Oct. 9, 1928.

1,686,839

H. E. RHOADS

ENGINE GOVERNOR

Filed March 21. 1919

2 Sheets-Sheet 1

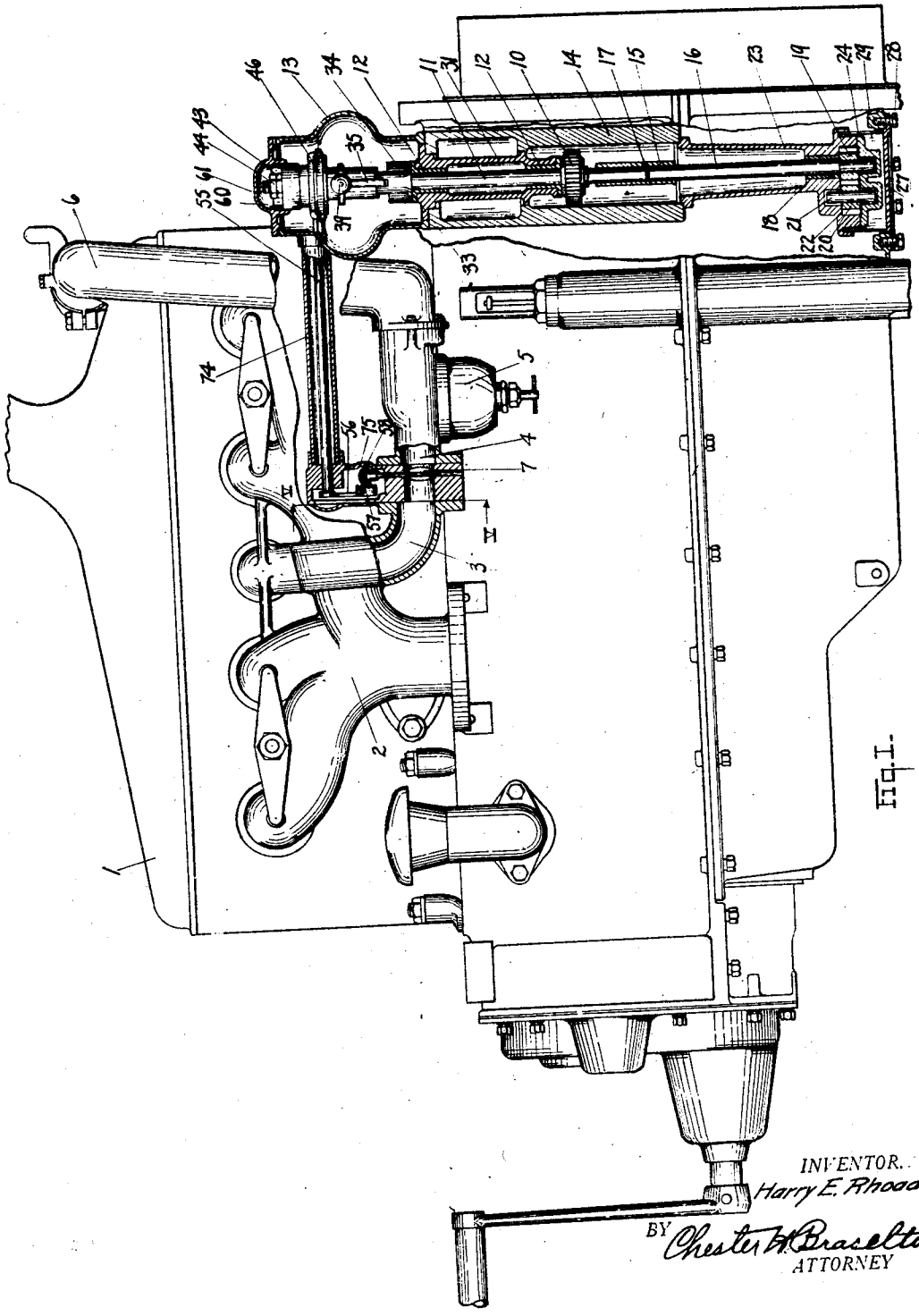


Fig. 1.

INVENTOR.
Harry E. Rhoads.
BY Chester B. Braselton
ATTORNEY

Oct. 9, 1928.

1,686,839

H. E. RHOADS

ENGINE GOVERNOR

Filed March 21, 1919

2 Sheets-Sheet 2

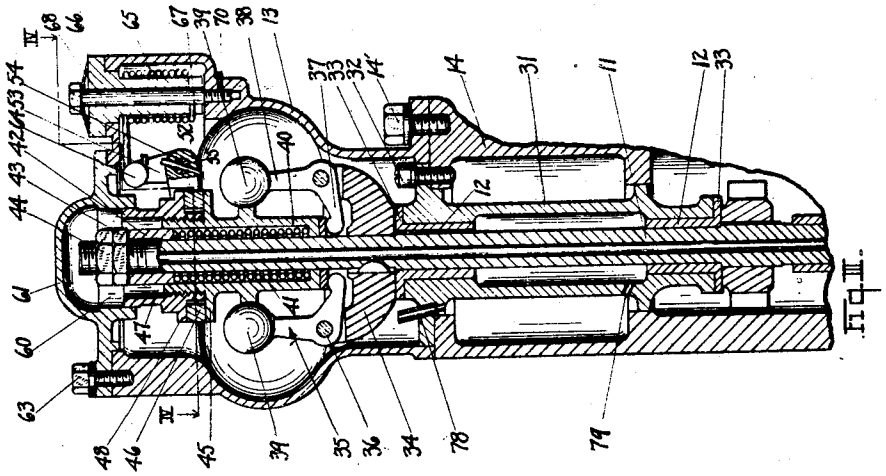


FIG. III.

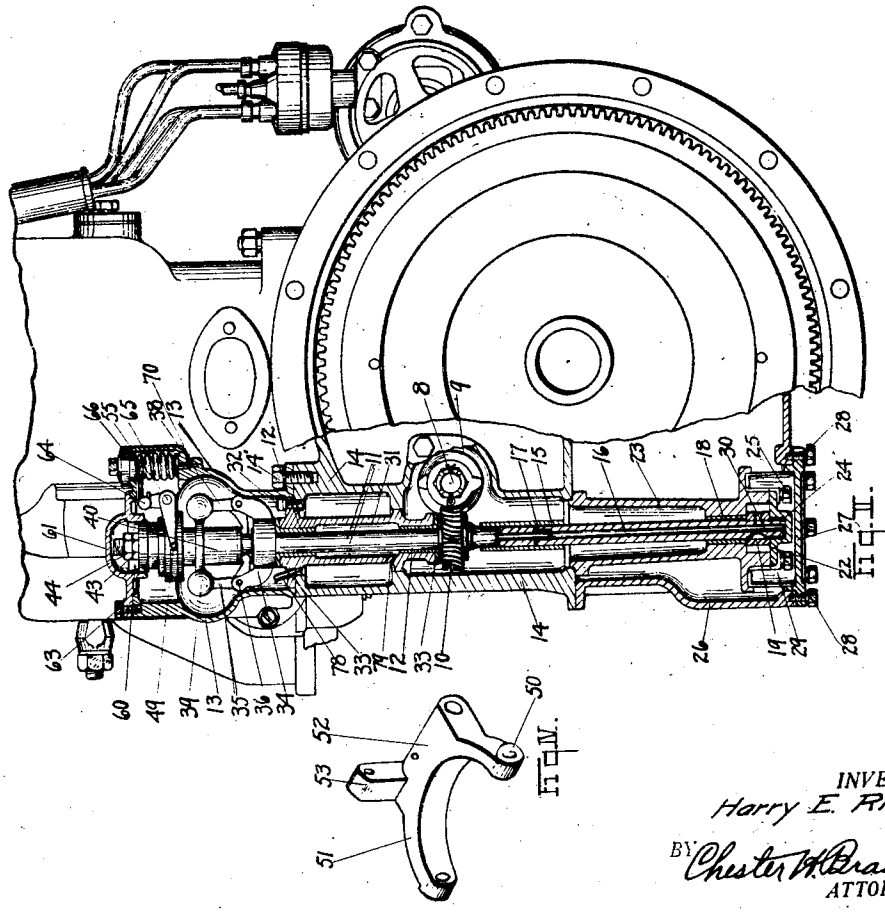


FIG. II.

FIG. IV.

INVENTOR.
Harry E. Rhoads.

BY Chester W. Braselton
ATTORNEY.

Patented Oct. 9, 1928. 1,686,839

UNITED STATES PATENT OFFICE.

HARRY E. RHOADS, OF TOLEDO, OHIO, ASSIGNOR TO THE WILLYS-OVERLAND COMPANY, OF TOLEDO, OHIO, A CORPORATION OF OHIO.

ENGINE GOVERNOR.

Application filed March 21, 1919. Serial No. 284,127.

This invention relates to engine governors, and more particularly to an improved form of engine governor particularly designed for use in connection with internal combustion engines.

One object of the invention is to provide an improved device of this character, wherein the speed of the engine is limited automatically.

A further object of the invention is to provide an oil pump and governor having hollow interengaging driving shafts that co-operate to form a continuous passage for supplying oil to the various parts.

A further object of the invention is to provide a device of this character, which is simple in construction and efficient in operation.

Further objects of this invention relate to economies of manufacture and details of construction as will hereinafter appear from the detailed description to follow.

The objects of the invention are accomplished in one instance by the devices and means described in the following specification, but it is evident that the same may be varied widely without departing from the scope of the invention as pointed out in the appended claims.

A structure constituting one embodiment of the invention, which may be the preferred, is illustrated in the accompanying drawing forming a part hereof, in which:

Figure I is a side elevational view of an internal combustion engine, the engine control mechanism being shown in section for the purpose of better illustrating the relative position of the operating parts.

Figure II is an end elevation of an internal combustion engine, a portion of the controlling mechanism being shown in section to better illustrate the relative position of the various operating parts.

Figure III is an enlarged sectional view, similar to Figure II, and illustrating the relative position of the parts as shown in that figure.

Figure IV is a perspective view of the valve actuating rocker arm.

Similar reference characters refer to corresponding parts throughout the several views, and the sectional views are taken looking in the direction of the small arrows at the ends of the section lines.

In the embodiment of the invention illustrated herewith, 1 designates an internal combustion engine of the usual type employed in connection with automobiles, this invention being particularly designed for use in connection with automobile trucks or tractors. The engine illustrated herewith is provided with a combined intake and exhaust manifold 2, having an intake passage 3 formed therein and adapted to communicate with the mixing chamber 4 positioned in proximity to the carburetor 5, which is adapted to receive air from an air supply pipe 6. The supply of gaseous fuel to the engine is adapted to be controlled by means of a control valve 7, positioned between the mixing chamber and the passage in the intake manifold, the said valve being entirely controlled by an automatic valve control mechanism. This control mechanism is adapted to be actuated from the engine cam shaft, or any other suitable rotating part of the engine mechanism which has a speed of rotation proportionate to the speed of rotation of the engine crank shaft.

In the form of the invention illustrated herewith, the cam shaft 8 is positioned near one side of the engine in the usual manner, and is provided with a worm 9 which is adapted to mesh with a worm gear 10 carried by and firmly secured to a hollow shaft 11, which hollow shaft 11 rotates within bearings 12 and is enclosed by casing sections 13 and 14. These casing sections 13 and 14, which enclose the hollow shaft 11 and the operating mechanism associated therewith, are adapted to be secured together in any suitable manner as by machine screws 14'. The hollow shaft 11 is positioned substantially vertically, and has the lower portion thereof rotatably mounted within a sleeve 15, said hollow shaft 11 being joined to a hollow shaft 16 within the sleeve 15 by means of a tongue and groove connection 17. The hollow shaft 16 is rotatably mounted within a bearing 18, and has keyed thereto near the lower end thereof a gear 19, the said gear 19 being adapted to mesh with a gear 20 carried by a shaft 21, the said gears 19 and 20 being positioned within a recess 22 formed in the lower portion of the casing member 23 and being adapted to form a gear pump for feeding oil to the various parts of the engine mechanism which are to be lubricated. A plate 24 is secured to the lower portion of the casing 23 in any suitable manner, as by

means of screws 25 for the purpose of enclosing the recess 22 within which the gears 19 and 20 are positioned. A portion of the engine casing 26 within which the casing 23 and its associated parts are enclosed, is provided with a cover plate 27 so positioned as to render the casing 23 and the mechanism carried thereby readily accessible upon removal of the cover plate. The cover plate is secured to the casing portion 26 by means of a plurality of machine screws 28. A cylindrical member 29 rests upon the cover plate 27 and bears against the lower portion of the casing 23 is such a manner as to hold the upper portion of the casing 23 in close proximity to the lower portion of the casing 14. A radial passage 30 is provided in the lower end of the hollow shaft 16 and the gear 19 carried thereby in such a manner as to place the interior hollow portion of the shaft 16 in communication with the recess 22 within which the gears 19 and 20 are mounted.

The bearings 12 within which the hollow shaft 11 is rotatably mounted are positioned within a substantially cylindrical casing member 31, which is suitably secured in position within the casing 14 and may be attached thereto by means of a plurality of screws 32. The bearings 12 are each provided with an outwardly extending annular flange 33 formed at one end thereof. Secured to the hollow shaft 11 in any suitable manner as by being keyed thereto is a collar 34 which is adapted to rest upon the annular flange 33 carried by the upper bearing 12. The collar 34 being keyed or otherwise secured to the shaft 11 rotates therewith and carries two or more bell crank levers 35, which are preferably oppositely positioned with respect to the shaft 11, and are each freely pivoted to the upper portion of the collar 34 at points 36, in such a manner that any pivotal movement of the bell crank 35 about the pivot point 36 will be in a plane passing through the axis of the shaft 11. Each of the bell cranks is provided with an inwardly extending arm 37 and an upwardly extending arm 38 upon which is carried a ball 39.

It will be readily understood that when rotation is communicated to the shaft 11 thru the worm 9 carried by the cam shaft 8 and the worm gear 10 upon the shaft 11, the shaft 11 will be rotated together with the collar 34 carried thereby, and as the speed of rotation of the shaft 11 increases, centrifugal force will urge the balls 39 outwardly from the shaft 11, thus oscillating the bell crank levers 35 upon their pivot points 36 and tending to raise the inwardly extending arms 37 in such a manner as to raise the sleeve 40 against the under portion of which the inwardly extending arms 37 of the bell cranks 35 are adapted to contact. The sleeve 40 is freely slidable upon the shaft 11 and is normally maintained in contact with the inwardly extending arms 37 of the bell crank levers by means of a spring 41, which surrounds the shaft 11 and is housed within the sleeve 40. The spring 41 is adapted to bear at its lower end against the sleeve 40 while the upper portion thereof bears against a sleeve 42, which is adapted to be slidably positioned upon the exterior surface of the shaft 11 and be retained in position relative thereto by a nut 43, adjustably positioned upon the upper end of the shaft 11 and adapted to be locked in place thereon by means of a lock nut 44. It will be readily apparent that the nut 43, which bears against the upper portion of the slidable sleeve 42 can be threaded upon the shaft a sufficient distance to place the desired degree of tension upon the spring 41, and after having been adjusted in such a manner as to properly tension the spring 41, the nut 43 may be clamped in position by the lock nut 44. The sleeve 40 is provided with an outwardly extending flange 45 upon which is adapted to rest a ring 46, the movement of which may be controlled by the vertical movement of the sleeve 40 through a guide sleeve 47, which is threaded upon the upper extremity of the sleeve 40 and is provided with an outwardly extending flange 48 adapted to bear against the opposite side of the ring 46, whereby the ring 46 is enclosed between the flanges 45 and 48, and has its vertical movement controlled thereby.

The ring 46 is provided at diametrically opposite points with a pair of pins 49, which engage in openings 50 formed in the ends of a pair of forked arms 51, which extend laterally and form a portion of a bell crank lever 52, which is provided with an upwardly extending arm 53. The bell crank 52 is mounted for pivotal movement at 54 upon a horizontal shaft 55, said bell crank 52 being keyed or otherwise firmly secured to the shaft 55 in such a manner as to rotate therewith. The shaft 55 is mounted in suitable bearings, and is provided at one end thereof with an arm 56 keyed or otherwise firmly secured to the shaft, said arm 56 being provided with a toothed segment 57, which meshes with a pinion 58 carried by the shaft upon which the control valve 7 is mounted.

The upper portion of the sleeve 47, which is threaded upon the sleeve 40 lies within a circular recess 60 formed in the cover plate 61 of the casing, and thus serves as a guide for the sleeve 40 to control the vertical movement of the same. The cover plate 61 is adapted to be secured to the casing 13 in any suitable manner, as by screws 63. A pin 64 secures one end of a coiled spring 65 to the upwardly extending arm 53 of the bell crank 52, while the opposite end of said spring

65 is coiled about a rotatable sleeve 66 and has the opposite extremity thereof positioned within a slot 67 formed in said sleeve 66. The sleeve 66 is pivotally mounted upon a shaft 68, which is threaded into the upper portion of the casing 13 and locked in position therein by a set screw 70. The sleeve 66 may be provided with suitable control mechanism (not shown) arranged so as to be readily accessible to the driver for rotating sleeve 66 and changing the tension of spring 65.

As previously stated, oil is adapted to be directed inwardly through the radial opening 30 formed in the shaft 16 and gear 19 carried thereby so as to pass into the interior passage formed in the hollow shafts 16 and 11 through which the lubricating oil is forced upwardly by the oil pump until it is discharged through the upper portion of the hollow shaft 11 into the space enclosed by the cover plate 61. From this space the oil may work into the enlarged chamber of the casing 13, occupied by the collar 34 and the pivoted bell crank 35, between the bearing surfaces formed between the sleeve 47 and the interior surface 60 of the cover plate 61, and also between the sleeves 42 and 40. A pipe 78 is adapted to lead from the chamber formed in the interior of the casing 13 into the interior of the casing 14, said pipe being adapted to extend to a point substantially level with the upper surface of the annular flange 33 formed upon the bearing 12 so as to insure a supply of oil to that portion of the shaft 11, which is enclosed within and rotatably mounted in the bearing 12. The excess supply of oil accumulated in the casing 13 passes through the pipe into the interior of the casing 14, from whence it is supplied to the interior of the cylindrical casing portion 31 through an oil passage 79, thus providing lubrication for the shaft 11 at the point where it bears within the lower bearing member 12. After lubricating the lower bearing 12, the excess oil will pass downwardly into the interior of the casing 23, where it provides lubrication for the bearing 18 within which the lower portion of the shaft 16 is rotatably mounted.

It is to be understood that only a portion of the oil is directed within the radial opening 30 and upwardly through the interior of the shafts 16 and 11 while the greater part of the lubricating oil which is directed by the gear pump is distributed to the various other bearing surfaces of the engine mechanism to which the oil is properly distributed by a series of channels (not shown).

The operation of the governor mechanism will now be described. Upon rotation of the cam shaft 8 and the worm gear 9 carried thereby, the hollow shaft 11 together with the hollow shaft 16 will be rotated through the worm 10 from the gear 9 at a speed proportional to the speed of rotation of the cam shaft 8. Rotation being imparted to the shafts 11 and 16, the gear pump comprising the gears 19 and 20 will be operated in such a manner as to draw lubricating oil from the oil reservoir and feed the same to the various parts of the engine mechanism which are adapted to be lubricated thereby. At the same time the rotation of the shafts 11 and 16 impart rotative movement to the collar 34, which is adapted to be firmly secured to the shaft 11, thus the centrifugal force acting upon the balls 39 tends to draw these balls outwardly from the shaft 11, the amount or displacement of the balls being proportional to the speed of rotation of the hollow shaft 11. Upon the outward displacement of the balls 39, the inwardly extending arms 37 of the bell cranks 35 will raise the sleeve 40 against the tension exerted by the coiled spring 41, thus causing upward movement of the ring 46, and rotating the bell crank 52 together with the shaft 55, which is adapted to be rotated by the bell crank 52. As the shaft 55 is oscillated by movement of the bell crank, the arm 56 carried by the shaft 54 causes a slight rotation of the shaft 59 carrying the control valve 7.

The manually operable control means for engaging the governor mechanism in such a manner as to permit the governor mechanism to be manually influenced comprises the rotatable member 66, which may be rotated by means of connections preferably extending to a point near the driver's seat and so arranged as to permit tension to be exerted upon the coiled spring 65 in such a manner as to place the upwardly extending arm 53 of the bell crank 52 under a sufficient degree of tension so as to partially overcome the weight of the sleeve 40 and its associated parts normally carried by the ring 46. It will be readily understood that when sufficient tension is exerted upon the upwardly extending arm 53 of the bell crank 52 to overcome the weight of the sleeve 40, less force will be exerted by the governor mechanism in raising the sleeve 40 a sufficient distance to operate the control valve.

It will be understood that in the position of the oppositely located bell crank levers 35 as shown in Figures II and III, the control valve 7 is opened to the limit of its adjusted position and as the speed of the engine increases and the balls 39 are consequently urged outwardly in such a manner as to raise the sleeve 40, the valve 7 is closed to a greater or less degree dependent upon the speed of the engine, and in the present embodiment of the invention upon the influence exerted upon the governor by the manually operated mechanism. The manual

control mechanism is adapted to influence the governor devices in such a manner as to be capable of causing a slowing down of the engine speed whenever such is desired. Whenever the manually operable sleeve 66 is rotated in such a manner as to exert tension upon the spring 65 so as to place the elbow lever 52 under tension to partially counteract the weight of the sleeve 40, such counteracting of a portion of the weight of the sleeve 40 permits the balls 39 to be more readily thrown outwardly and consequently permits a closing at a lower speed than would be the case if the manually operated mechanism were not actuated. The purpose of the manually operated mechanism is to cause a slowing down of the speed of the motor at desired points, while if the manually operable control mechanism remains in its original position, the speed of the engine will be controlled solely by the governor mechanism, which is preferably arranged in such a manner as to prevent the speed of the engine from exceeding a certain definite limit.

While I have shown and described in considerable detail a specific embodiment of my invention, it is to be understood that this showing and description is illustrative only and for the purpose of rendering my invention more clear, and that I do not regard my invention as limited to the details of construction illustrated or described, nor any of them, except in so far as I have included such limitation within the terms of the following claims, in which it is my intention to claim all novelty inherent in my invention broadly as well as specifically.

What I claim as new and desire to secure by Letters Patent is:

1. In an internal combustion engine, a casing, a hollow shaft mounted therein having an engine governor at the upper end thereof, means for driving said shaft, an oil pump detachably connected to said casing, and a hollow pump shaft in communication with the outlet of said pump, said shafts having interengaging portions at their adjacent ends whereby, when said pump is in attached position, it is adapted to be driven by said first shaft and oil may be supplied through said shafts.

2. In an internal combustion engine, a casing, a hollow shaft mounted therein having control mechanism at the upper end thereof, means for driving said shaft, an oil pump casing detachably connected to said first casing, an oil pump mounted therein having a hollow shaft communicating with the outlet of said pump, said shafts having interengaging portions at their adjacent ends, and means for detachably securing said pump casing to said first casing whereby said pump is adapted to be driven by said first shaft and oil is conveyed through said shafts to said control mechanism.

3. In an internal combustion engine, a governor, a hollow governor shaft, a hollow pump shaft in alignment with said governor shaft, the adjacent ends of said shafts being interfitted to form a driving connection therebetween, means operated by the pump shaft for forcing oil through the hollow shafts to said governor, and means for driving one of said shafts from an operative part of the engine mechanism.

4. In an internal combustion engine, a cam shaft, a hollow governor shaft, means for driving the governor shaft from the cam shaft, and a hollow pump shaft in alignment with said governor shaft and connected thereto by a separable connection whereby the pump shaft may be driven from the governor shaft or detached therefrom without affecting the operation of the governor shaft, and means for forcing oil upwardly through the hollow shafts for lubricating the mechanism.

5. In an internal combustion engine, a hollow governor shaft, a hollow pump shaft in alignment with said governor shaft, the two shafts being connected in such a manner as to provide an unobstructed passage through the hollow portions thereof, means for rotating said governor shaft, and means actuated by said pump shaft for forcing oil through said hollow shafts.

6. In an internal combustion engine, a vertical drive shaft having a passage therethrough an engine governor at the upper end of said shaft and driven thereby, driving means for said vertical shaft intermediate the ends thereof, a casing, a pump shaft therein arranged to be operated by the lower end of said drive shaft and having an oil passage therethrough communicating with the passage of the drive shaft, and a gear pump adapted to be directly driven by said pump shaft and arranged to discharge oil into and through the passages of both of said shafts.

In testimony whereof, I affix my signature.

HARRY E. RHOADS.