(No Model.)

3 Sheets—Sheet 1.

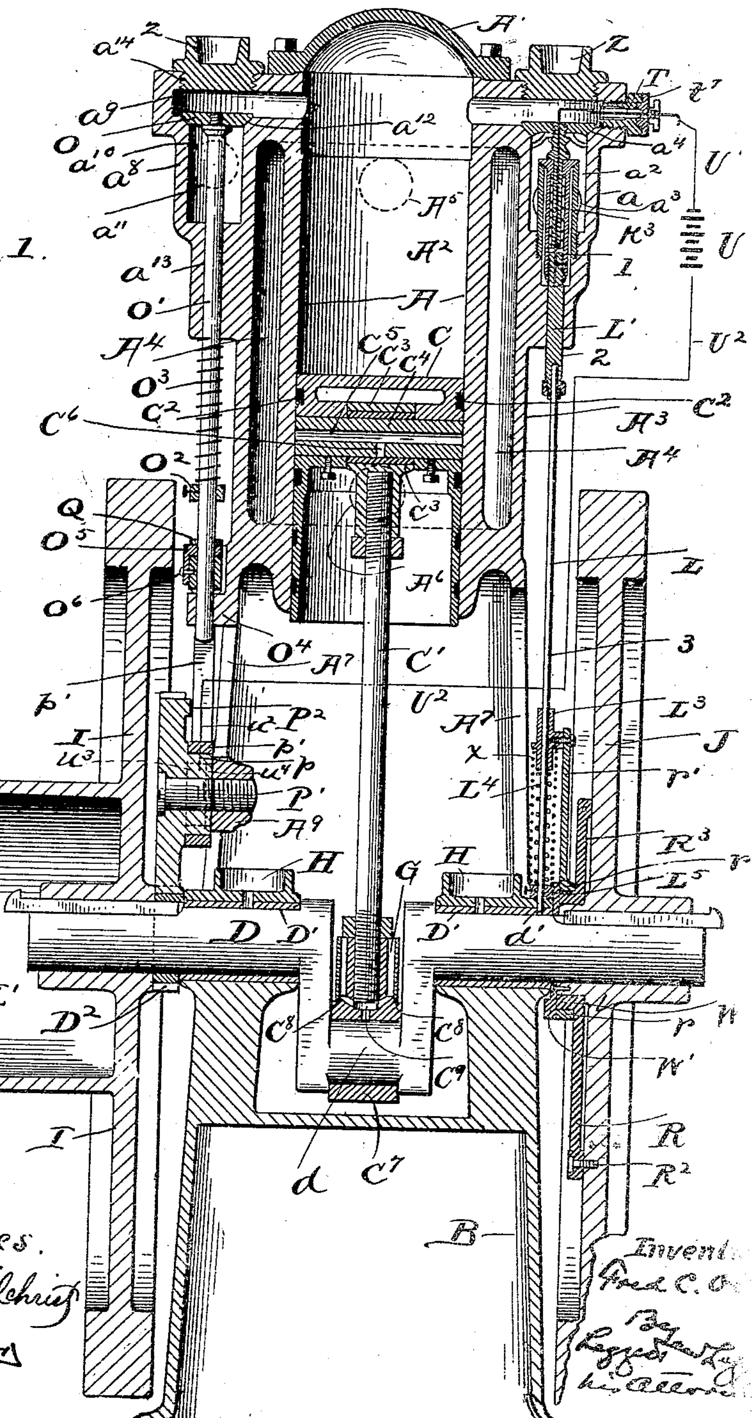
F. C. OLIN.

GAS ENGINE.

No. 569,386.

Patented Oct. 13, 1896.

Fig. 1.



Witnesses.
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his Attor

(No Model.)

3 Sheets—Sheet 2.

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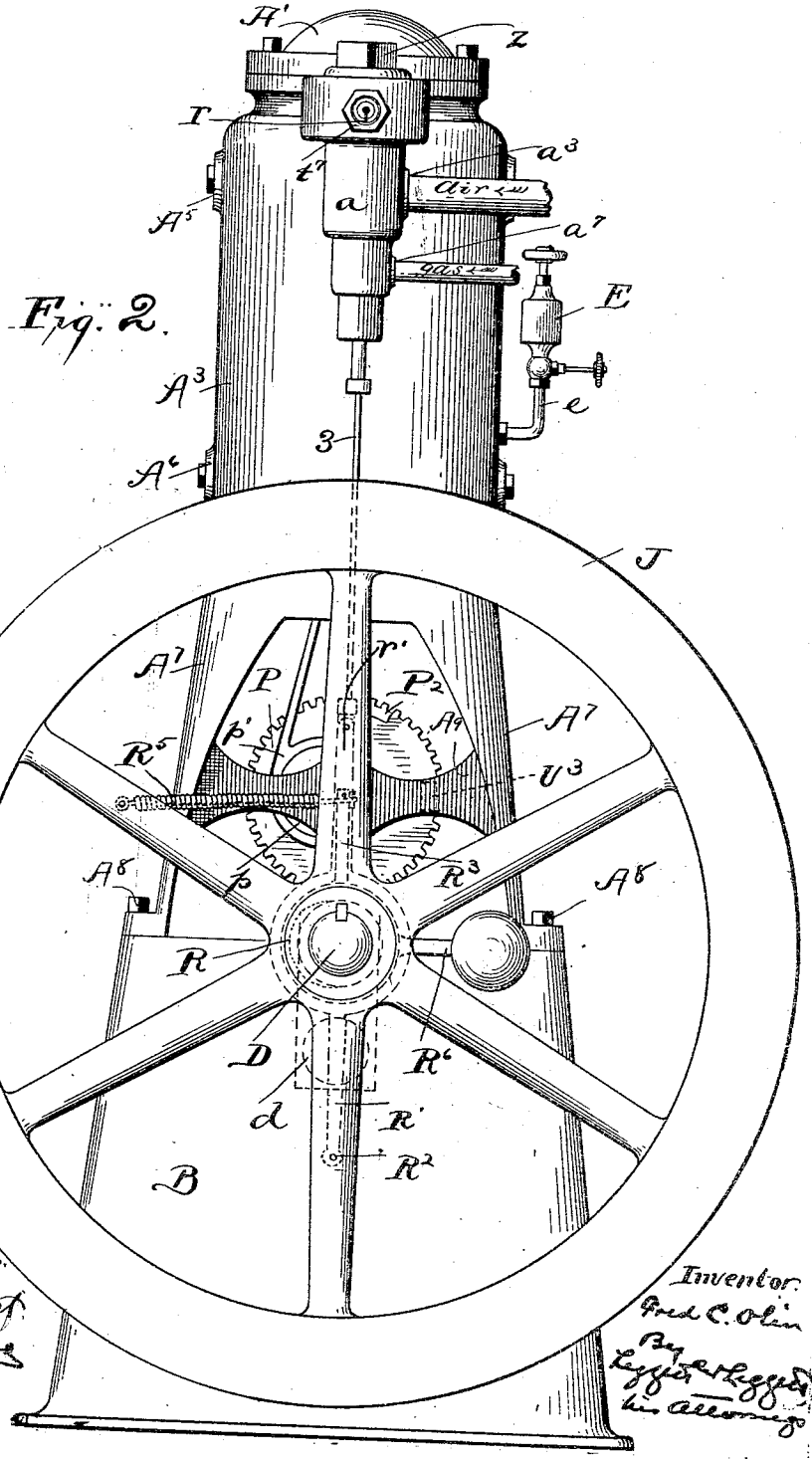
Fig. 2.



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(No Model.)

3 Sheets—Sheet 3.

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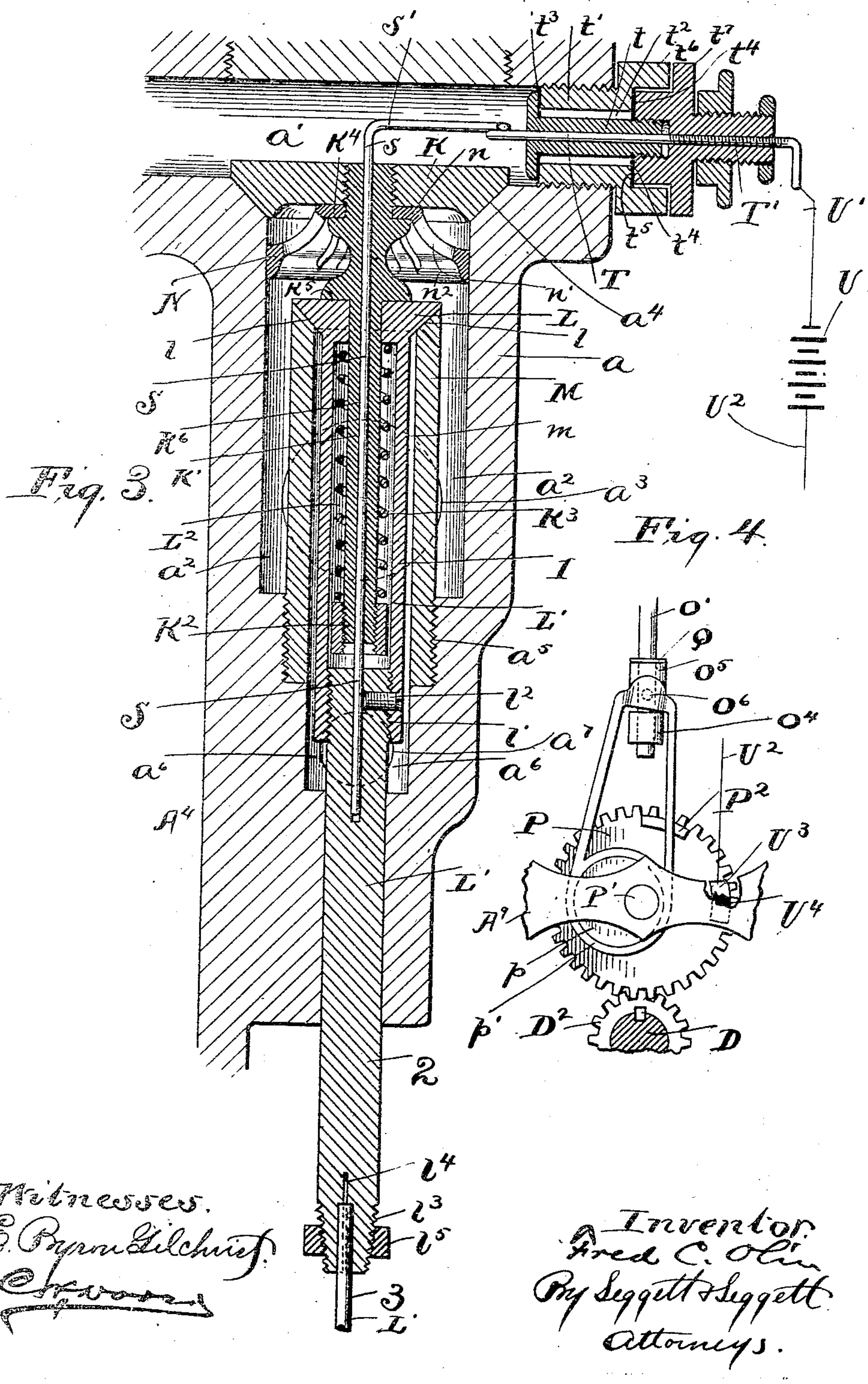

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UNITED STATES PATENT OFFICE.

FRED C. OLIN, OF BUFFALO, NEW YORK.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 569,386, dated October 13, 1896.

Application filed February 11, 1893. Renewed March 13, 1896. Serial No. 583,134. (No model.)

To all whom it may concern:

Be it known that I, FRED C. OLIN, of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in gas-engines, and more especially to that class of gas-engines wherein the expansive force of the gas acts directly upon the piston and through the piston upon the other moving parts, and wherein gas is introduced at one induction-port and atmospheric air at another induction-port to commingle with the gas, and wherein the mixed fluids are ignited or exploded by an electric spark, the resulting combustion or dilatation of the gases furnishing the desired motive power.

My invention consists especially in the means employed for producing the electric spark to explode the gases; in the means employed for governing the speed of the engine; in the means employed for operating the eduction-valve, and in the means employed for lubricating the connection of the piston-rod with the piston and engine-shaft.

My invention also consists in certain features of construction and in combination of parts hereinafter described, and pointed out in the claims, the object being to produce an engine that is not only more economical and simple in construction, but that is more reliable, durable, and efficient than the gas-engines heretofore devised.

In the accompanying drawings, Figure 1 is a central vertical section of an engine embodying my invention. Fig. 2 is a right-hand side elevation relative to Fig. 1. Fig. 3 is an enlarged central vertical section of a portion of the means employed for igniting the gases and of the valve mechanism for controlling the supply of air and gas to the engine. Fig. 4 is a side elevation of a portion of the means employed for opening the eduction-valve.

Referring to the drawings, A represents the upright hollow cylinder that is closed at its upper end by means of a cap A', bolted to said end of the cylinder. The cylinder is open at its lower end. The cylinder is jacketed, as at A^2, the annular chamber A^3, between the jacket and casing of the cylinder, being filled with water for the purpose of maintaining the cylinder in a comparatively cool condition, the ports or ducts for supplying the jacket and draining the same being shown in dotted lines at A^5 A^6, respectively, Fig. 1. The jacket is preferably cast integral with the cylinder, and said casting at its lower end below the cylinder terminates in legs A^7, securely bolted, as at A^8, to the supporting-base B of the engine.

C represents the piston that is adapted to reciprocate endwise of chamber A^4 of the cylinder, the piston-rod C' being suitably secured to the piston and being operatively connected, in any suitable manner, with the crank d of the main or driving shaft D of the engine. The piston is kept lubricated in any suitable manner, but preferably by means of an oil-cup E, located outside of the jacket and cylinder and communicating, by means of a pipe e, with the lower portion of the chamber of the cylinder. The piston is preferably of the trunk variety, and the external periphery of the trunk is provided at suitable intervals with circumferential grooves or recesses C^2, adapted to receive and distribute the lubricant, thereby keeping the piston at all times and at all parts amply lubricated.

The piston-rod is connected with the trunk of the piston preferably as shown in Fig. 1, wherein the upper end of said rod terminates in an eye or sleeve C^3, that easily embraces around transverse pin or member C^4, suitably supported within the trunk of the piston, member C^4 being centrally and longitudinally perforated, as at C^5, for the reception of lubricant from the exterior of the piston. Passage-way C^5, by means of a lateral orifice or perforation C^6 in member C^4, communicates with the bearing at the upper end of the piston-rod, thereby keeping said bearing well lubricated. Some of the lubricant fed to said bearing will, however, find an exit at the end of eye or sleeve C^3 of the piston-rod and trickle or flow down said rod. I therefore provide suitable means for catching or receiving the lubricant that thus trickles or flows down the piston-rod, and utilize said lubricant for the

lubrication of the connection of the piston-rod with the crank of the engine-shaft. A preferable construction is shown in Fig. 1, wherein the lower end of the piston-rod terminates in a sleeve C^7, that easily embraces the central or horizontal portion of the crank of the engine-shaft. Sleeve C^7 at the top is provided with an external annular shoulder C^8, that supports an upright cup or receptacle G, through which the piston-rod extends. Said cup or receptacle is in open relation, by means of one or more passage-ways C^9, with the bearing of sleeve C^7, and hence by the construction just described it will be observed that any lubricant trickling or flowing down the piston-rod is caught by cup or receptacle G and is thence fed through passage way or ways C^9 to the bearing of the connection of the piston-rod with the crank of the engine-shaft.

I would here remark that I reserve the matter disclosed in the preceding paragraph for the subject-matter of a separate application for Letters Patent.

Engine-shaft D has suitable bearing in the supporting-base of the machine and is lubricated in any suitable manner, but preferably, as shown in Fig. 1, from oil-cups H, suitably supported and provided one at either end of crank *d*. The engine-shaft is preferably provided with two fly-wheels I and J, one at each end of the shaft, said fly-wheels being operatively mounted upon the shaft in any suitable manner and the one fly-wheel I being provided with the pulley I', by which the motive power is applied.

Referring next to the means employed for supplying air and gas to the cylinder and for governing the speed of the engine, the cylinder and inclosing jacket at one side and at its upper end is laterally enlarged, as at *a*, and is provided with a lateral duct *a'*, that extends through said lateral enlargement of the casing and is closed at its outer end, as will hereinafter appear. Casing *a* is provided with a vertical or upright chamber a^2, that is in open relation with the air-induction port or opening a^3. (Shown more clearly in Fig. 3.)

Chamber a^2 is adapted to communicate with duct *a'*, and the casing of said chamber at its upper end is provided with a seat a^4 for a valve K, that is adapted to establish and close communication between chamber a^2 and duct *a'*. The stem K' of said valve (see Fig. 3) extends downwardly and centrally through a valve L, that is seated, as at *l*, at the upper end of a tubular casing M, that is located centrally of chamber a^2 a suitable distance below valve K and externally screw-threaded at its lower end and screwed into a correspondingly-threaded bore a^5 in casing *a*. Chamber *m* of casing M is in open relation at its lower end with a chamber a^6 in casing *a*, and chamber a^6 is in open relation with the gas-induction port or opening a^7. It will thus be observed that valve L is adapted to open and close communication between gas-receiving chamber *m* and chamber a^2 and that the air and gas commingle in said last-mentioned chamber. The stem L' of valve L extends downwardly through gas-receiving chamber *m* and is preferably made in three sections, as will hereinafter more fully appear, the upper section of the stem 1 being tubular, as shown, screw-threaded internally at its lower end, as at l', and screwed onto the correspondingly externally-threaded upper end of the section of valve-stem next below, and also preferably secured thereto by means of a screw l^2. The stem of valve K extends downwardly centrally through chamber L^2 in the upper section of the stem of the valve L and terminates in the lower portion of said chamber. The lower end of valve-stem K' is externally screw-threaded and has mounted thereon a nut K^2, between which and the top wall of chamber L^2 is located a coil-spring K^3, confined upon the valve-stem. Spring K^3 acts in the direction to retain valves K and L in their proper relative position. N represents a guide for valve-stem K, said guide being located preferably as shown, next below valve K. The stem of valve K is provided with external annular shoulders K^4 K^5, the one shoulder, K^4, abutting the under side of guide N, and the other shoulder, K^5, resting upon the top of valve L when valve K is closed

By the construction herein before described it will be observed that the actuation of valve L will necessarily accompany the actuation of valve K, except when valve L is mechanically held to its seat, as will hereinafter appear. Guide N is preferably of the construction shown, the same comprising an annular rim *n*, resting upon shoulder K^4 of the stem of valve K, and arms *n'*, declining downwardly and outwardly from said rim and connected at their lower and outer end by a rim n^2, that engages the surrounding wall of chamber a^2. By means of this construction it is obvious that the upward currents of air and gas, upon opening valves K and L, will strike arms *n'* of said guide N and be thereby directed in different directions, resulting in a more thoroughly commingling of the air and gas.

The central member 2 of valve-stem L', that is rigidly secured to the upper tubular member of said stem at its lower end, terminates, preferably, in a downwardly-tapering externally-screw-threaded hollow portion l^3, slitted longitudinally, as at l^4, and having mounted thereon a nut l^5, that securely clamps portion l^3 upon the upper end of the lower section 3 of the valve-stem, section 3 extending into section 2, as shown. The lower section 3 (see Fig. 1) of said valve-stem extends downwardly along the side of the engine into a corresponding hole *d'* in the adjacent box or bearing D' of the engine-shaft.

Referring now to the eduction side of the engine, (see Fig. 1,) the cylinder opposite to the location of the air and gas induction valve casing is laterally enlarged, as at a^8, and pro-

vided with a lateral duct or passage-way a^9, that is in open relation with the chamber of the cylinder and is adapted to communicate with an upright chamber a^{10} within casing a^8, said chamber a^{10} being in open relation with eduction port or pipe a^{11}. Casing a^8, at the upper end of chamber a^{10}, is provided with a seat a^{12} for a valve O, that is adapted to open and close communication between duct or passage-way a^9 and chamber a^{10}. The valve-stem O′ of valve O extends downwardly through chamber a^{10} and through a corresponding perforation a^{13} in casing a^8. Upon valve-stem O′, a suitable distance below casing a^5, is rigidly mounted a collar O^2, between which and the adjacent end of casing a^8 the valve-stem has confined upon it a coil-spring O^3, that acts in the direction to retain valve O in its seat. Valve-stem O′ at its lower end extends loosely through a guide O^4, rigid with the adjacent supporting leg or member of the cylinder, and above said guide has slidably mounted thereon a sleeve O^5, to which is pivotally secured, as at O^6, the arm of eccentric-strap p', that embraces eccentric p, rigid and preferably integral, as shown, with a spur-gear P, that is pivoted, as at P′, to any suitable support, such, for instance, as a transverse member or brace A^9 of supporting legs or members A^7, and meshes with a pinion D^2, operatively mounted upon the engine-shaft.

By the construction just described it will be observed that sleeve O^5 is elevated during each rotation of eccentric p against rigid collar O^2, thereby and thereupon elevating the valve-stem and lifting valve O off its seat. A cushion Q, of leather, rubber, or any suitable material, embraces the valve-stem below collar O^2, so that no appreciable noise is occasioned by the actuation of sleeve O^5 against said collar.

A cycle of the engine involves four complete strokes of the piston. The piston being at the extreme of its upstroke at the commencement of a cycle, (both induction-valves and eduction-valve being closed,) upon the succeeding down or drawing stroke of the piston a partial or practical vacuum is created in the cylinder above the piston, creating a suction that will lift the induction-valves K and L off their seats and cause the mixed air and gas to flow into the cylinder, (the eduction-valve O being meanwhile held to its seat by spring O^3.) The next succeeding upstroke of the piston (second piston-stroke in the cycle) will compress the mixed charge above the piston, whereupon by an electric spark, produced as hereinafter described, the mixed air and gases are ignited, resulting in the combustion or dilatation of the gases and in an expansive force directly upon the piston. Just at the time the piston commences the second upstroke or fourth stroke of the cycle, upon the completion of the second downward stroke or third stroke of the cycle that immediately follows the explosion of the charge, eduction-valve O, by the mechanism hereinbefore described and operatively connected with the engine-shaft, is opened, so that the exploded or dilated gases are discharged during the fourth or last piston-stroke of the cycle, the mechanism for opening the eduction-valve being so timed that it will perform its function at the proper time.

The eduction-valve being required to open but once with every other rotation of the engine-shaft, it follows that the diameter of gear P of said eduction-valve-actuating mechanism is twice that of the driving-pinion.

The simplicity and efficiency of the mechanism employed for opening the eduction-valve is quite apparent.

The speed of the engine is controlled or governed by partially or entirely cutting off the supply of gas. Valve L, that opens and closes communication between gas-receiving chamber m and air receiving and mixing chamber a^2, is adapted to be held closed or partially closed against any suction created in the surrounding chamber by mechanism operatively connected with the engine-shaft. A preferable construction of said governing mechanism comprises an eccentric R, (see Figs. 1 and 2,) loosely mounted upon the hub of fly-wheel J. Said eccentric is provided with a laterally-extending arm R′, pivoted at its outer end, as at R^2, to one of the spokes or arms of the fly-wheel, preferably diametrically opposite arm R′. Said eccentric has a laterally-extending arm R^3, to which is attached a spring R^5, the other end whereof is attached to one of the arms of the fly-wheel. Said spring acts in the direction to retain the eccentric in its normal position, the eccentric having a laterally-extending weighted arm R^6 rigid therewith. An eccentric-strap r embraces eccentric R and has an upwardly-extending arm r', pivotally secured at its outer end to a collar L^3, slidably mounted on section 3 of valve-stem L′, a stiff coil-spring L^4 being confined upon said section of the valve-stem between collar L^3 and any rigid member of the stem below, such, for instance, as a lever L^5, rigidly mounted on the lower end of section 3 of the stem. The arrangement of parts is such that when the speed of the engine-shaft becomes too great or abnormal, weighted arm R^6, by means of the centrifugal force developed in the weight of said arm, will be moved to shift the eccentric in the direction to move arm r' of the eccentric-strap to depress or hold sliding collar L^3, acting upon spring L^4, that in turn acts upon the stem of valve L, causing said valve to be held closed or partially closed, notwithstanding any suction created in the chamber surrounding the valve, thereby reducing or cutting off the supply of gas until the engine-shaft has again attained its normal speed, when the parts will automatically return to their normal position,

and valve L will be released subject to the action of the suction intermittently created in the chamber surrounding the valve.

Referring lastly to the means employed for producing the electric spark to ignite the compressed charge above the piston, it will be observed that the stem of valve K (see Fig. 3) is perforated longitudinally, as at K^6, and a wire or rod S extends through said perforation and is bent laterally at its upper extremity, as at S', a suitable distance above valve K. Said wire or rod at its lower end extends into a corresponding hole in the central section of stem of valve L and is secured to said stem by means of screw l^8. The laterally-bent portion S' of said wire or rod, in the normal position of the same, rests and bears upon the inner end of a wire or rod T, that extends centrally through a screw t into duct a'. Screw t extends centrally through a sleeve or annular plug t', that is screwed into the correspondingly-threaded outer end of duct or passage-way a'. The external diameter of sleeve t' is such, relative to the diameter of screw t, as to form an annular chamber t^2 between said members. Screw t is securely held in place by means of a disk of insulating material t^3, interposed between the inner end of sleeve t' and the head of screw t, and by means of a disk t^4 of insulating material abutting annular shoulder t^5, formed by the annular head t^6, in which the outer end of said sleeve terminates. Insulating-disk t^3 nicely fits the internal periphery of said head and is securely held in place against shoulder t^5 by means of a nut t^7, screwed onto the shank of screw t, nut t^7 being of such size that when secured in place it shall not make contact with the head of sleeve or plug t', but shall be sufficiently separated from the same to be electrically insulated therefrom. Wire or rod T extends centrally through said nut, and in order that said wire or member shall be rigidly held in place it is preferably screw-threaded where it extends through the nut, as at T', and engages a correspondingly-threaded perforation in said nut. Wire or rod T is thus electrically insulated from the engine, and said wire or rod at or near its outer end is electrically connected, by means of wire U', (see Figs. 1 and 3,) with the one terminal of a battery U. The other terminal of said battery is electrically connected, by means of a wire U^2, with a contact U^3, secured to (see also Fig. 4) but insulated from, as at U^4, the supporting member of gear P of the mechanism for opening the eduction-valve, and adapted to be engaged at the proper time by a revolving contact operatively connected with the engine-shaft and electrically connected with the engine, such, for instance, as a lug or projection P^2, integral with gear P, and thereby complete the electric circuit, the complete circuit being from the battery through wire U^2 to stationary contact U^3, thence through revolving contact P^2, through the engine to wire or rod S, and thence through insulated wire or rod T and wire U' to the other terminal of the battery.

Operatively mounted upon the engine-shaft, preferably next inside of the hub of fly-wheel J, is a cam disk or wheel W, the cam or projection W' whereof is adapted to engage and actuate lever L^5 and thereby turn valve-stem L', to which wire or rod S, as already indicated, is rigidly secured, resulting in the disconnection of members S and T, causing a break in the electric circuit in case the circuit was complete and resulting in the production of an electric spark and in the ignition of the compressed charge of air and gases within the cylinder. By the construction shown members S and T will of course be disconnected with each rotation of the engine-shaft, but the electric circuit, it will be observed, is only completed once in a cycle of the engine, and the arrangement of parts is such that the circuit is closed immediately upon the compression of the charge within the cylinder and just before member S is electrically disconnected from member T. The explosion of the mixed air and gases having been effected, lever L^5, and consequently valve-stem L' and wire or rod S, are turned back to their normal position by the action of a coil-spring X, confined upon said stem between and secured at opposite ends to sliding collar L^8 and said lever, said spring being put under tension upon the actuation of lever L^5 by cam or cam-wheel W.

Wire or rod S, bearing, when the electric circuit is complete, upon insulated wire or rod T, as already indicated, it follows that member S will be electrically disconnected from member T with a snap, which not only insures the production of an effective spark, but maintains the rubbing-surfaces of said contact devices clean and polished.

Revolving contact P^2 is adapted to become electrically disconnected from stationary insulated contact U^3 immediately after the production of the electric spark.

Lateral enlargements a and a^8 of the casing of the engine-cylinder and inclosing jacket at the top are each provided with a vertical threaded bore a^{14}, closed by a correspondingly-threaded plug Z. By removing said plugs access is had to the valve mechanism, &c., below. I would also remark that by the peculiar connection of sections 2 and 3 of valve-stem L', hereinbefore described, the adjustment of valve L is readily and conveniently effected.

What I claim is—

1. In a gas-engine, the combination with the cylinder, two valve-casings rigid with each other and located the one within the other, a duct or passage-way adapted to open communication between the chamber of the outer-valve casing and the chamber of the cylinder, an air-induction port or passage-way opening into the chamber of the outer-valve casing, a gas-induction port or passage-way opening into the chamber of the inner-valve casing,

of a valve for opening and closing communication between the chamber of the outer-valve casing and chamber of the cylinder and a valve for opening and closing communication between the chambers of the two valve-casings, the valve of the outer-valve casing having a stem extending downwardly through the inner valve, a nut or rigid member on the lower end of said valve-stem, a coil-spring mounted on the stem between said rigid member and the inner valve, and a shoulder on said valve-stem adapted to abut the top of the inner valve when the outer valve is closed, substantially as set forth.

2. In a gas-engine, the combination with the cylinder, two valve-casings rigid with each other and located the one within the other, a duct or passage-way adapted to open communication between the chamber of the outer-valve casing and the chamber of the cylinder, an air-induction port or passage-way opening into the chamber of the outer-valve casing, a gas-induction port or passage-way opening into the chamber of the inner-valve casing, of a valve for opening and closing communication between the chamber of the outer-valve casing and chamber of the cylinder, and a valve for opening and closing communication between the chambers of the two valve-casings, the outer or upper valve having a downwardly-extending stem suitably connected with the lower or inner valve, a guide for said stem within the chamber of the outer-valve casing, a shoulder on the stem for supporting said guide, said guide comprising downwardly and outwardly inclined arms connected at their lower and outer ends by a rim engaging the surrounding wall of the chamber of the valve-casing, substantially as set forth.

3. In a gas-engine, the combination with the gas-induction valve, and engine-shaft, of a rotating member operatively mounted on said shaft, an eccentric loose upon the shaft and having an arm pivoted to said rotating member, a weighted arm rigid with and extending laterally of the eccentric, a spring acting in the direction to retain the eccentric in its normal position and suitable mechanism operatively connecting the aforesaid valve with the eccentric and adapted to hold the valve closed or partially closed, the arrangement of parts being such that when the speed of the engine-shaft becomes too great or abnormal the centrifugal force developed in the aforesaid weight shall shift the eccentric against the action of the aforesaid spring, and cause the aforesaid valve-holding mechanism to perform its function, substantially as set forth.

4. In a gas-engine, the combination with the cylinder, valve-casing rigid with the cylinder, gas-induction port or passage-way opening into the chamber of said valve-casing, said chamber being adapted to communicate with the chamber of the cylinder, and a valve for opening and closing said communication, said valve being adapted to be opened by the suction created by a vacuum or partial vacuum in the cylinder, and having a stem extending outwardly through the valve-casing, of the engine-shaft, a fly-wheel operatively mounted on said shaft, an eccentric loosely embracing the engine-shaft or hub of the fly-wheel, and having a laterally-extending arm pivoted to one of the spokes or arms of the fly-wheel, a weighted arm rigid with and extending laterally of the eccentric, a spring acting to retain the eccentric in a concentric position, an eccentric-strap embracing the eccentric and connected with the aforesaid valve-stem in such a manner, and the arrangement of parts being such, that when the speed of the engine-shaft becomes abnormal or too great said valve shall positively be held closed or partially closed until normal speed of the shaft is again attained, substantially as set forth.

5. In a gas-engine, the combination with an upright cylinder a valve-casing rigid with said cylinder, a gas-induction port or passage-way opening into the chamber of said valve-casing, said chamber being adapted to communicate with the chamber of the cylinder, and a valve for opening and closing said communication, said valve being adapted to be opened by suction created by a vacuum or partial vacuum in the cylinder, and having a stem extending downwardly through the valve-casing, of the engine-shaft, a fly-wheel operatively mounted on said shaft, an eccentric mounted on the hub of said wheel and having a laterally-extending arm pivoted to one of the spokes or arms of the fly-wheel, a weighted arm rigid with and extending laterally of the eccentric, a spring acting to retain the eccentric in its normal position, an eccentric-strap embracing the eccentric and connected with the aforesaid valve-stem in such a manner and the arrangement of parts being such that when the speed of the engine-shaft becomes abnormal or too great the aforesaid valve shall be positively held closed or partially closed until normal speed again obtains, substantially as set forth.

6. In a gas-engine, the combination with the gas-induction valve and valve-casing, the stem of the valve extending outwardly through the valve-casing, a sliding sleeve or collar on said stem, fixed member on the stem outside of said collar and a coil-spring suitably mounted on the stem between said fixed member and sliding member, of the engine-shaft, a fly-wheel operatively mounted on the shaft, an eccentric loosely mounted on the shaft or fly-wheel hub and having a laterally-extending arm pivotally connected with the fly-wheel, a weighted arm rigid with and extending laterally of the eccentric, a spring acting to retain the eccentric in its normal position, an eccentric-strap embracing said eccentric and pivotally connected with the aforesaid sliding member on the valve-stem, the arrangement of parts being substantially as and for the purpose set forth.

7. In a gas-engine, the gas-induction valve

having a stem composed of three sections, the lower section, at its upper end, extending into a corresponding hole in the outer end of the central section and said portion of the central section being tapering outwardly, externally screw-threaded, and engaged by a correspondingly-threaded nut securely clamping said section onto the lower section, substantially as set forth.

8. In a gas-engine, the combination with the cylinder, two valve-casings rigid with the cylinder and located the one within the other, an air-induction port communicating with the chamber of the outer-valve casing, a gas-induction port communicating with the chamber of the inner-valve casing, a valve for opening and closing communication between the chambers of said valve-casings, a duct or passage-way, a', closed at the outer end and adapted to establish open communication between the chamber of the outer-valve casing and the chamber of the cylinder, and a valve for opening and closing said communication, said valves being suitably connected with each other and adapted to be opened by suction created by a vacuum or partial vacuum formed within the cylinder, of an insulated conducting piece or member extending into said duct and supported by but insulated from the engine, and electrically connected or adapted to be electrically connected with the one terminal of an electric battery, a non-insulated conducting-piece electrically connected with the engine, extending into the aforesaid duct, terminating, within said duct, in a laterally-extending member adapted to bear upon the inner end of the aforesaid insulated conducting-piece, and being rigidly secured to the stem of one of the aforesaid valves, the engine forming part or being adapted to form a part of the electric circuit, suitable means for actuating said valve-stem to cause the non-insulated conducting-piece to become electrically disconnected from the insulated conducting-piece, engine-shaft and suitable means operatively connected with said shaft for turning said stem in the one direction and suitable means for turning said stem in the opposite direction, the parts being arranged substantially as and for the purpose set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 22d day of December, 1892.

FRED C. OLIN.

Witnesses:
E. W. BARTHOLOMEW,
A. G. BARTHOLOMEW.