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P. MOHRDIECK.

GOVERNOR FOR ENGINES.

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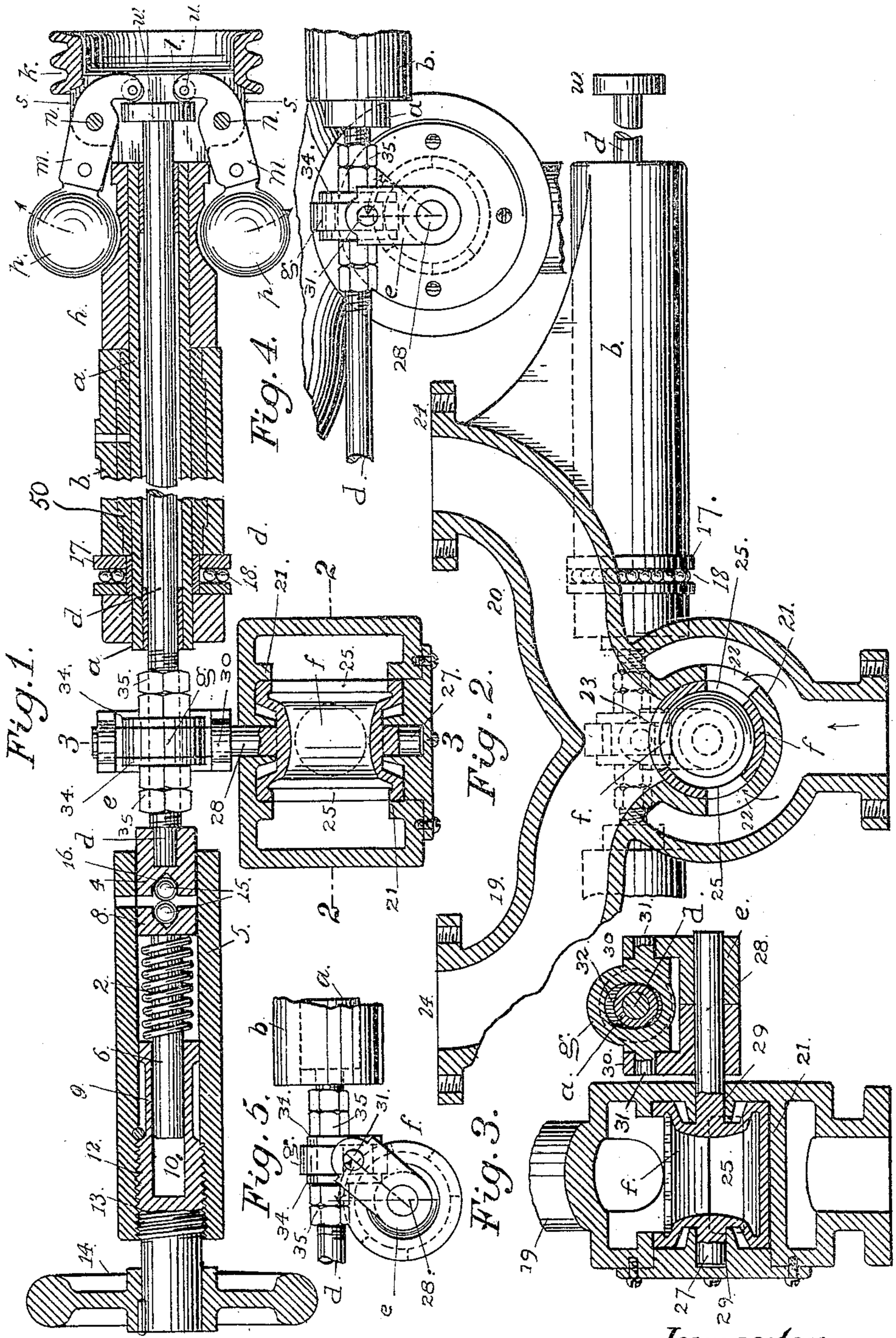

Witnesses.
C. A. Brandow
M. Regnier.

Inventor:
Peter Mohrdieck
by C. E. Gibbon
Atty.

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PETER MOHRDIECK, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO STANDARD GAS ENGINE COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION.

GOVERNOR FOR ENGINES.

No. 824,564. Specification of Letters Patent. Patented June 26, 1906.

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To all whom it may concern:

Be it known that I, PETER MOHRDIECK, a citizen of the United States, and a resident of the city and county of San Francisco and State of California, have invented a new and useful Improvement in Governors for Engines, of which the following is a specification.

This invention has for its object, chiefly, the production of a governor specially adapted for engines and motors in which explosive mixtures of air and gas or the vapors of gasolene or other similar explosive agents are fired in the cylinder to drive the piston; and the invention comprises certain novel parts and the combination thereof with other parts and mechanism producing an improved governor for controlling the area of the supply-valve through variations in the speed of the engine, and thus regulating the quantity of the explosive mixture entering the cylinder through the engine-valve, all as hereinafter particularly described, and pointed out in the claims at the end of this specification.

The drawings accompanying this description and forming a part of the same represent a governor embodying my improvements and one that is adapted for a gasolene-engine of the upright-cylinder type.

Figure 1 is a top view showing the parts chiefly in section, including the supply-valve and the parts connecting it with the governor. Fig. 2 is a front elevation, principally in section, of the supply-pipe having branches for connecting it to the cylinders of a two-cylinder engine and a single two-way supply-valve controlling the supply to both inlets. In this figure the valve is sectioned on the line 2 2, Fig. 1, and the valve is on the center giving a full supply to the inlet-valves of the engine. Fig. 3 is a transverse section taken vertically through the line 3 3, Fig. 1. Fig. 4 is a rear elevation of the supply-valve taken from the back of Fig. 2, showing the parts connecting the stem of the supply-valve with the reciprocating rod of the governor. Fig. 5 is an elevation in detail of the body of the supply-valve and its connections, showing the position of the parts when the valve is set over to the extreme right from the position in which it stands in Fig. 4 or to the extreme left from the position represented in Fig. 2.

The principal members of this governor comprise a hollow shaft *a*, rotatable in a fixed sleeve or bearing *b*, stationary on the frame of the engine; a rod *d*, extending through the hollow shaft, in which it is fitted also to move longitudinally; a coupling *e*, by which the longitudinally-movable rod of the governor is connected to a valve of the rotary type set at right angles to the rod, and a revolving head *h*, fast on the outer end of the hollow shaft and having a grooved pulley *k*, and pivoted arms *m* carrying balls *p* on their outer ends.

The arms are attached to the head by fulcrum-pins *n*, inserted through lugs *s* on the head, and in these bearings the arms swing freely under the centrifugal action of the balls *p* on their outer ends. The shorter members of the arms are curved inwardly toward the axis of rotation, and on each curved end a roller *t*, loosely set on a stud *u*, stands in contact with a flat head or disk *w* on the end of the rod *d*.

The weighted arms carried by the rotating head are caused to swing outward at increasing angles to the axis of rotation under increment of speed, and thereby bring their curved ends with greater or less pressure against the end of the rod, according to the angular position of the arms. Against this longitudinal movement of the rod as produced by the outward throw of the arms is opposed the force of a coiled spring 2, applied at the opposite end of the rod, and this spring, while yielding as the force of the pivoted arms presses the rod inward, also moves the rod in the contrary direction as the centrifugal force becomes less through a reduction in speed, and by that means also the arms are brought back to their initial position whenever the energy stored up in the spring exceeds the pressure of the arms against the head of the rod. By varying the resistance of this spring the rod can be made to move with greater or less rapidity and delicacy under changes in the inertia of the balls, and thus the governor can be adjusted to make the valve respond with any desired degree of delicacy or quickness to an acceleration of speed or, on the other hand, to move the valve only under a cumulative force and speed attained by the revolving arms. For this purpose the end of the rod *d* is fitted to a socket in a bearing-

block 4, that is movable both longitudinally and axially in a stationary sleeve 5, and against this bearing-block a slidable spindle 6 is held by a coiled spring 2, surrounding the spindle and confined between the enlarged head 8 on the end of the spindle and the end of a follower 9 in the stationary sleeve. The end of the spindle is fitted loosely in a socket or cylindrical recess 10 in the follower, and the latter piece has a screw-thread 12 working in a threaded socket 13 in the sleeve and on the outer end a hand-wheel 14 for turning it. Screwing in the follower has the effect to increase the resistance of the bearing-block to the thrust of the rod in proportion to the degree of compression produced in the spring. Usually I place antifriction-balls 15 between the head of the spindle and the bearing-block, as shown in Fig. 1, the opposing faces of the two parts having cavities 16 to hold the balls on a line of contact with the axis of rotation.

In order to counteract the excessive weight of the rotary head and balls carried by the outer end of the hollow shaft, a grooved collar 17, fixed on the opposite end of the shaft, is fitted to a bearing 50 in the stationary sleeve, and in the circular groove a number of balls 18 are confined by the surrounding bearing-surfaces. This form of bearing is shown in Figs. 1 and 2.

The supply-valve *f*, through which the governor acts to regulate the supply of gas to the admission-valve of the engine, is of the rocking or oscillating type. It is situated in the supply-pipe between the admission-valve and the gas-tank or other source from which the motive agent is supplied, and in the application of the governor to a two-cylinder engine, as seen in Fig. 2, the valve is placed at the conjunction of two branches 19 20, where a casing 21, formed by a cylindrical enlargement in the supply-pipe, incloses the plug or body *f* of the valve. In the inner walls of the casing are inlet-ports 22 22, open to the surrounding gas-passage, and an outlet-port 23, opening into the oppositely-diverging passages. Flanges 24 on the ends of the branch pipe 19 20 are provided for coupling them to pipes connecting, respectively, to the admission-valves of the right and the left cylinder.

The valve-body is a hollow cylindrical shell with openings 25 in its circumference and solid heads having trunnions 27 28, for which bearings 29 are provided in the ends of the casing. One of the trunnions extends through the casing to form a stem, on which is fixed a coupling-block *e*. This part constituting the connecting means between the valve and the rod *d* of the governor is of such character that it transforms the rectilinear movement of the rod into rotary movement at the valve, causing the rod, as it is pressed in by the arms, to reduce the area of the valve-ports, or as the coiled spring, reacting when the arms move in toward the head, brings the rod back to normal position the valve opens the ports.

The coupling-block *e*, fixed on the stem of the valve, has two ears 30, provided with sockets for the pivots 31 of a swiveled yoke *g*. An opening 32 in the yoke to admit the rod *d* is elongated vertically and is confined between two disks or washers 34, loosely fitting the rod, but held against longitudinal movement by nuts 35. The yoke being free to move vertically between the disks and being also capable of turning on the pivots in the block causes the latter piece to move in an arc having the valve-stem for its center, and thus to assume an angular position more or less out of the vertical or normal position, according to the extent of longitudinal movement given to the rod by the weighted arms.

With the governor driven at the regular working speed of the engine, so that the arms are folded against the rotating head, as shown, in Fig. 1, the coupling-block is adjusted to stand in a vertical plane, holding the valve full open and giving a maximum supply of gas to the engine-valves; but by shifting the disks 34 on the rod, which is done by turning back the nuts 35 on one side of the swiveled coupling and screwing up those on the other, the valve can be set to start from a less than full-open position, thereby giving the valve a greater or less amount of lap. As thus constructed the operation of the governor is as follows: The parts being adjusted, as before described, to run with the ports of the supply-valve full open while the engine is running at ordinary speed or at less speed than the degree required to act on the pivoted arms, a maximum supply of gas will pass through the supply-pipe to the admission-valve. As the speed increases sufficiently to overcome the inertia of the balls and the pivoted arms take an angular position they press the rod *d* back or farther into the hollow shaft and against the yielding bearing-block, with the effect to compress the coiled spring and also turn the supply-valve on its axis. The extent of such rotary movement of the valve obviously is governed by the degree of angularity obtaining in the pivoted arms, and as that is dependent on and varies with the speed of the engine the area of the ports in the supply-valve is at all times controlled and regulated by the speed of the engine.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a rotary valve, of a governor comprising a hollow shaft, a fixed sleeve in which the shaft is fitted to revolve, a pulley-carrying head on the end of the shaft for rotating it, a rod rotatable with and also movable longitudinally in the shaft,

centrifugal, ball-carrying arms pivotally attached to the pulley-carrying head and having their inner ends arranged to bear against the end of the rod, a coupling connecting the stem of the valve directly with the rod, consisting of an arm fast on the stem of the valve, a yoke pivotally attached to the arm and having an elongated aperture through which the rod passes, the rod being provided with threaded portions on opposite sides of the yoke, adjustable nuts on said threaded portions adapted to clamp the yoke between them and thereby positively connect the said parts together, a bearing-block for the end of the rod beyond the yoke in which the rod is fitted to rotate and an adjustable thrust-block behind the said bearing and means for regulating the pressure thereof against the bearing-block consisting of a coiled spring, a longitudinally-movable follower behind the spring, and means for adjusting said follower to vary the resistance of the spring.

2. In an engine-governor the combination with a rotary valve of a governor having a hollow revoluble shaft in a fixed bearing, and provided with a pulley-carrying head, centrifugal, ball-carrying arms on the head, a rod within the hollow shaft and movable longitudinally therein, one end of said rod being in contact with the end of the centrifugal arms, means positively connecting the rod with the stem of the valve consisting of an arm fast on the stem and a yoke pivotally attached to the arm and secured on the rod at a point within its end and an adjustable thrust-block adapted to take the endwise pressure of the rod and by its adjustment to vary the resistance to the force exerted by the centrifugal arms against the opposite end of the rod.

In testimony whereof I have signed my name in the presence of two subscribing witnesses.

PETER MOHRDIECK.

Witnesses:
EDWARD E. OSBORN,
M. REGNER.