No. 635,294. Patented Oct. 24, 1899.

J. O. BROWN.

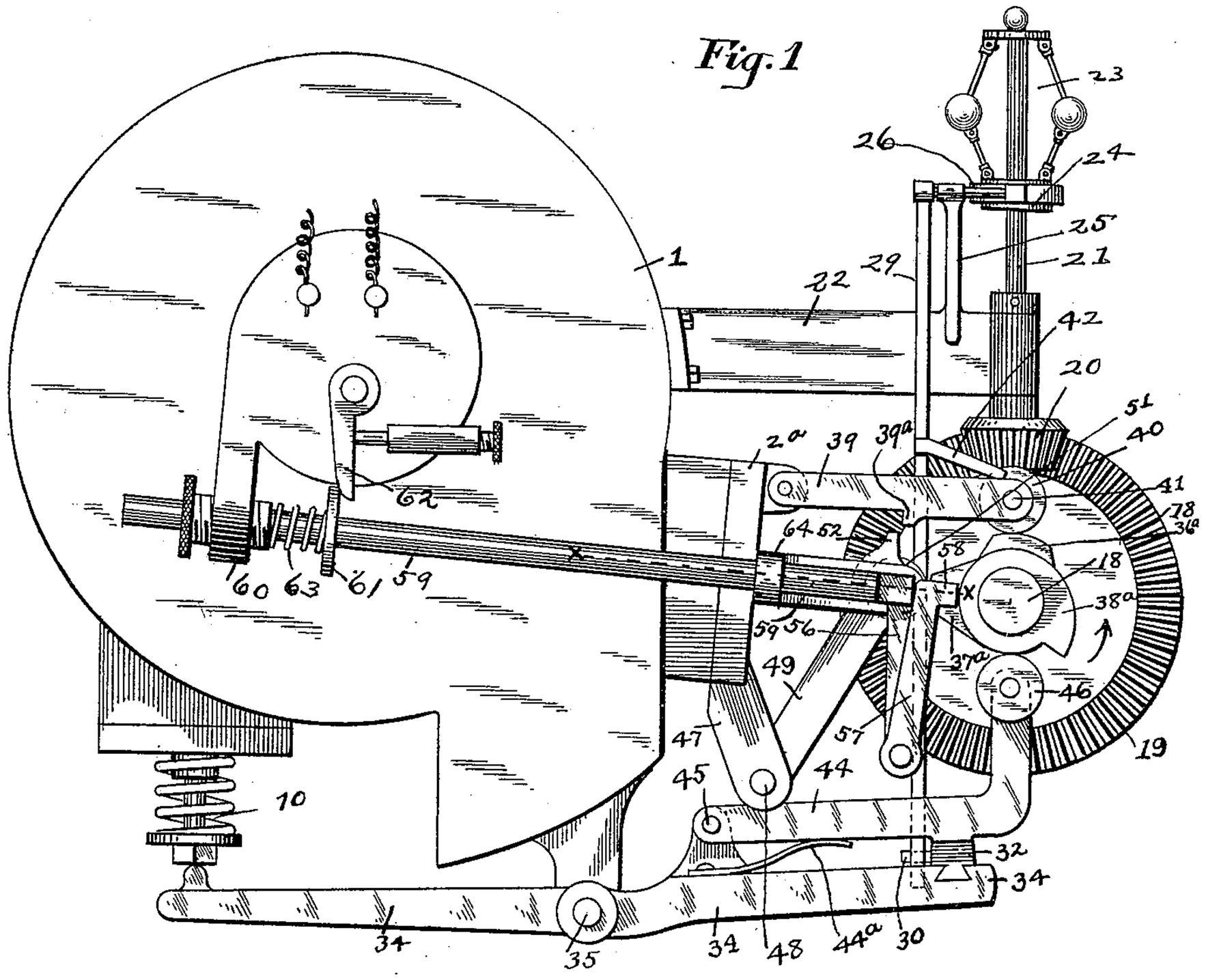
GAS ENGINE.

(Application filed Dec. 1, 1898.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1



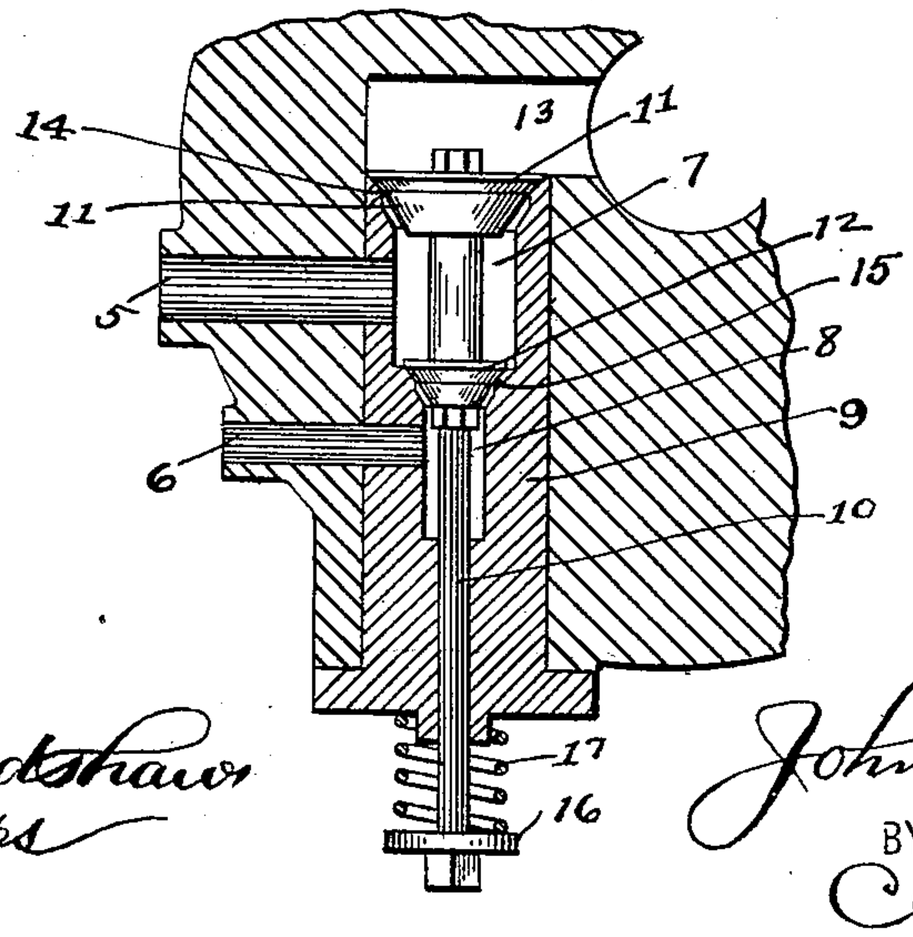


Fig. 2.

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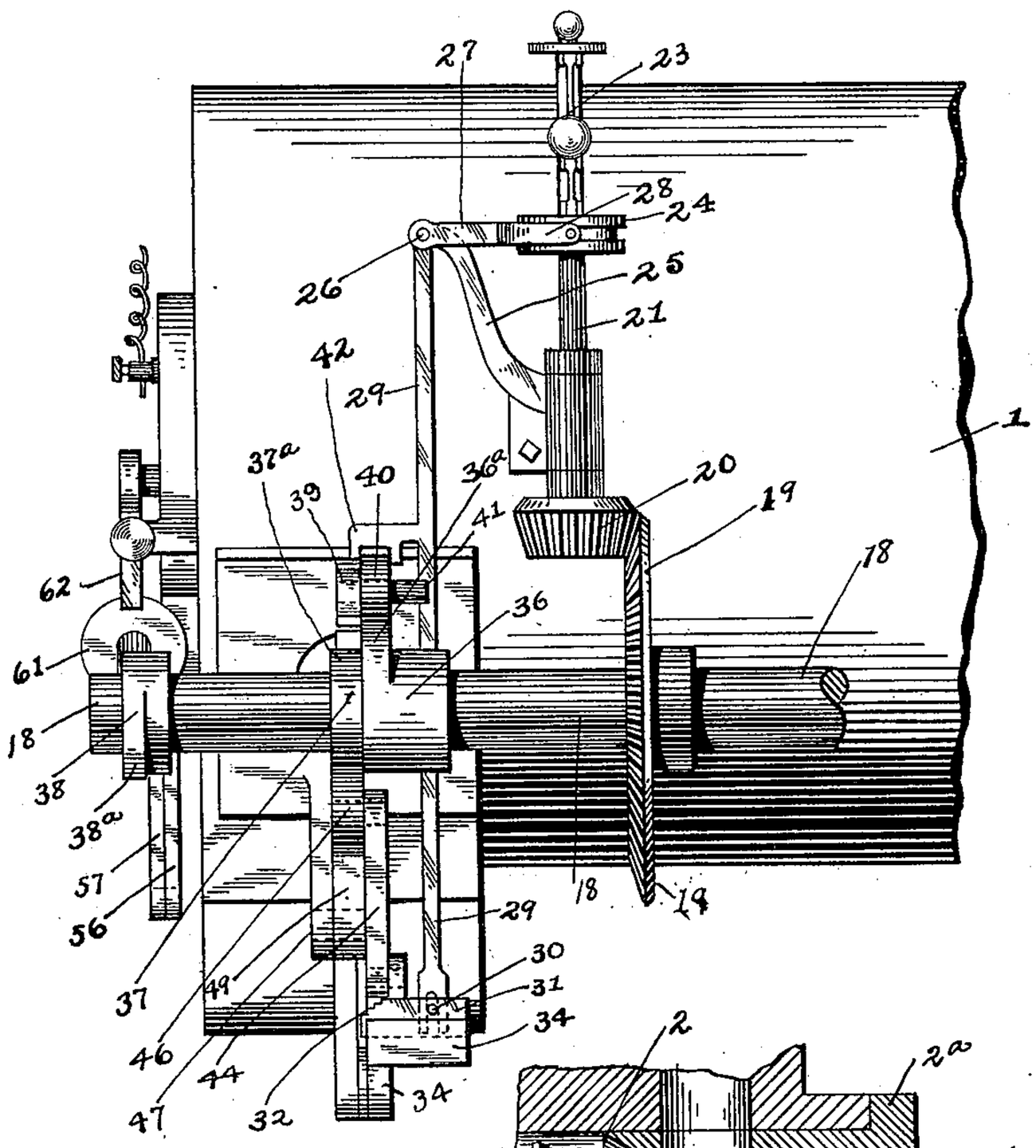

Fig. 3.

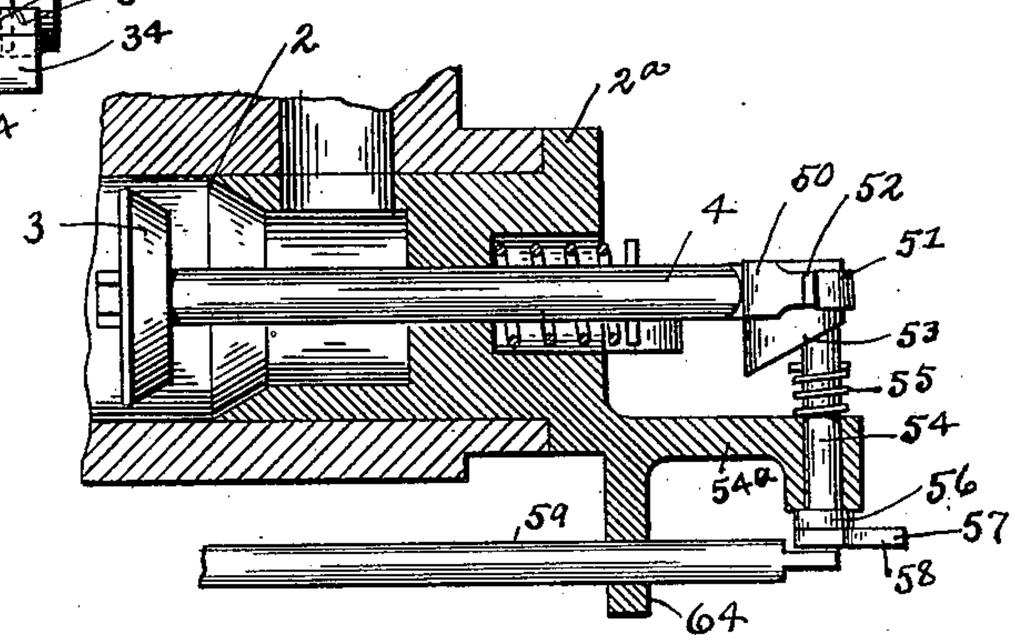

Fig. 4.

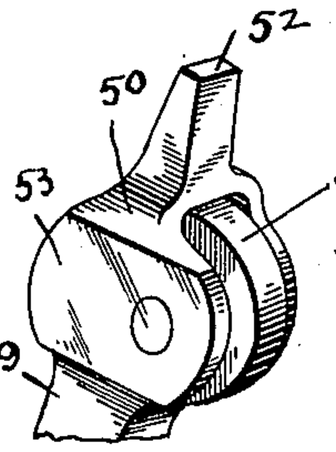

Fig. 6.

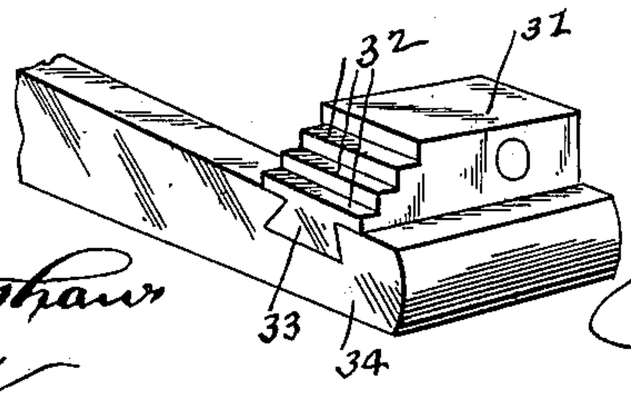

Fig. 5.

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UNITED STATES PATENT OFFICE.

JOHN O. BROWN, OF COLUMBUS, OHIO, ASSIGNOR TO ALLIE M. BROWN, OF SAME PLACE.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 635,294, dated October 24, 1899.

Application filed December 1, 1898. Serial No. 697,972. (No model.)

To all whom it may concern:

Be it known that I, JOHN O. BROWN, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Gas-Engines, of which the following is a specification.

My invention relates to the improvement of gas-engines; and the objects of my invention are to provide a gas-engine with improved means for automatically regulating the charges of gas and air in proportion to the power required, to provide improved means for operating the gas and air intake valves in conjunction with improved means for operating the exhaust-valve and igniting mechanism, and to produce other improvements, the details of construction and arrangement of which will be more fully pointed out hereinafter. These objects I accomplish in the manner illustrated in the accompanying drawings, in which--

Figure 1 is an end view of a gas-engine cylinder, showing in connection therewith my improved apparatus. Fig. 2 is a detail sectional view through a portion of the cylinder-body and through the air and gas intake ports. Fig. 3 is a view in elevation taken at right angles with that shown in Fig. 1. Fig. 4 is a detail sectional view on line x x of Fig. 1. Fig. 5 is a detail view in perspective of the graduating-block which I employ in the manner hereinafter described, and Fig. 6 is a detail view in perspective of the head or upper end portion of one of the lever-bars.

Similar numerals refer to similar parts throughout the several views.

1 represents the gas-engine cylinder-body, which is provided on one side with the usual exhaust-port 2, which communicates with the combustion-chamber of the cylinder, said exhaust-port being adapted to be closed through the medium of a valve 3 when the spring-actuated valve-rod 4 is moved to its outer limit. The cylinder is provided on the opposite side from the exhaust-port or at other suitable points with air and gas inlet ports 5 and 6, which lead, as shown, into communicating upper and lower air and gas chambers 7 and 8, which are formed in a valve-casing 9. Through the central portion of said casing passes loosely a valve-stem 10, which within the upper chamber 7 carries tapering or conical valves 11 and 12. The upper valve 11 normally closes communication between the chamber 7 and a passage 13, which leads to the combustion-chamber of the cylinder by bearing in a flaring seat 14, formed in the upper end of the casing 9, while the lower and smaller valve 12 serves to normally cut off communication between the chamber portions 7 and 8 by bearing upon a correspondingly-shaped seat or shoulder 15, which is formed at the junction of said chambers. The lower and outer end portion of the valve-stem 10 is provided with a flange or shoulder 16, between which and the under side of the valve-casing 9 I provide a coiled spring 17, the latter normally depressing said valve-stem. On the outer side of the cylinder and suitably journaled in a parallel position therewith is a shaft 18, which is suitably driven from the fly-wheel of the engine. Upon this shaft is carried a bevel gear-wheel 19, the teeth of which engage those of a bevel-pinion 20, mounted on the lower end of a vertical governor-shaft 21, the latter being journaled and supported in a bracket-arm 22, which extends outward from the cylinder-body, as shown. Upon the upper portion of the shaft 21 is provided a desirable form of governor 23 of that class which is provided with a collar 24, which rises and falls on the shaft 21 in accordance with the speed of the latter. Fulcrumed in the upper and outer end of a bracket-arm 25, which projects from the arm 22, is a shaft 26, this shaft 26 carrying an outwardly-extending yoke-arm 27, the fingers 28 of which embrace and loosely engage opposite sides of the governor-collar 24. The shaft 26 also has depending therefrom and connected therewith a bar 29. The lower end of this bar, which is below the cylinder-body, is bifurcated and loosely engages, as indicated in dotted lines in Figs. 3 and 1, a pin 30, which projects laterally from a larger graduating-block 31, said block having its outer end portion inclined and said inclined portion having formed therein successive steps, as shown at 32. The under side of the block is provided with a longitudinally-formed dovetailed projection or guide 33,

which is adapted to fit and slide transversely in the outer end portion of a substantially horizontal lever 34. This lever is centrally fulcrumed at 35 to a downwardly-extending arm of the cylinder-body and has its end portion, which projects beneath the cylinder, contacting, as shown, with the under side of the spring-actuated valve-stem 10. Upon the shaft 18 are carried adjoining cams 36 and 37, while on the outer end of said shaft 18 is carried a cam-body 38, the contact projections 36^a, 37^a, and 38^a of said cams being arranged out of parallel with each other, as shown. Fulcrumed to the outwardly-projecting end portion of the exhaust-valve casing 2^a is an outwardly-extending bar 39, on the outer end of which is journaled a disk or roller wheel 40, the latter being mounted on a laterally-projecting pin 41 of said bar 39. Opposite sides of the disk 40 are embraced loosely by the notched under side of an arm 42, which extends outward from the bar 29. As indicated at 39^a, the under side of the bar 39 is provided near the center of its length with a downwardly-projecting catch-lug or shoulder.

44 represents an angular lever, the inner end of which is fulcrumed at 45 to an upwardly-projecting lug of the lever 34. The outwardly-extending arm of the lever 44, which is supported by a spring-strip 44^a, is designed to contact with the desired one of the steps 32 of the block 31 or to shear past said block without contact in accordance with the position of the block. The outer upturned arm of the lever 44 has journaled thereon a disk or roller 46, which is supported in the path of the cam projection 37^a.

To a fixed arm 47, which extends downward from the casing 2^a, is fulcrumed at 48 an upwardly-extending and outwardly-inclined bar 49, the latter having its recessed outer end portion or head 50, as indicated more clearly in Fig. 6 of the drawings, provided with a journaled disk or wheel 51. Said bar-head is also provided with an upwardly-extending lug 52. As shown more clearly in Fig. 4 of the drawings, the head of the bar 49 is supported in front of the outer end of the valve-stem 4 and is provided with a lateral extension 53, which has an inclined or beveled face, as shown.

54 represents a short horizontal shaft, which has a sliding support in an outwardly-extending arm 54^a of a bracket which projects from the valve-casing 2^a. The inner end of this short shaft 54 is beveled to conform to the incline of the face of the bar-head extension 53, against which said shaft is normally retained through the medium of a coiled spring 55. From the outer end of the shaft 54 depends a bar 56, the latter having fulcrumed to its lower end the corresponding end of an upwardly-extending contact-arm 57, the latter being provided on its upper end with an outward extension 58, which is normally retained in the path of the cam projection 38^a.

59 represents the usual igniter-operating rod, the inner end portion of which is supported to slide in a bracket 60, which projects from the cylinder end, said rod being provided with the usual contact-disk 61, which is adapted to contact with the usual igniter-trigger 62 in the ordinary manner. The igniter-rod 59 is normally retained in its outer position through the medium of a coiled spring 63, and the outer end portion of said igniter-rod is provided with a sliding bearing in a bracket-arm 64. (See Figs. 4 and 1.)

In order to illustrate the operation of my improved mechanism, we will assume that the parts are in the positions shown in the drawings—that is, first, the cam projection 37^a in contact with the roller 51, under which condition the head 50 of the bar 49 is forced inward sufficiently to retain the exhaust-valve 3 in an open position through the contact of said bar-head and valve-stem; second, the air and gas valves 11 and 12 are in their closed positions, and, third, that the laterally-movable roller 40 is upon the cam projection 36^a. The parts being in this position, it is obvious that the end of the short shaft 54, which is indicated more clearly in Fig. 4, is in contact with the lowest portion of the inclined face 53 of the bar-head 50, and the head of the arm 57 is out of alinement with the outer end of the igniter-rod 59.

The engine being in operation and the shaft 18 revolving in the direction of the arrow indicated in Fig. 1, it is obvious that the cam projection 37^a will lose contact with the roller 51 and allow the spring-actuated exhaust-valve 3 to close. The outward movement thus imparted to the valve-rod 4 results in forcing the bar-head 50 outward and in a consequent outward or lateral movement of the shaft 54 until the head of the arm 57 is in the path of the outer end of the igniter-rod 59 and also in the path of the cam projection 38^a. Owing to the connection heretofore described of the depending bar 29 with the vertically-movable collar of the governor it is obvious that either a backward or forward swinging movement will be imparted to said bar 29 as said governor-collar is raised or lowered by the increase or decrease in the speed of the governor-shaft 21, the speed of which is controlled by the shaft 18. The connection of the graduated block 31 and swinging bar 29 results in the position of said block being governed by the position of said bar and the particular step 32 of said block, with which the lever 44 contacts when the latter is depressed, must therefore depend upon the position of said block. As the shaft 18 continues its rotary motion it is obvious that the cam projection 37^a will by contact with the roller 46 temporarily depress the lever 44, and through contact of the latter with one of the steps of the block 31 and the consequent depression of the outer end of the lever 34 cause the elevation of the air and gas valve stem 10 and a consequent opening of the valves thereon. In the above-de-

scribed manner the gas from the chamber 8 and air in the chamber 7 are intermingled and allowed to escape through the passage 13 into the combustion-chamber of the cylinder. The shaft 18 being revolved sufficiently to bring the cam projection 38ª into contact with the head of the arm 57, it is obvious that the latter will be pressed inwardly, causing a consequent inward movement of the igniter-rod 59 and resulting in the igniting of the charge of air and gas through contact of the rod-flange 61 and igniting-trigger 62 in the usual manner. The contact of the cam projection 37ª with the roller 51 immediately following the igniting operation above described must result in again opening the exhaust-valve and allowing the products of combustion to escape through the exhaust-passage. In thus opening said exhaust-valve it is obvious that the arm-head 58 will be drawn by the spring 55 out of the path of the igniter-rod and the latter will thus be allowed to return to its outer position.

It is obvious that when the engine attains too great a speed or a greater speed than required the raising of the governor-collar on its shaft may result in moving the depending bar 29 a sufficient distance to bring the steps of the block 31 entirely out of the path of the descending lever 44, thus resulting in a failure of the operation of the air and gas operating lever and preventing the charge of gas and air being taken into the combustion-chamber. Under this condition it is desirable that the exhaust-valve be retained in an open position to prevent compression of air within the cylinder, and this object I attain in the following manner: When the engine is running at a comparatively low speed and the lever 44 is operating to depress the lever 34, it is obvious that the depending bar 29 will, owing to the position of the governor-collar, be supported at such angle of a vertical position as to retain the roller 40 in the path of the cam projection 36ª, which, as will be seen, must cause the arm 39 to be raised to a substantially horizontal position, which will prevent engagement of the arm-lug 39ª and the bar-head lug 52. As the engine changes from a low to a high speed, however, it is obvious that the position assumed by the arm 29 must throw the roller 40 out of the path of the cam projection 36ª, thus allowing the arm 39 to drop downward until its lug 39ª is in position for engagement with the projection 52 of the bar-head 50. This engagement being effected when the exhaust-valve is in its open position, it is obvious that said valve will be retained in an open position, thereby preventing any compression of air within the cylinder, while the air and gas valves are inoperative through the failure of the lever 44 to contact with the block 31. When a sufficiently low speed has been attained, it is obvious that the roller 40 will, by the movement of the bar 29, be again moved in position to engage the cam-lug 36ª, whereby the bar-lug 39ª will be disengaged from and carried above the projecting head 52 and the exhaust-valve allowed to again close.

Owing to the formation of the steps 42 in the block 31 in successive planes and the fact that the particular step of said block with which the bar 44 will contact is governed by the speed of the engine, it is obvious that the degree of opening movement of the air and gas valves, and consequently the quantity of air and gas which enters the combustion-chamber, will be regulated automatically in proportion to the requirements of the engine. It will also be observed that the mechanism which I have herein shown and described not only provides simple and positive means for operating the exhaust-valve, regulating the charge of gas and air and igniting the same, but provides means for retaining the exhaust-valve in an open position when the air and gas valve lever is inoperative.

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

1. The combination with a gas-engine having gas and air supply controlling valves, and a governor adapted to rise and fall with the speed of the engine, a fulcrumed lever adapted when tipped to open said air and gas valve, an engine-operated shaft 18 and a cam thereon, an angular spring-supported lever 44, fulcrumed to said air and gas valve controlling lever, and a roller carried on said angular lever in the path of said shaft-cam, of a depending arm 29 having a swinging movement controlled by the governor and a block carried on said arm which is adapted by the swinging movement of said arm to be interposed between said angular lever and said gas and air valve controlling lever, substantially as specified.

2. In a gas-engine, the combination with the cylinder having gas and air inlets and valves controlling the supply of said air and gas to said cylinder, of a rotary governor-shaft operated from the engine, a fulcrumed depending bar 29 connected with the sliding base of said governor-shaft, a fulcrumed air and gas valve operating lever, a sliding contact-block having graduated steps and supported in said lever, a jointed connection between said block and bar 29, a fulcrumed contact-lever 44 and means for depressing the latter at intervals to contact with one of said block-steps or to pass said block, substantially as and for the purpose specified.

3. In a gas-engine, the combination with the cylinder having gas and air inlets and valves controlling the supply of air and gas therethrough, an engine-operated shaft 18, a governor-shaft operated from said shaft 18, a rotary governor mounted on said governor-shaft and having a sliding movement thereon, and a cam carried on said shaft 18, of a fulcrumed air and gas valve operating lever 34, a contact-

block having graduated steps and movably supported in the outer end portion of said lever 34, a fulcrumed lever 44 having one of its arms or a projection thereon normally retained in the path of the cam of said shaft 18, a depending fulcrumed bar 29 connected with and having its movement controlled by the rise and fall of the governor-base, and the lower portion of said bar 29 having a jointed connection with said contact-block, substantially as and for the purpose specified.

4. In a gas-engine, the combination with the cylinder, air and gas ports leading thereto, valves controlling said ports and means for operating said valves at intervals, an exhaust-port and a spring-actuated valve normally closing the same, of an engine-operated shaft 18, a fulcrumed bar 49 having a head 50 provided with an inclined face 53, said head adapted to be supported in front of the exhaust-valve stem, a spring-actuated shaft 54 bearing against the inclined face of said bar-head and adapted to slide horizontally, a contact-arm 57 supported by said shaft 54, a spring-actuated igniter-operating rod 59, cams 38^a and 37^a carried on said shaft 18, said bar-head 50 being adapted by contact with the cam 37^a to press the exhaust-valve open and move the arm 57 laterally and said cam 38^a adapted by contact with the head of the arm 57 to cause the latter to engage and press inwardly the igniter-rod, substantially as and for the purpose specified.

5. In a gas-engine, the combination with the cylinder having gas and air inlets and valves controlling the supply of air and gas therethrough, a spring-actuated exhaust-valve, an engine-operated shaft 18, a governor-shaft operated from said shaft 18, a rotary governor mounted on said governor-shaft and having a sliding movement thereon, and a fulcrumed bar 29 connected with and having its movement controlled by the rise and fall of the governor-base, of cam projections 36^a and 37^a carried on said shaft 18, a fulcrumed bar 49 having its head supported in front of the exhaust-valve stem, said bar-head having an upward extension 52, a depending swinging bar 29, the position of which depends upon the location of the governor-base upon its shaft, a fulcrumed bar 39 having a laterally-movable contact-wheel journaled in its outer end portion and a projecting lug 39^a, an arm 42 leading from the bar 29 and embracing the contact-wheel 40, the support of the latter in or out of the path of the cam 36^a being dependent upon the position of the arm 29, substantially as and for the purpose specified.

JOHN O. BROWN.

In presence of—
C. C. SHEPHERD,
P. S. KORSHERER.