S. Z. HALL.

INTERNAL COMBUSTION ENGINE.

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1,298,497. Patented Mar. 25, 1919.

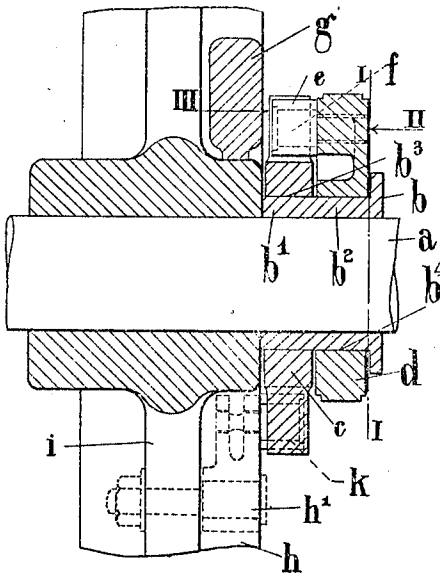


Fig. 1.

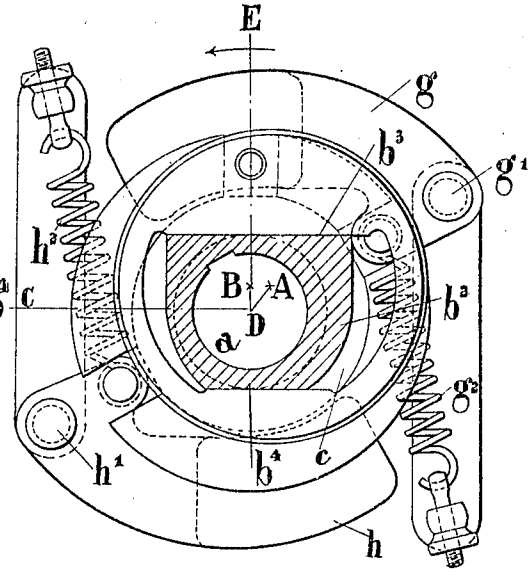


Fig. 2.

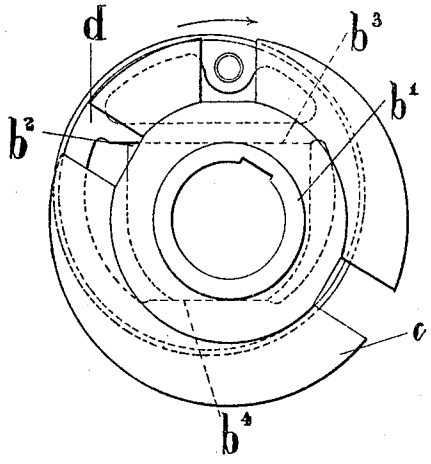


Fig. 3.

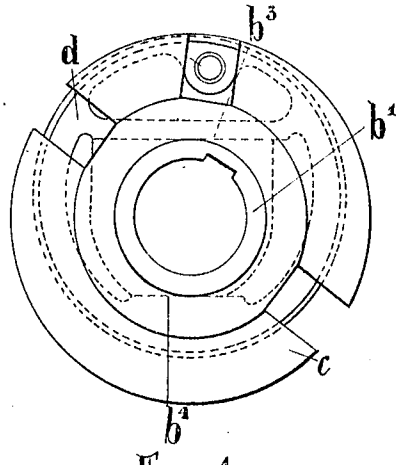


Fig. 4.

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# UNITED STATES PATENT OFFICE.

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## INTERNAL-COMBUSTION ENGINE.

1,298,497. Specification of Letters Patent. Patented Mar. 25, 1919.

Application filed January 29, 1918. Serial No. 214,403.

*To all whom it may concern:*

Be it known that I, SIDNEY ZALESKI HALL, a subject of the King of Great Britain and Ireland, residing at 76 Victoria street, London, S. W., England, have invented certain new and useful Improvements in and Relating to Internal-Combustion Engines, of which the following is a specification.

This invention relates to an improved governor, and more particularly a shaft governor, for controlling the quantity of fuel delivered to the cylinder of an internal combustion engine using liquid fuel, and more especially by the method in which the stroke of the plunger of the fuel pump used for delivering the fuel to the engine is automatically regulated to suit the variation of load.

The main object of the present invention is to provide a simplified construction of shaft governor.

The present invention consists in a governor, and more particularly a shaft governor for varying the supply of liquid fuel to the cylinder of the engine in accordance with the load, which governor comprises a block secured to the shaft, one part of which is made of circular cross-section, its outer periphery being concentric with the shaft, while another part thereof is formed with two flat surfaces, a ring mounted on the part of circular cross-section so as to be capable of angular displacement thereon, its outer periphery being concentric with the shaft, centrifugal weights and springs attached thereto for displacing the said ring, and an eccentric mounted on the flat part of the block formed with the two flat surfaces so that it shall be capable of being displaced by the ring along the said flat surfaces to get a different eccentricity.

The invention also consists in the improved governor for regulating the amount of fuel delivered to the cylinder of an internal combustion engine as hereinafter more particularly referred to.

In the accompanying drawings illustrating by way of example one mode of carrying the invention into effect:—

Figure 1 is a sectional elevation of the improved governor along the line C D E in Fig. 2,

Fig. 2 is a sectional end view thereof along the line I I in Fig. 1, seen in the direction of the arrow II, and

Figs. 3 and 4 are end views seen in the direction of the arrow III, with the centrifugally operated weights removed, and illustrating the positions of the eccentric corresponding to its maximum and minimum throw respectively.

Referring to the drawings, $a$ is the crankshaft of the engine, and $b$ is a block keyed or otherwise attached thereto. One part of the block $b$, viz., $b^1$ is made of circular cross-section and carries a ring $c$ rotatably mounted thereon, while another part thereof, viz., $b^2$ is formed with two flat surfaces $b^3$ $b^4$ and carries an eccentric $d$ which imparts the necessary motion to the plunger of the fuel pump delivering fuel to the cylinder of the engine and is free to slide along the flat surfaces $b^3$, $b^4$ on the block. This sliding movement of the eccentric causes its eccentricity to be changed for the purpose of regulating the amount of fuel delivered to the engine. The ring $c$ and the eccentric $d$ are interconnected, preferably by means of a die $e$ and stud $f$, in such a manner that when the ring is rotated relatively to the crankshaft, the eccentric is caused to slide along the flat surfaces $b^3$ $b^4$ on the block at right angles to the axis of the crankshaft. The eccentric is mounted in such a manner that it is restrained from any other relative movement except the radial sliding movement at right angles to the axis of the crankshaft.

Two centrifugally operated weights $g$ and $h$ are pivoted to the fly-wheel $i$ at $g^1$ and $h^1$ respectively, or other carrier secured to the crankshaft $a$, their outward movement under the action of centrifugal force, in a direction at right angles to the axis of the crankshaft and around their pivots, being under the control of helical or other springs $g^2$ and $h^2$ respectively. The weights $g$ and $h$ are adapted to rotate the ring $c$ during their outward movement, and this may be effected by connecting the weights to the rotatable ring $c$ by means of studs and dies $k$, or by links, or any other suitable means.

The operation of the governor hereinbefore described is as follows:—

When the crankshaft is stationary, the springs $g^2$ $h^2$ hold the weights $g$ and $h$ against the boss of the carrier $i$, the eccentric being then in such a position that it allows the maximum amount of fuel being delivered to the engine. Upon the engine starting to run, the weights $g$ and $h$ move outward around their pivots $g^1$ $h^1$, under the action of centrifugal force, and in over-

coming the pull of their respective springs $g^2$ and $h^2$, the latter become extended. This motion causes the ring $c$ to be angularly displaced around the block $b$ by means of the connecting studs and dies $k$, and the angular displacement of the ring causes the eccentric $d$, to which it is connected through the die $e$ and stud $f$, to slide radially along the flat surfaces $b^3$ and $b^4$ of the block $b$.

In this way the center of the eccentric may be moved from the position marked A corresponding to the stationary condition and maximum throw (see Fig. 3) to the end position marked B, corresponding to the minimum throw (see Fig. 4), thereby effecting a gradual reduction in the eccentricity of the eccentric. In the same way, when the weights $g$ $h$ move inward toward the center of the crankshaft, the operation hereinbefore described is reversed. The center of the eccentric will take a position between the two positions marked A and B so that the eccentricity will always correspond to the load on the engine at the particular moment, and the supply of liquid fuel to the cylinder will be proportional to the load.

I wish it to be understood that the details for carrying the invention into effect may be modified in various respects without departing from the spirit of the invention.

What I claim is:—

1. A governor for varying the supply of liquid fuel to the cylinder of an internal combustion engine in accordance with the load, comprising a block secured to the shaft of the engine, said block having one part of circular cross-section, the outer periphery of which is concentric with the shaft and another part formed with two flat surfaces, a ring carried on the part of circular cross-section of the block so as to be capable of angular displacement thereon, the outer periphery of said ring being concentric with the shaft, centrifugal weights and springs attached thereto for displacing the said ring, and an eccentric mounted on the part of the block formed with the two flat surfaces so that it shall be capable of being displaced by the ring along the said flat surfaces to get a different eccentricity, as and for the purpose set forth.

2. A governor for varying the supply of liquid fuel to the cylinder of an internal combustion engine in accordance with the load, comprising a block secured to the shaft of the engine, said block having one part of circular cross-section, the outer periphery of which is concentric with the shaft and another part formed with two flat surfaces, a ring carried on the part of circular cross-section of the block so as to be capable of angular displacement thereon, the outer periphery of said ring being concentric with the shaft, centrifugal weights and springs attached thereto for displacing the said ring, means for interconnecting the ring and the centrifugal weights, an eccentric mounted on the part of the block formed with the two flat surfaces so that it shall be capable of being displaced by the ring along the said flat surfaces to get a different eccentricity, and means for interconnecting the ring and the eccentric, as and for the purpose set forth.

In testimony whereof I have signed my name to this specification.

SIDNEY ZALESKI HALL.