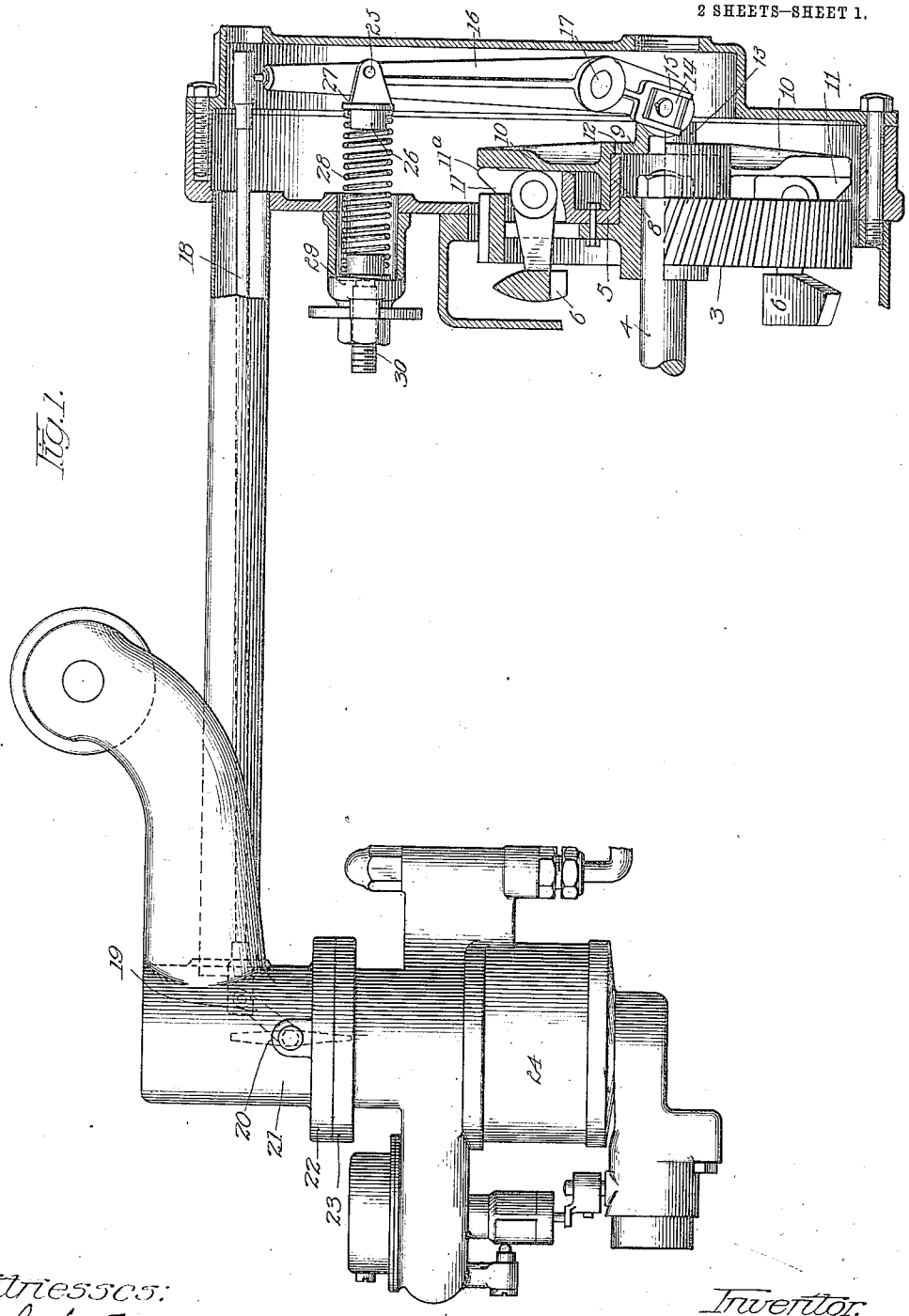


Fig. 1.

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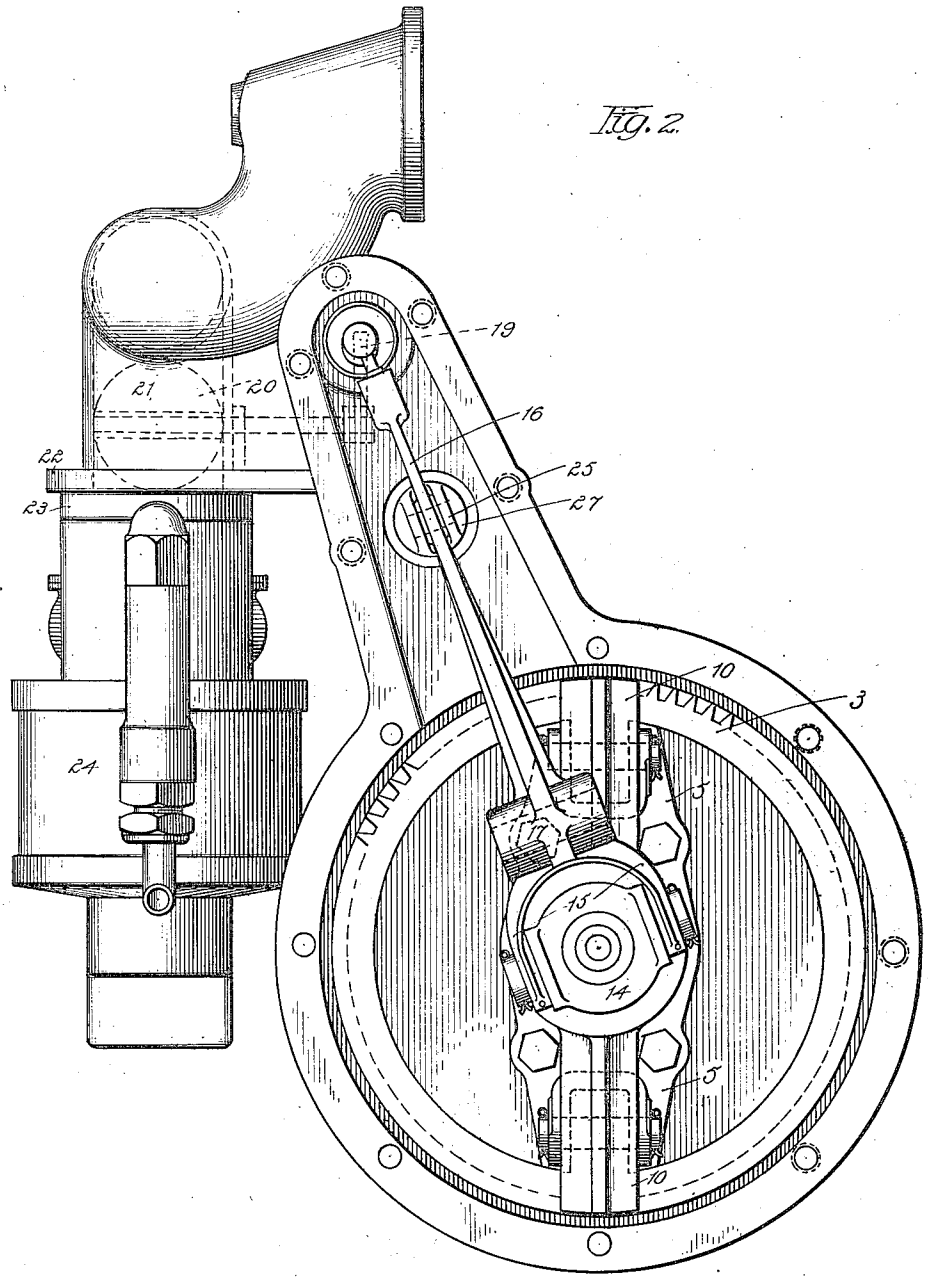
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2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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GOVERNOR FOR INTERNAL-COMBUSTION ENGINES.

1,104,119. Specification of Letters Patent. Patented July 21, 1914.

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To all whom it may concern:

Be it known that I, HARRY L. HORNING, a citizen of the United States, residing at Waukesha, in the county of Waukesha and State of Wisconsin, have invented certain new and useful Improvements in Governors for Internal-Combustion Engines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to governors for internal combustion engines and its object is to provide suitable mechanism for shutting off the supply of carbureted air passing from a carbureter to the intake manifolds of the internal combustion engine with which the carbureter is associated when the engine has reached its predetermined speed.

The governor of my invention is particularly adapted for use in connection with commercial trucks and tractors where it is advisable to have means adapted to prevent the engine running at speeds above a predetermined maximum.

In accomplishing the object of my invention I employ a timing gear mounted upon an engine driven shaft, said shaft preferably extending through the engine crank case. The said timing gear has bolted to the hub thereof a yoke, which yoke is provided with a cylindrical sleeve upon which is mounted a cup-shaped member shiftable longitudinally of the sleeve. The position of said cup relatively to its supporting sleeve is determined by the position of a pair of centrifugal weights of the type commonly employed in fly governors, the said weights being pivoted to the aforementioned yoke. Motion given to said cup by said centrifugal weights is transmitted to a lever having ball bearing connection with said cup. Motion of the lever is in turn transmitted through a suitable connecting rod to the butterfly valve controlling the flow of combustible mixture supplied to the engine. A compression spring, the tension of which is readily adjusted, acts on the lever attached to the movable cup in such a manner as to normally tend to move the cup in the direction opposite that in which it is moved by the centrifugal weights. Besides determining the engine speed necessary to actuate the other governor devices sufficiently to cut off the supply of combustible mixture to the engine, this compression spring takes up the lost motion between the centrifugal weights themselves and the point at which the resulting motion is to be delivered. Thus this spring in taking up the lost motion between the centrifugal weights and the butterfly valve permits the engine speed to be governed without hunting of the engine, as would be the case if the lost motion were not taken up.

The cup mounted upon the sleeve of the gear carried yoke is provided with one or more small holes which admit air slowly to the space between the hub of the gear and the cup as the said cup is moved by the centrifugal weights. The combination acts as a dash pot to steady the movement of the governor parts; said holes also provide for oiling the sleeve and cup members.

These and other features of my invention are referred to in more detail in the following description and are illustrated in detail in the accompanying drawings, in which;

Figure 1 is a view of the device of my invention illustrating the same partly in section and partly in elevation; and Fig. 2 is an elevational view of the same looking in the direction parallel to the shaft upon which the timing gear is mounted.

Similar characters of reference refer to similar parts throughout the several views.

In the drawings 3 indicates a timing gear, said timing gear being mounted upon a shaft 4, which extends through the side of the crank case of an internal combustion engine. Mounted upon the right hand hub of the timing gear is a yoke 5, bolted to the gear as illustrated. The yoke serves as a support for a pair of centrifugal weights 6 pivoted in lugs carried by said yoke. The lugs forming the bearings for the weights may if desired be cast on the hub of the timing gear 3, but it is better manufacturing practice to provide the yoke as illustrated. The yoke 5 is provided with a cylindrical sleeve 8, as shown. Mounted upon the sleeve 8, and movable longitudinally thereof is a cup member 9, which however, is keyed against rotation independently of the sleeve. The cup 9 is provided with a pair of arms 10, cast integrally therewith, said arms being disposed directly opposite the feet 11 of the centrifugal weights. One or more holes 12 in the cup 9 admit air slowly to the space

between the cup and the hub of the gear; effecting a dash pot action which serves to steady the movement of the governor parts.

The cup 9 is provided with a central boss 13, which has a swivel ball bearing connection at 14, with the bifurcated end 15 of a lever 16. The said lever 16 is pivoted at 17, as illustrated. The lever 16 at its upper end has ball bearing connection with one end of a rod 18, as illustrated. The other end of the rod 18 is pivoted to the crank arm 19, of a butterfly valve 20, located in the intake manifold 21 of an internal combustion engine. A flange 22 is provided which may be bolted to the corresponding flange 23 of a carbureter of any suitable type, the said carbureter being illustrated at 24.

Pivoted to the lever 16 at 25 is a member 26, provided with a flange 27, against which bears the end of a compression spring 28, the other end of which bears against a flange or washer 29 carried by a stem or bolt 30. It will thus be seen that the tension of the spring 28 may be adjusted as desired by means of the member 30. A lock or suitable sealing mechanism prevents tampering with the spring after the tension of the same has been adjusted. As illustrated, all of the elements of my invention are incased, making it possible to lubricate the same from the crank and gear cases, if desired.

The operation of the device of my invention is as follows: As the speed of the engine increases, the weights 6 are drawn out by centrifugal force, thus bringing the feet 11 into engagement with the arms 10 of the cup 9. When the force exerted upon the arms 10 is sufficient to overcome the force exerted upon the lever 16, by spring 28, the lever 16 is moved against the tension of said spring, operating the butterfly valve 20; and thus reducing the amount of combustible mixture permitted to pass through the engine manifold. It should be noticed that the feet 11 are flat in order that the arms 10 of the cup 9 may normally tend to hold the centrifugal weights 6 toward the center, due to the pressure of the spring 28 acting back through the mechanism. Moreover the toes 11^a of the feet 11 are curved to form cam surfaces. These cam surfaces can be varied in curvature to determine the exact action of the governor. It is a very simple matter to change the curvature of the toes 11^a and so secure the desired action. The fact that the lever 16 has ball bearing connection with the cup 9 and rod 18 makes it unnecessary to secure the most perfect alinement of the parts, since the ball bearings equalize for any slight lack of alinement.

As hereinbefore pointed out, the spring 28 takes up lost motion between the weights 6 themselves and the point at which the resulting motion is delivered. Although the spring is shown bearing against the lever 16, and this is perhaps the most practical application, the spring may be placed upon the butterfly valve itself or upon the crank arm, which turns it. In the embodiment of my invention here illustrated the ball bearing spring joints at either end of the rod 18 take up any lost motion which may be present at these points.

When the governor is used on a tractor engine, a lever is provided for adjusting and setting the tension of the spring 28. Said lever is controlled by the operator and is provided with a segment or a lock screw to hold it wherever it may be set by the operator. He can in this way set his governor for, say, four miles an hour, and then go off and look after his plows or whatever may be necessary. If he then wants to run at five miles an hour, he merely moves the controlling lever to a position corresponding to five miles per hour, which will increase the tension on the spring 28; whereupon the governor will tension to five miles.

While I have shown my invention in the particular embodiments herein shown and described, I do not, however, wish to be limited to these exact constructions, but desire to claim broadly any equivalent constructions which may suggest themselves to those skilled in the art.

What I claim is:

1. In combination, an internal combustion engine, a valve controlling the supply of combustible mixture thereto, a governor controlling the position of said valve, said governor comprising a timing gear, a yoke provided with a sleeve rigidly mounted upon the hub of said gear, a cup-shaped member disposed over said sleeve, said cup-shaped member being adapted to shift longitudinally of said sleeve but being held against rotation independently thereof, a pair of arms carried by said cup-shaped member, a pair of centrifugal weights pivoted to said yoke, said weights having feet bearing against said arms, a pivoted lever, one end of said lever having ball bearing connection with said cup-shaped member, the other end of said lever being connected to said valve, and a spring acting against said lever tending to move said cup-shaped member against the action of said centrifugal weights.

2. In combination, a valve controlling the supply of fuel to an internal combustion engine, a substantially cylindrical member adapted to be rotated at a speed proportional to engine speed, a substantially cup-shaped member fitted over said cylindrical member, a centrifugal device mounted upon said cylindrical member adapted to shift said cup-shaped member relative to said cylindrical

member, means whereby motion imparted to said cup-shaped member by said centrifugal device is transmitted to said valve, a hole in said cup-shaped member adapted to admit air slowly to the space between said cylindrical member and said cup-shaped member as said cup-shaped member is shifted, and a spring tending to prevent said shifting of said cup-shaped member.

3. In combination with an internal combustion engine, a valve controlling the supply of combustible mixture to the engine, and mechanism controlling said valve, said mechanism comprising a substantially cup-shaped member, a supporting member upon which said cup-shaped member is snugly and slidably fitted, a centrifugal device driven at a speed proportional to engine speed adapted to shift said cup-shaped member relative to its supporting member, a hole in said cup-shaped member adapted to admit air slowly between said cup-shaped member and the supporting member, and mechanism connecting said cup-shaped member with said valve.

4. In combination with an internal combustion engine, a valve controlling the supply of fuel to said engine, and mechanism controlling said valve, said mechanism comprising a hollow member, a second member collapsible with the hollow member, a centrifugal device driven at a speed proportional to engine speed adapted to shift one of said members relative to the other, mechanism connecting the shiftable member with said valve, a hole in one of said members adapted to slowly admit fluid to the space between said members when the shiftable member is moved by the centrifugal device, and a spring tending to prevent the shiftable member from moving under the action of the centrifugal device.

5. In combination with an internal combustion engine, a valve controlling the supply of fuel to the engine, and means for controlling said valve, said means comprising a hollow member, a second member collapsible with the hollow member, governor mechanism driven at a speed proportional to engine speed adapted to shift one of said members relative to the other, mechanism connecting the shiftable member with said valve, and a hole in one of said members adapted to slowly admit fluid to the space between the said members when the shiftable member is moved by the governor mechanism.

6. In combination with an internal combustion engine, a valve controlling the supply of fuel to said engine, and mechanism controlling said valve, said mechanism comprising a hollow member, a second member collapsible with the hollow member, a centrifugal device driven at a speed proportional to engine speed adapted to shift one of said members relatively to the other, mechanism connecting the shiftable member with said valve, and a hole in one of said members adapted to slowly admit fluid to the space between said members when the shiftable member is moved by the centrifugal device.

7. In combination with an internal combustion engine, a valve controlling the supply of fuel to the engine, and means for controlling said valve, said means comprising a member rotated at a speed proportional to engine speed, a second member collapsible with the first non-rotatably mounted thereon, a governor mechanism driven at a speed proportional to engine speed adapted to move said second member relative to the first, a hole in one of said members adapted to slowly admit fluid to the space between said members when said second member is moved under the action of the governor mechanism, a pivoted lever, one end of said lever having ball-bearing connection with said second member, the other end of said lever being mechanically connected with said valve, and a spring acting against said lever tending to move said second member against the action of the governor mechanism.

8. In combination with an internal combustion engine, a valve controlling the supply of fuel to the engine, and mechanism for automatically controlling said valve, said mechanism comprising an operating lever for said valve, a governor device driven at a speed proportional to engine speed adapted to actuate said lever to operate the valve, spring means tending to move said lever against the action of said governor device, and dashpot mechanism adapted to prevent said lever from being suddenly operated by said governor device.

9. In combination with an internal combustion engine, a valve controlling the supply of fuel to the engine, and mechanism controlling said valve, said mechanism comprising a cylindrical member driven at a speed proportional to engine speed, a pair of centrifugal weights pivoted to said cylindrical member, a sleeve member non-rotatable on said cylindrical member but slidable thereon, said sleeve member comprising a pair of radial arms, said centrifugal weights comprising feet adapted to bear against said radial arms, a pivoted lever having ball-bearing connection with said sleeve member, the other end of said lever being connected to said valve, and a spring tending to move said sleeve member against the action of said centrifugal weights.

10. In combination with an internal combustion engine, a valve controlling the supply of fuel to the engine, and mechanism controlling said valve, said mechanism comprising a cylindrical member driven at a

speed proportional to engine speed, a pair of centrifugal weights pivoted to said cylindrical member, a sleeve member non-rotatable on said cylindrical member but slidable thereon, said sleeve member comprising a pair of radial arms, said cylindrical weights comprising feet adapted to bear against said radial arms, a pivoted lever, said lever comprising a long arm connected to said valve, and a relatively shorter arm having ball-bearing connection with said sleeve member, and a spring bearing against the lever tending to move said sleeve member against the action of said centrifugal weights.

11. In combination with an internal combustion engine, a valve controlling the supply of fuel to the engine, and mechanism for automatically controlling said valve, said mechanism comprising an operating lever for said valve, a governor device driven at a speed proportional to said engine speed adapted to actuate said lever to operate the valve, spring means tending to move said lever against the action of said governor device, and pneumatic mechanism adapted to prevent said lever from being suddenly operated by said governor device.

In witness whereof, I hereunto subscribe my name this 16th day of May, A. D., 1913.

HARRY L. HORNING.

Witnesses:
S. A. PERKINS,
F. M. WELNICK.