No. 744,486. PATENTED NOV. 17, 1903.

L. S. CHADWICK.

CONTROLLING MECHANISM FOR GAS ENGINES.

APPLICATION FILED MAR. 26, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

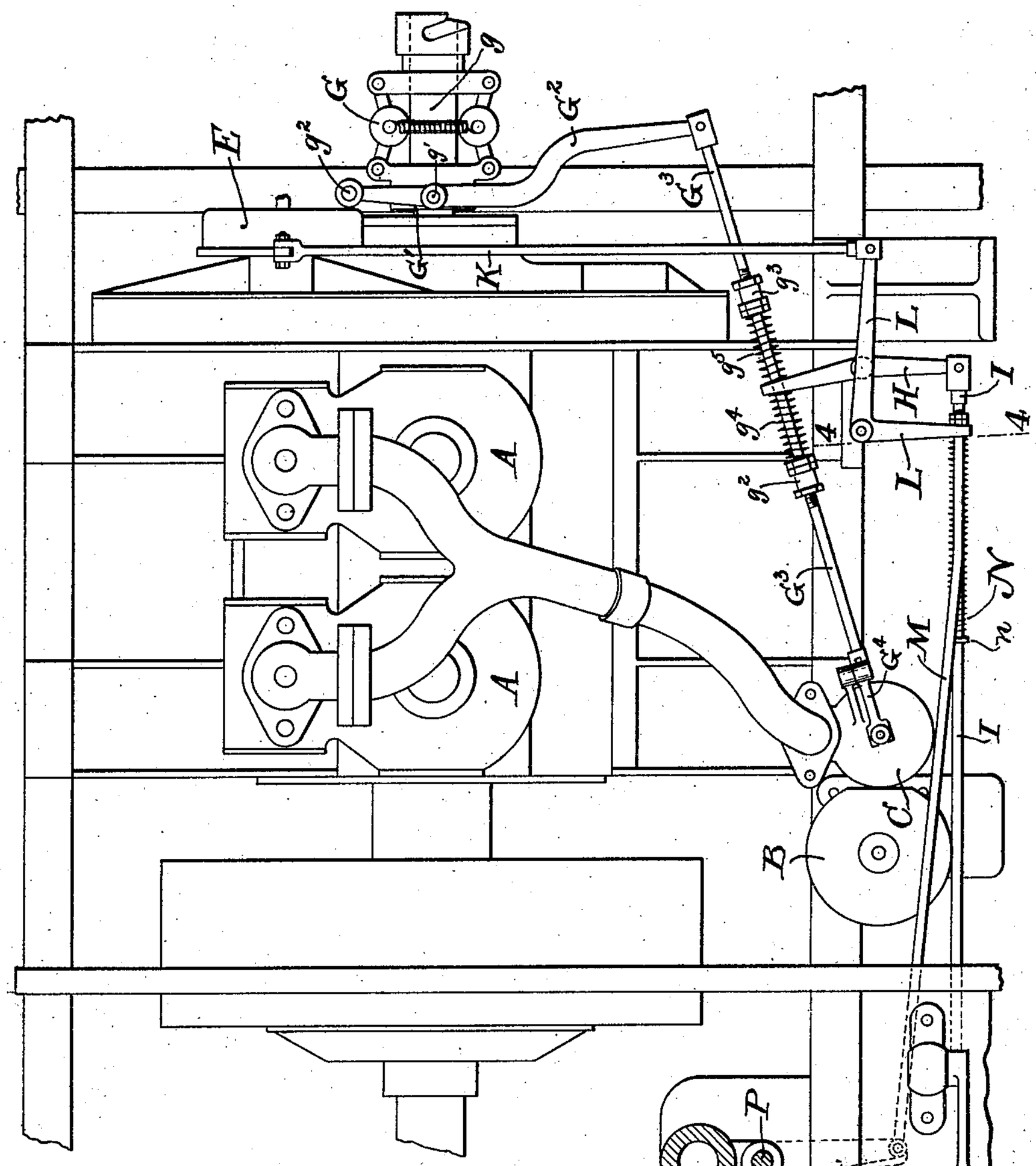

Fig. 1.

WITNESSES:
W. W. Canby.
M. F. Ellis

INVENTOR
Lee S. Chadwick
BY
Harding & Harding
ATTORNEYS.

No. 744,486. PATENTED NOV. 17, 1903.

L. S. CHADWICK.

CONTROLLING MECHANISM FOR GAS ENGINES.

APPLICATION FILED MAR. 26, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

Fig. 4.

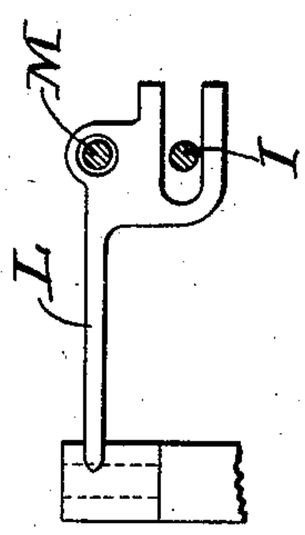

Fig. 2.

WITNESSES:

W. N. Canby.

M. H. Ellis

INVENTOR

Lee S. Chadwick

BY

Harding & Harding

ATTORNEYS.

No. 744,486. Patented November 17, 1903.

UNITED STATES PATENT OFFICE.

LEE S. CHADWICK, OF RIDLEY PARK, PENNSYLVANIA.

CONTROLLING MECHANISM FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 744,486, dated November 17, 1903.

Application filed March 26, 1903. Serial No. 149,639. (No model.)

To all whom it may concern:

Be it known that I, LEE S. CHADWICK, a citizen of the United States, residing at Ridley Park, county of Delaware, and State of Pennsylvania, have invented a new and useful Improvement in Controlling Mechanism for Gas-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

The invention relates to the controlling mechanism for gas-engines of the explosive type, such as are employed for the propulsion of automobiles.

The object of the invention is to connect the governor-control mechanism and the mechanism for advancing or retarding the spark for exploding the gas in such a way as to prevent premature sparking of the gas while the engine is going at slow speed and to cause the spark to be advanced proportionately to the speed of the engine.

In the drawings, Figure 1 is a general plan view of the engine, carbureter, governor, and controlling mechanism for the sparking device and the governor. Fig. 2 is a side view of a portion of the governor-control mechanism and the mechanism for controlling the sparking device and the connections between them and also of the connections to the throttle-valve. Fig. 3 is an enlarged vertical sectional view of the throttle-valve and mixing-chamber of the carbureter, and Fig. 4 is an enlarged section on line 4 4 of Fig. 1.

A is the engine; B, the carbureter; C, the mixing-chamber, and D the throttle-valve for regulating the amount of gas passing to the engine.

E is the device for advancing or retarding the spark which explodes the gas and actuates the engine-piston. This spark-controlling device is not shown in detail, its construction being well known in the art. It consists simply of brushes mounted on the oscillating frame E and engaging a commutator rotated by the engine-shaft, the position of the brushes determining the time of the spark, as is well understood.

F is a lever by means of which (through connections to be hereinafter described) the spark-controlling device is operated.

The gasolene or other pressure liquid passes from the carbureter to the mixing-chamber, where it is gasified and mixed with a proper quantity of air, the resultant gas passing through the throttle-valve to the piston-chamber of the engine. To prevent the engine exceeding the desired speed, it is desirable and necessary as the engine speeds up to further close the throttle-valve, thus decreasing the supply of gas. For this purpose a governor is provided, as is usual, which is connected with the throttle-valve as follows:

G is the governor on the engine-shaft g. Secured to the governor is a collar G′.

G^2 is a lever pivoted to the engine-frame at g^2 and engaging the collar at g'.

G^3 is a rod secured at one end to the lever G^2 and at the other end to one end of a bell-crank lever G^4, the other end of which engages the throttle-valve D.

As the engine speeds up the balls of the governor fly out, drawing collar G′, lever G^2, and rod G^3 to the right, thereby moving the bell-crank G^4 to throttle the gas-exit port from the mixing-chamber. To permit the operator to attain any degree of speed up to the maximum speed of which the machine is capable, more or less pressure is put upon the governor, thereby preventing it from acting upon the throttle-valve unless the speed becomes so great as to enable the governor to overcome such pressure. The following means are provided for so controlling the governor:

H is a lever pivoted to the frame of the machine between its ends. The inner end of this lever engages the rod G^3. Secured to the rod G^3 are nuts g^2 g^3, between which and the inner end of lever H and surrounding the rod G^3 are coil-springs g^4 g^5. I is a rod, one end of which is secured to the outer end of lever H and the other end of which is secured to one end of the bell-crank lever J. The other end of this bell-crank is provided with a foot-treadle J′. By depressing the foot-treadle J′ the rod I is moved to the right, moving the lever H so as to compress the spring g^4. The governor now will not act to close the throttle-valve unless the speed of the engine becomes so great as to enable the governor to overcome the tension of spring g^4 and further compress the spring. Thus it

will be understood that the maximum speed is determined by the extent to which the foot-treadle is depressed.

It is desirable that the point of sparking of the gas should be considerably advanced at high speed and retarded at low speed. For this purpose the vibrating frame E for carrying the brushes is provided, as before described. It is customary to have this device under the direct control of the operator. It frequently happens, however, that the operator cannot or will not at all times set the spark-controlling device at the most effective point for the speed of the engine. It frequently happens that the sparking-point is too far advanced at a comparatively slow speed, which results in a premature explosion of the gas and the forcing of the piston backwardly instead of forwardly. I have devised means whereby the operator cannot directly control the point of sparking, but can only determine the maximum extent to which the sparking-point can be advanced, the governor-control mechanism moving the spark-controlling device to advance the sparking-point proportionately to the speed at which the engine is set and preventing it being moved beyond that point and also moving it back to retard the spark when the governor-control mechanism is operated to reduce the speed of the engine. The means for effecting this result are as follows:

K is a link connecting the frame E and bell-crank lever L. The outer end of this bell-crank is provided with orifices through which extend the rod I (of the governor-control mechanism) and the rod M.

N is a coil-spring on the rod I, this spring extending between the bell-crank L and the fixed projection *n* on the rod I.

m i are nuts or stops on rods M and I, respectively, these nuts limiting the movement of the bell-crank L. The other end of rod M is connected by means of link O and shaft P with the lever F.

By turning lever F the rod M may be moved so as to cause nut *m* to recede from bell-crank L. The latter, however, will not be operated, as it still abuts against the nut *i*. If, however, the treadle J′ is depressed to move the rod I and permit the engine to speed up, the spring N causes the bell-crank L to follow up the nut *i*, thereby raising link K and turning frame E, thus advancing the sparking-point. If the pressure on the foot-treadle J′ is released, the spring g^4 through lever H moves back the rod I, thereby through nut *i* restoring the bell-crank L and frame E to their original position. Thus within the limit fixed by the operator the sparking-point is advanced proportionately to the increased speed of the engine and retarded proportionately as the engine's speed is diminished.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In a gas-engine, in combination, the governor, devices for controlling the governor, the spark-controlling device and actuating mechanism therefor, and a stop operated by the governor-controlling devices and adapted to limit the movement of the spark-controlling-device-actuating mechanism, substantially as described.

2. In a gas-engine, in combination, the governor, devices for controlling the governor, the spark-controlling device and actuating mechanism therefor, a spring operated by the governor-controlling devices adapted to actuate the spark-controlling-device-actuating mechanism, and a stop also operated by the governor-controlling device for limiting the movement of said mechanism, substantially as described.

3. In a gas-engine, in combination, the governor, devices for controlling the governor, the spark-controlling device and actuating mechanism therefor, a manually-controlled stop adapted to be moved to permit the spark-controlling-device-actuating mechanism to operate, and means connected with the governor-controlling devices to operate said spark-controlling-device-actuating mechanism, substantially as described.

4. In a gas-engine, in combination, the governor, devices for controlling the governor, the spark-controlling device and actuating mechanism therefor, a manually-controlled stop adapted to be moved to permit the spark-controlling-device-actuating mechanism to operate and means connected with the governor-controlling devices to operate said spark-controlling-device-actuating mechanism and to limit the movement thereof, substantially as described.

5. In a gas-engine, in combination, the governor, devices for controlling the governor, the spark-controlling device and actuating mechanism therefor, a manually-controlled stop adapted to be moved to permit the spark-controlling-device-actuating mechanism to operate, a spring operated by the governor-controlling devices adapted to actuate the spark-controlling-device-actuating mechanism, and a stop also controlled by the governor-controlling devices to limit the movement of said mechanism, substantially as described.

6. In a gas-engine, the combination, with the governor and spark-controlling device, of a rod, means for operating said rod, connections from said rod to the governor, a stop on said rod, a lever engaging said rod, a connection from said lever to the spark-controlling device, a projection on said rod, and a spring on said rod between said projection and lever, substantially as described.

7. In a gas-engine, in combination, the governor, the throttle-valve, connections from the governor to the throttle-valve, a lever, a spring interposed between said lever and said connections, manual controlling devices for operating said lever, the spark-controlling device and actuating mechanism therefor, and a

stop operated by said manual controlling devices and adapted to limit the movement of the spark-controlling-device-actuating mechanism, substantially as described.

8. In a gas-engine, in combination, the governor, the throttle-valve, connections from the governor to the throttle-valve, a lever, a spring interposed between said lever and said connections, manual controlling devices for operating said lever, the spark-controlling device and actuating mechanism therefor, a spring operated by said manual controlling devices adapted to actuate the spark-controlling-device-actuating mechanism, and a stop also operated by said manual controlling devices for limiting the movement of said mechanism, substantially as described.

9. In a gas-engine, in combination, the governor, the throttle-valve, connections from the governor to the throttle-valve, a lever, a spring interposed between said lever and said connections, manual controlling devices for operating said lever, the spark-controlling device and actuating mechanism therefor, a manually-controlled stop adapted to be moved to permit the spark-controlling-device-actuating mechanism to operate, and means connected with said manual controlling devices to operate said spark-controlling-device-actuating mechanism, substantially as described.

10. In a gas-engine, in combination, the governor, the throttle-valve, connections from the governor to the throttle-valve, a lever, a spring interposed between said lever and said connections, manual controlling devices for operating said lever, the spark-controlling device and actuating mechanism therefor, a manually-controlled stop adapted to be moved to permit the spark-controlling-device-actuating mechanism to operate, and means connected with said manual controlling devices to operate said spark-controlling-device-actuating mechanism and to limit the movement thereof, substantially as described.

11. In a gas-engine, in combination, the governor, the throttle-valve, connections from the governor to the throttle-valve, a lever, a spring interposed between said lever and said connections, manual controlling devices for operating said lever, the spark-controlling device and actuating mechanism therefor, a manually-controlled stop adapted to be moved to permit the spark-controlling-device-actuating mechanism to operate, a spring operated by said manual controlling devices adapted to actuate the spark-controlling-device-actuating mechanism, and a stop also operated by said manual controlling devices to limit the movement of said mechanism, substantially as described.

12. In a gas-engine, the combination, with the governor, the spark-controlling device and throttle-valve, of connections from the governor to the throttle-valve, a lever, a spring interposed between said lever and said connections, a rod connected to said lever, means for operating said rod, a stop on said rod, a lever engaging said rod, a connection from said lever to the spark-controlling device, a projection on said rod, and a spring on said rod between said projection and lever, substantially as described.

13. In a gas-engine, the combination, with the governor, the spark-controlling device, of rods each having a stop, means to operate each rod, connections from one of said rods to the governor, a lever engaging both rods, a connection from said lever to the spark-controlling device, a projection on the rod connected with the governor, and a spring between said projection and lever, substantially as described.

14. In a gas-engine, the combination, with the governor, the spark-controlling device and throttle-valve, of connections from the governor to the throttle-valve, rods each having a stop, means to operate said rods, a lever secured at one end to one of said rods, a spring interposed between the other end of said lever and said connections, a second lever engaging both of said rods, a connection from the second lever to the spark-controlling device, a projection on the rod to which the first-named lever is secured, and a spring between said projection and the second lever, substantially as described.

15. In a gas-engine, the combination, with the governor, the spark-controlling device and the throttle-valve, of a lever pivoted to said governor, a rod secured to said lever, a bell-crank lever, one arm of which is secured to said rod and the other arm of which is attached to the throttle-valve, nuts on said rod, springs between said nuts, a second lever engaging said rod and interposed between said springs, a second rod to which said second lever is secured, a stop and a projection on said second rod, a third rod, a stop thereon, a second bell-crank lever, one arm of which engages the second and third rods, a link to one end of which the other end of said second bell-crank is attached, the other end of said link being secured to the spark-controlling device, a spring between said projection and said second bell-crank, and means for operating said second and third rods, substantially as described.

In testimony of which invention I have hereunto set my hand, at Chester, Pennsylvania, on this 20th day of March, 1903.

LEE S. CHADWICK.

Witnesses:
C. W. ROWE,
E. A. HOWELL.