No. 755,564. PATENTED MAR. 22, 1904.

D. W. CONE & D. N. PERRY.

ENGINE GOVERNOR.

APPLICATION FILED AUG. 8, 1903.

NO MODEL.

Fig. 1.

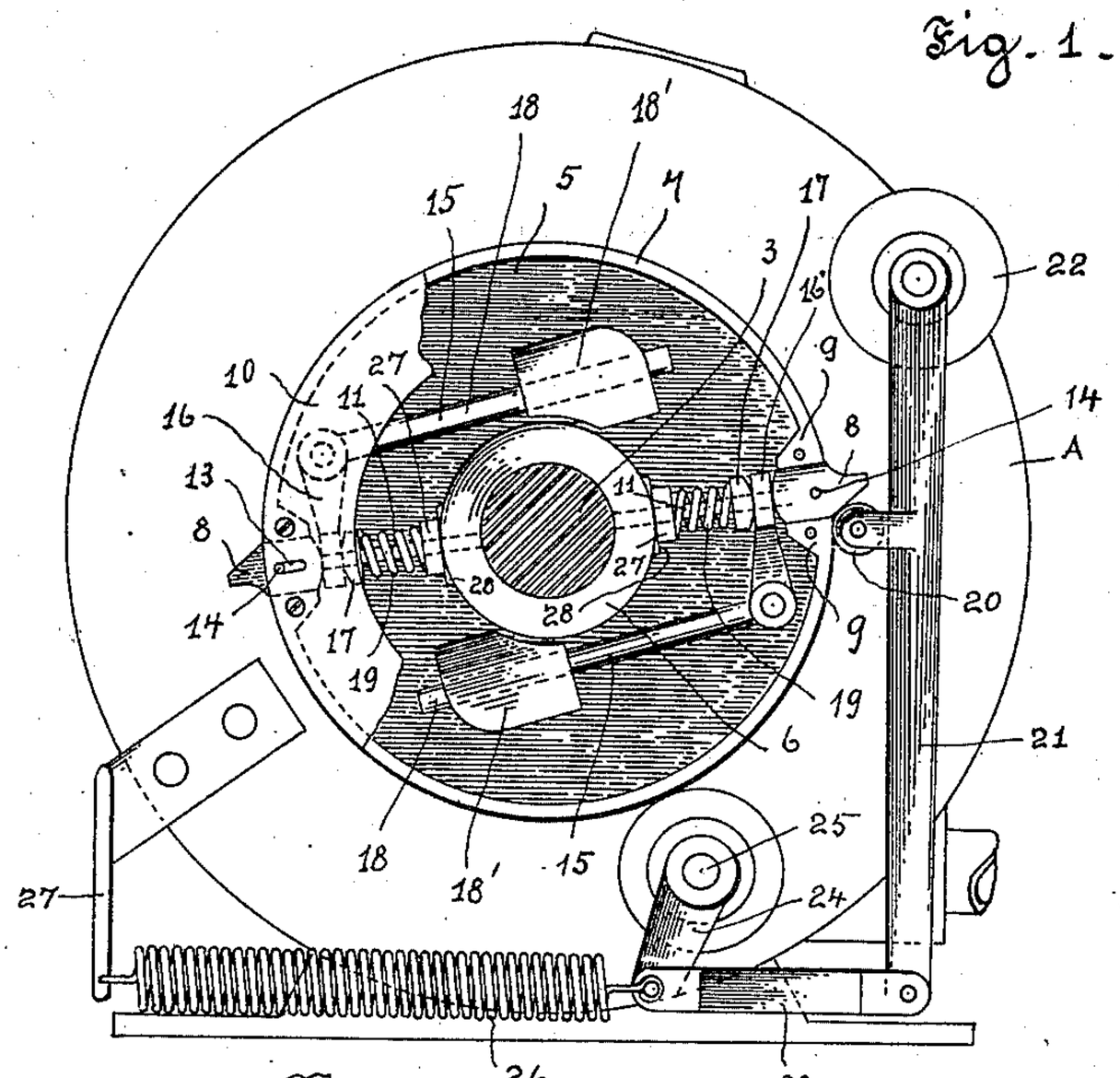


Fig. 3.

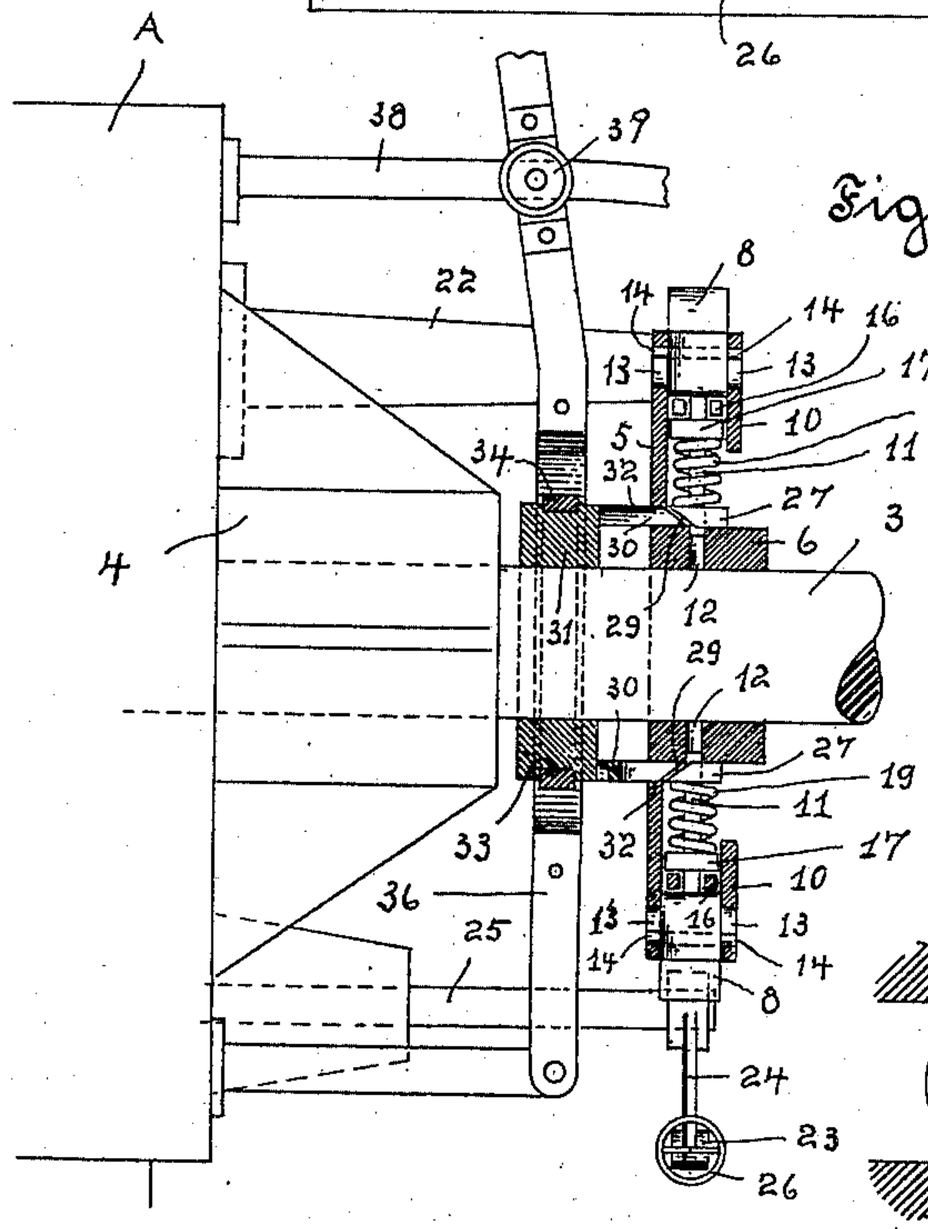


Fig. 2.

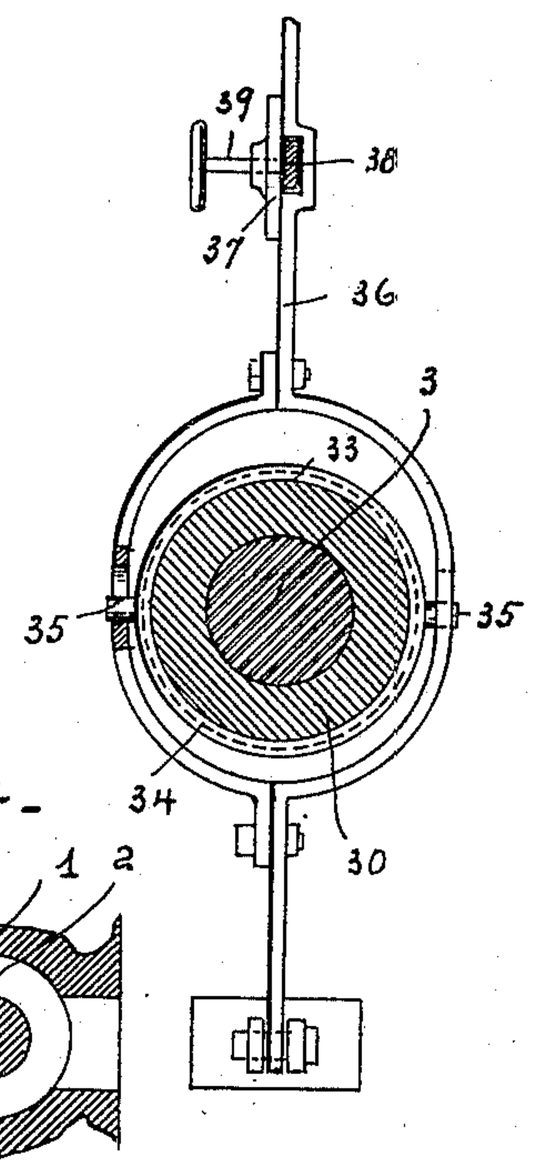
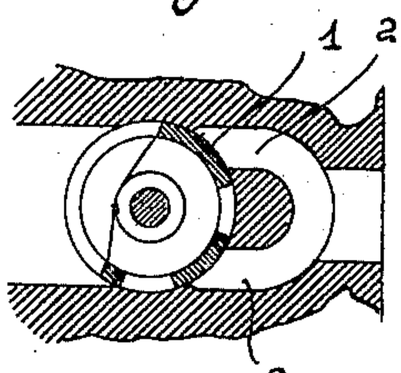


Fig. 4.



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UNITED STATES PATENT OFFICE.

DORWIN W. CONE, OF TOLEDO, OHIO, AND DAVID N. PERRY, OF WYANDOTTE, MICHIGAN.

ENGINE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 755,564, dated March 22, 1904.

Original application filed May 27, 1903, Serial No. 158,960. Divided and this application filed August 8, 1903. Serial No. 168,715.

(No model.)

To all whom it may concern:

Be it known that we, DORWIN W. CONE, residing at Toledo, in county of Lucas and State of Ohio, and DAVID N. PERRY, residing at Wyandotte, in the county of Wayne and State of Michigan, citizens of the United States, have invented a new and useful Improvement in Engine-Governors, of which the following is a specification.

Our invention relates to a mechanism for operating and automatically controlling engine-valves, and has for its object to provide a mechanism of the kind whereby the valve or valves of the engine are operated to periodically admit separate charges of compressed elastic fluid to the piston-chamber from a supply source of substantially uniform pressure and whereby the pressure of charges admitted is automatically varied according to the requirements of the load; furthermore, to provide a mechanism of the kind whereby the valve or valves of the engine, normally closed, are automatically moved to fully or partially uncover the valve port or ports for proportionate periods of time to admit to the piston-chamber from a supply source separate charges of compressed elastic fluid respectively varying in pressure and motive force according to the requirements of the load; furthermore, to provide a mechanism of the kind whereby in the operation of an engine by compressed elastic fluid an economical use thereof is secured.

The objects of our invention are accomplished as hereinafter described, and illustrated in the drawings, in which—

Figure 1 is a front view of our governor. Fig. 2 is a section through the same on line X X of Fig. 1. Fig. 3 shows the operating-lever for moving the compressing-arms to adjust the compression of the springs of the governor, and Fig. 4 is a cross-section through a double-ported rock-valve.

As illustrated in the drawings, our governor is constructed in a form applicable to a rotary engine A, constructed and operating as described in an application for Letters Patent filed by us May 27, 1903, Serial No. 158,960, in which steam or compressed carbureted air is admitted through a valve 1, arranged to rock in an arc to open the inlet-ports 2 to admit a charge of gas or steam to the cylinder. The shaft 3 of the engine extends through the bearings 4, and at one side thereof there is mounted upon the shaft a disk-wheel 5, which is provided with a hub 6, keyed to the shaft, and with a lateral flange 7, extending around the margin of the disk. As the piston of the engine illustrated in the drawings is designed to receive a plurality of impulses during the revolution of the shaft, we have arranged our governor to actuate the rock-valve the desired number of times by providing wheel 5 with the trip-heads 8. The trip-heads 8 are movably housed between guides 9, formed by radial incuts in the marginal flange of the disk and which extend along the incuts on both sides of the trip-heads, and the trip-heads are retained in the incuts by means of the annular closure-plate 10, bolted to the guide-walls and the rim of the flange. From the inner ends of the trip-heads a stem 11 is extended, which is held in an aperture 12, formed radially in the hub of the disk, and to limit the radial movement of the trip-heads in or out the web of the disk and the annular closure-plate are provided with elongated slots 13, arranged opposite and in line with the movement of the trip-heads, and through both slots a pin 14 is extended from opposite sides of the trip-head, the projecting ends of the pin being adapted to contact with the opposite ends of the slots and limit the movement of the trip-heads in and out. At one side of each trip-head stem a bell-crank 15 is suitably pivoted at its angle to the disk. Arms 16 of the bell-cranks are bifurcated at the free end to receive the stems of the trip-heads, and upon each trip-head stem is mounted a fixed collar 17, by means of which the trip-head is moved inward by the bell-crank toward the shaft, and to permit the movement of the bell-crank without interference with the movement of the trip-head the adjacent faces of the trip-head and the collar are crowned to allow the free movement of the short arm 16 of the bell-crank in its arc. Upon the long arm 18 of the bell-crank are mounted weights

18′, which are adjustable thereon to increase or decrease the centrifugal force required to overcome the inertia of the governor, which is determined by the compression of springs 19, mounted helically around the trip-head stems and interposed between the hub and the collar 17. The projecting portions of the trip-heads are formed as inclined planes to contact with the roller 20 of the operating-lever 21. The operating-lever 21 is so pivotally mounted on the arm 22, connected to one side of the engine, that the trip-heads in their revolution will engage the roller 20 and push it out of their path, and thereby rock the lever.

Roller 20 is so disposed on the lever 21 that the lateral movement of the roller by the trip-heads is proportionately multiplied at the end of the lever to produce the requisite movement of the valve. The movement of the lever is transmitted to the valve by means of a coupling-link 23, which pivotally connects the free end of the operating-lever 21 with the free end of the lever-arm 24, mounted on the stem 25 of the rock-valve 1. As the operating-lever is actuated by a trip-head in one direction only, we have provided a spring 26, arranged to normally hold the valve closed, with the trip-head roller in contact with the rim of the disk-flange. The spring 26 is connected at one end to the valve-lever 24 and at the opposite end to a bracket 27, extending from the side of the engine.

Thus constructed when the valve has been opened and released by a trip-head the spring 26 quickly closes the valve, and, presupposing that the load is adjusted to a standard pressure in the source of pressure, it is manifest that when by reason of any reduction of the load the velocity of the governor-wheel so increases that the centrifugal action of the weights 18′ is sufficient through the leverage of the bell-cranks to further depress the springs 19 the trip-heads will be drawn inward in proportion to such increase of velocity, and thereby proportionately reduce the length of time the valve 1 is open and also the port area that is uncovered by the valve. It is further manifest that the pressure of the charge admitted to the piston-chamber by the valve at the full capacity of the port will always be slightly less than that of the source and that any reduction in the time the valve is open and in the port area that is uncovered will proportionately further reduce the pressure of the charge, and thereby secure an economical operation of the engine and also prevent any high acceleration of speed.

In the event that the pressure in the source of pressure is reduced below the standard while the load remains constant any reduction of the speed below the average caused thereby will proportionately increase the length of time the valve remains open at its full capacity, causing the pressure of the charges to proportionately approximate the full pressure of the source as the speed diminishes, thereby by reason of this proportionate increase of the pressure of the charges tending to maintain the average speed.

The action of the governor mechanism will be the same whether compressed carbureted air or steam be used, since any variation in the pressure of the charges of explosive gas produces a proportionate variation in the force generated by their explosion.

To adjust the compression of the springs encircling the trip-head stems, and thereby establish the normal speed at which the engine will run before the governor-weights will further compress the springs, we have provided on the stems of the trip-heads movable collars 27, which are interposed between the springs and the abutting shoulders 28 of the hub. The collars 27 are beveled upon one side to form inclined planes 29, and in contact therewith between the collars and the shoulders of the hub are arms 30, extending from the collar 31, movably mounted upon the engine-shaft, with the arms extending through slots 32, formed in the web of the disk, and are bifurcated to receive the trip-head stems and beveled to contact with the beveled sides 29 of the collars, whereby when the movable collar 31 is moved toward the disk the inclined planes of the arms 30 will raise the collars 27 and compress the springs, and, vice versa, when the collar 31 is moved from the disk the arms 30 will be withdrawn and allow the expansion of the springs. By this construction it is manifest that the resistance of the springs to the centrifugal action of the weights will be according to the advancement or retraction of the movable collar on the shaft. The collar 31 is formed with a groove 33, in which a collar 34 is mounted, which is provided with trunnions 35, to which the slotted operating-lever 36 is pivotally connected. The base of the operating-lever is pivotally connected to the bed-plate of the engine, and the top portion of the lever is provided with a slot 37 to receive the guide-arm 38 and with the thumb-screw 39 to lock the movable collar in any desired position. Thus constructed when it is desired to adjust the engine to an increased load, the pressure being normal or to a lower standard of pressure in the source, the load being normal, the lever 36 is operated to force the adjusting-arms 30 farther under the collars 27, which increases the resistance of the springs 19 to the centrifugal action of the governor-weights, thereby increasing the speed, which effects the desired object in either case. To adjust the engine to a reduced load or a higher standard pressure in the source, the lever is operated to withdraw the adjusting-arms, which diminishes the resistance of the springs and allows the governor mechanism to begin to retract the trip-heads at a

lower velocity of the governor-wheel, thereby reducing the pressure of the charges to the requirements of the load.

What we claim to be new is—

1. In a valve-gear for engines, the combination with a rock-valve, of a rock-arm adapted to actuate the valve to open and close a port or ports, a wheel on the engine-shaft adapted to engage the rock-arm and provided with radial ways through its periphery, trip-heads in the ways and having limited radial movement therein to project at different distances beyond the periphery of the wheel and adapted to actuate the rock-arm to open the valve-ports proportionate in time and distance to the projection of the heads, and at fixed periods of the revolution of the shaft, means to automatically actuate the rock-arm to close the valve when released by the trip-heads, radial bosses on the wheel-hub provided with orifices radial to the hub, stems for the trip-heads extending into and movable in the orifices of the bosses, yoke-collars fixed on the stems, coil-springs mounted on the stems between the collars and the bosses and adapted to yieldingly hold the trip-heads projected to the outward limit of their movement, and a bell-crank for each trip-head pivotally mounted at its angle to the wheel-web and having the free end of one arm bifurcated and engaged with the yoke-collar of a trip-head stem, and the free end of the other arm weighted and held normally inward toward the hub by the stem-coil, substantially as and for the purpose set forth.

2. In an adjustable valve-gear for engines, the combination with a wheel on the engine-shaft having spring-projected trip-heads adapted to actuate a rock-valve at fixed periods of the revolution of the shaft, and having weighted levers so connected to the trip-heads that they will under the action of centrifugal force draw the trip-heads radially inward proportionately to the velocity of the wheel and the resistance of the springs of the trip-heads, of means to adjust the resistance of the springs of the trip-heads, substantially as and for the purpose set forth.

3. In an adjustable valve-gear for engines, the combination with a rock-valve, of a rock-arm adapted to actuate the valve to open and close a port or ports, a wheel on the engine-shaft having spring-projected trip-heads adapted to engage the rock-arm at fixed periods of the revolution of the shaft and acuate it, and having weighted levers so connected to the trip-heads that they will under the action of centrifugal force produced by the revolution of the wheel draw the trip-heads radially inward proportionately to the velocity of the wheel and the resistance of the springs of the trip-heads, a collar movably mounted on the shaft adjacent to the hub of the wheel, adjusting wedge-bars projecting from the collar on opposite sides of the hub between the springs of the trip-heads and their bases, adapted when moved in one direction to increase the compression of the springs of the trip-heads and when moved in the opposite direction to diminish such compression, and means to move the collar forward and backward on the shaft substantially as and for the purpose set forth.

4. In an adjustable valve-gear for engines, the combination with a rock-valve, of a rock-arm adapted to actuate the valve to open and close a port or ports, a wheel on the engine-shaft having spring-projected trip-heads adapted to engage the rock-arm at fixed periods of the revolution of the shaft and actuate it, and have weighted levers so connected to the trip-heads that they will under the action of centrifugal force produced by the revolution of the wheel draw the trip-heads radially inward proportionately to the velocity of the wheel and the resistance of the springs of the trip-heads, a collar movably mounted on the shaft adjacent to the hub of the wheel, adjusting wedge-bars projecting from the collar on opposite sides of the hub between the springs of the trip-heads and their bases, adapted when moved in one direction to increase the compression of the springs of the trip-heads and when moved in the opposite direction to diminish such compression, a circumferential groove in the collar, a yoke-collar provided with trunnions mounted in the groove of the collar, a lever having a lower end portion pivoted to a support, a central yoke portion encircling the collar and pivotally mounted on the trunnions of the yoke-collar, and an upper-end handle portion, and means to lock the lever in various positions in the arc of its movement substantially as and for the purpose set forth.

In witness whereof we have hereunto set our hands this 20th day of July, 1903.

DORWIN W. CONE.
DAVID N. PERRY.

Witnesses:
FRANK C. YOUNGS,
ROBIE CONE.