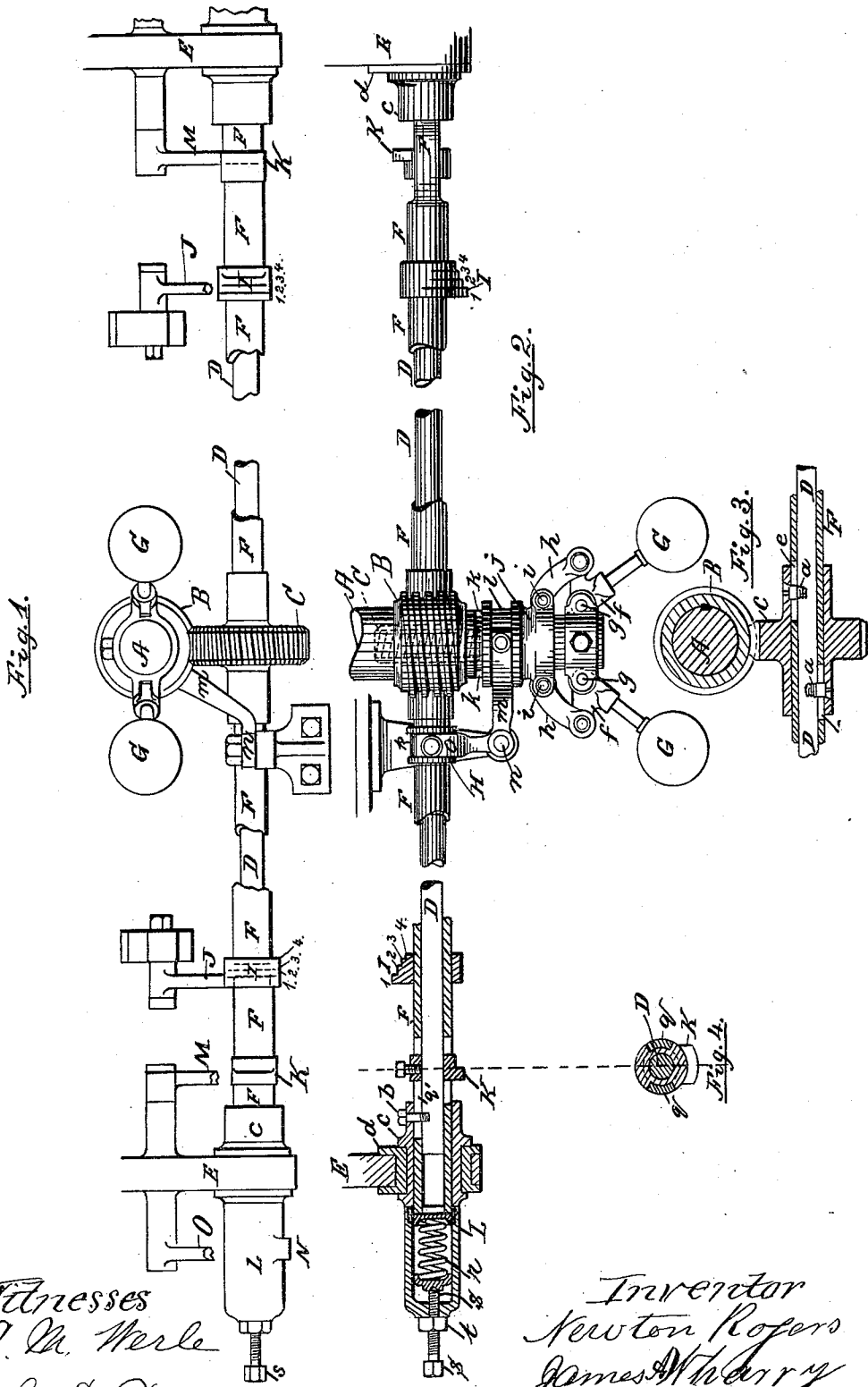


(No Model.)

N. ROGERS & J. A. WHARRY.  
GOVERNOR FOR GAS ENGINES.

No. 403,378.

Patented May 14, 1889.



Witnesses  
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# UNITED STATES PATENT OFFICE.

NEWTON ROGERS AND JAMES A. WHARRY, OF TERRE HAUTE, INDIANA.

## GOVERNOR FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 403,378, dated May 14, 1889.

Application filed August 22, 1888. Serial No. 283,450. (No model.)

*To all whom it may concern:*

Be it known that we, NEWTON ROGERS and JAMES A. WHARRY, of Terre Haute, in the county of Vigo and State of Indiana, have invented certain new and useful Improvements in Governors for Gas-Engines; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to

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which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

My invention relates to improvements in governors for gas-engines, and has for its object to provide mechanism by means of which the gas and air inlet valve of the engine is immediately fully shut off when the engine exceeds its normal working-speed, and to especially adapt the governor to a duplex engine—for instance, to the one shown in our application, Serial No. 283,451, filed August 22, 1888. We accomplish these objects by the mechanism illustrated in the accompanying drawings, wherein—

Figure 1 is an elevation of the governor way-shaft for operating the governor and valves, and the main engine-shaft for operating the way-shaft. Fig. 2 is a plan of the same. Fig. 3 is a vertical section through the axis of the way-shaft, showing a detail; and Fig. 4 is a section at *x x*, also showing a detail.

Similar letters refer to similar parts in all the views.

A is the main shaft of the engine, operated by a crank and connecting-rod from two opposite cylinders. The shaft A is provided with a worm, B, which gears with a worm-wheel, C. The worm-wheel C is rigidly secured to the way or valve shaft D by means of screws or pins *a*. The shaft D has no longitudinal motion, being secured near its ends by pins or bolts *b* to revolving journals *c*, fitting in bearings *d*, carried in brackets E, which are secured to the engine frame or cylinders. The shaft D is surrounded by a sleeve, F, capable of longitudinal movement

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subject to the influence of the governor. Slots *e* are cut away in the sleeve to permit this movement by the pins *a*, as shown in Fig. 3.

A ball-governor is attached directly to the engine-shaft and is operated thereby.

G are the balls of the governor; *f*, the bell-cranks, attached to the shaft by pins *g*, to one end of which the balls are fastened, and to the other ends of which are pivoted the links *h*, which connect by pins *i* to a sliding collar, *j*. This collar *j* is secured to the shaft by keys *k*, and is provided with the groove *l*, in which a forked arm, *m*, engages. The arm *m* forms a bell-crank, pivoted at *n*, the other arm of the bell-crank being likewise forked at *o*, to engage a groove, *p*, in the fixed collar H on sleeve F. As the governor-balls recede from each other on an increase of speed of the engine-shaft and approach each other on a decrease of speed, the movement is transmitted by the above-described mechanism to the collar H, and the sleeve F connects therewith, they will consequently receive a longitudinal motion to the left or to the right, according as the speed increases or decreases.

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The sleeve F has keyed to it the cams I, which operate the inlet-valves of the two engine-cylinders by means of the valve-levers J. The exhaust-valves of the cylinders are operated by means of cams K, secured directly to the way-shaft D by keys or bolts. To permit the sleeve F to slide by these cams, the sleeve is slightly swelled at this point and let into the cams, as shown at *q*, Fig. 4, and a slot, *q'*, permits the sleeve F to move by the pin *b*. This permits the exhaust-cam to operate at each revolution of the way-shaft, irrespective of the motion of the sleeve F.

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To resist the thrust of the sleeve F, due to the governor-balls, springs *r* are provided at each end bearing against the sleeve. These springs are housed in cages L, and are adjusted by means of bolts *s* and jaw-nuts *t*. The cages L are preferably screwed on the end of the journals C, as shown.

The exhaust-cams operate the exhaust-valve levers M, and the cage L carries the

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ignitor-cam N, contacting with a lever, O, or reciprocating rod, as shown in our above-named application, Serial No. 283,451.

The various cams and valve-levers are arranged in opposite relation to each other on both sides of the main shaft to suit the operation of the two oppositely-working pistons, as shown in our said application, Serial No. 283,451, and in the present drawings. The  
 10 cams can be so adjusted that the governor may throw off one engine and then the other, as may be desired.

From the above description the operation of our device can be easily understood, and  
 15 it will suffice to say that an increase of speed pushing the sleeve F to the right will cause the inlet-cams I to be moved from beneath the engine inlet-valve levers, and the gas and air will fail to enter the cylinder, thus allow-  
 20 ing the engine to run idle until the speed decreases to the normal.

By having a series of steps on our inlet-cams instead of only one, the amount of inlet lift of the inlet-valves can be made to vary  
 25 in inverse ratio to the speed of the engine, and only to close entirely by the removal of the smallest step on the cam-block at very high speed above the normal, in which case the charges would gradually be reduced as  
 30 the speed increased, and when finally the charges become so small as to fail to ignite by means of dilution with the burned gases still remaining in the clearance spaces of the  
 35 cylinders the valve remains closed altogether and the waste is saved. By varying the relative diameters of the two worms B and C, this governor can be made to control the various styles of engines having different cycles.

It will be noticed that when our governor  
 40 operates the sleeve to govern the duplex engine, the left-hand cam causes the valve-lever to drop on the steps toward the right as the cam and sleeve move to the left, and at the right  
 45 hand the cam is moved to the left and causes the valve-lever to drop successively from steps  
 1 2 3 4 to the right.

The cams are so adjusted that when the left-hand valve-lever is on cam-step 1 the right-hand valve-lever is on cam-step 2, the  
 50 result of which is that the left-hand cylinder will have its gas-valve closed more slowly than the right-hand one, and that the right-hand cam-lever drops to the cylindrical part 4 and cuts off the gas entirely while the left-  
 55 hand valve-lever is still on step 3 and opening that valve slightly, so that when the engine runs too fast the admission of gas to both cylinders is gradually throttled until at a  
 60 higher speed the right-hand cylinder is thrown out of action, and at a still higher speed the left-hand cylinder is also thrown idle.

What we claim is—

1. In combination with the main shaft of a  
 65 gas-engine, a worm on said shaft gearing with a worm-wheel on a way-shaft, which operates

the engine-valves, a centrifugal governor on the main shaft, bell-crank connections between the governor-sleeve, a sleeve surrounding the way-shaft and revolving with it, but  
 70 capable of sliding longitudinally thereon, and a cam rigidly secured to said sleeve for operating the engine inlet-valve, substantially as described.

2. In combination with the main shaft of a  
 75 gas-engine, a centrifugal governor on said shaft, driving-connections between said shaft, a driving-link between the movable governor-collar and a sliding sleeve on the way-shaft, a connecting-pin between the sleeve and the  
 80 way-shaft, a slot in said sleeve surrounding said pin, whereby the said sleeve is caused to revolve with the way-shaft and to slide by the action of the governor, and an engine inlet-valve cam on said sliding cam. 85

3. In combination with the main shaft of a gas-engine, a centrifugal governor on said shaft, a sliding collar on said shaft operated by the governor, a double-forked bell-crank  
 90 lever, one fork fitting in a groove on said sliding collar, the other fork fitting a grooved collar on a sleeve surrounding the way-shaft, a connection between said sleeve and the way-  
 95 shaft, a slot in said sleeve surrounding said connection, a driving-connection between the main and way shafts, and a gas-inlet valve-cam on said sliding sleeve, substantially as described.

4. In combination with the main shaft of a gas-engine, a way-shaft operated thereby, a  
 100 governor on said main shaft, connections between said governor and a sleeve on said way-shaft, a pin for causing the sleeve and way-shaft to revolve together, a slot in said sleeve to slide under the influence of the governor,  
 105 a spring pressing on the end of said sleeve to oppose the motion produced by the governor, and a gas-inlet valve-cam on said sleeve, substantially as described.

5. In combination with a way-shaft driven  
 110 by the engine, a sleeve surrounding said way-shaft, a gas-inlet valve-cam on said sleeve, a pin connecting the sleeve and the way-shaft, a slot for said pin in said sleeve, a spring  
 115 pressing against the end of the sleeve, an adjusting device for said spring, a speed-governor operated by the engine, and connections between the governor and the sleeve whereby a variation in the speed of the governor produces a sliding motion in the sleeve, substan-  
 120 tially as described.

6. The combination of the shaft A, worm-wheel B on said shaft, gearing with a worm-wheel, C, on a shaft, D, a sleeve, F, a pin, a,  
 125 slot e, a governor on the main shaft, double-forked bell-crank M O, connecting the governor with sleeve F, a spring, r, adjusting-screw s at the end of sleeve F, and a cam, I, on the sleeve, substantially as set forth.

7. In a duplex gas-engine, the combination of  
 130 the valve-actuating way-shaft, a sliding sleeve thereon operated by a centrifugal governor,

and two cams on said sleeve for operating the inlet-valves of the two cylinders, said cams being so situated with respect to the valve-levers that one cam operates to cut off the gas-inlet quicker than the other, whereby the power of one cylinder is reduced and finally destroyed in advance of the other, substantially as described.

In testimony that we claim the foregoing as our own we affix our signatures in presence of two witnesses.

NEWTON ROGERS.  
JAMES A. WHARRY.

Witnesses:

MARTIN HOLLINGER,  
W. C. ENGLER.