E. S. BOWEN.

SPARKING MECHANISM FOR GAS ENGINES.

APPLICATION FILED FEB. 4, 1907.

930,345. Patented Aug. 10, 1909.

2 SHEETS—SHEET 1.

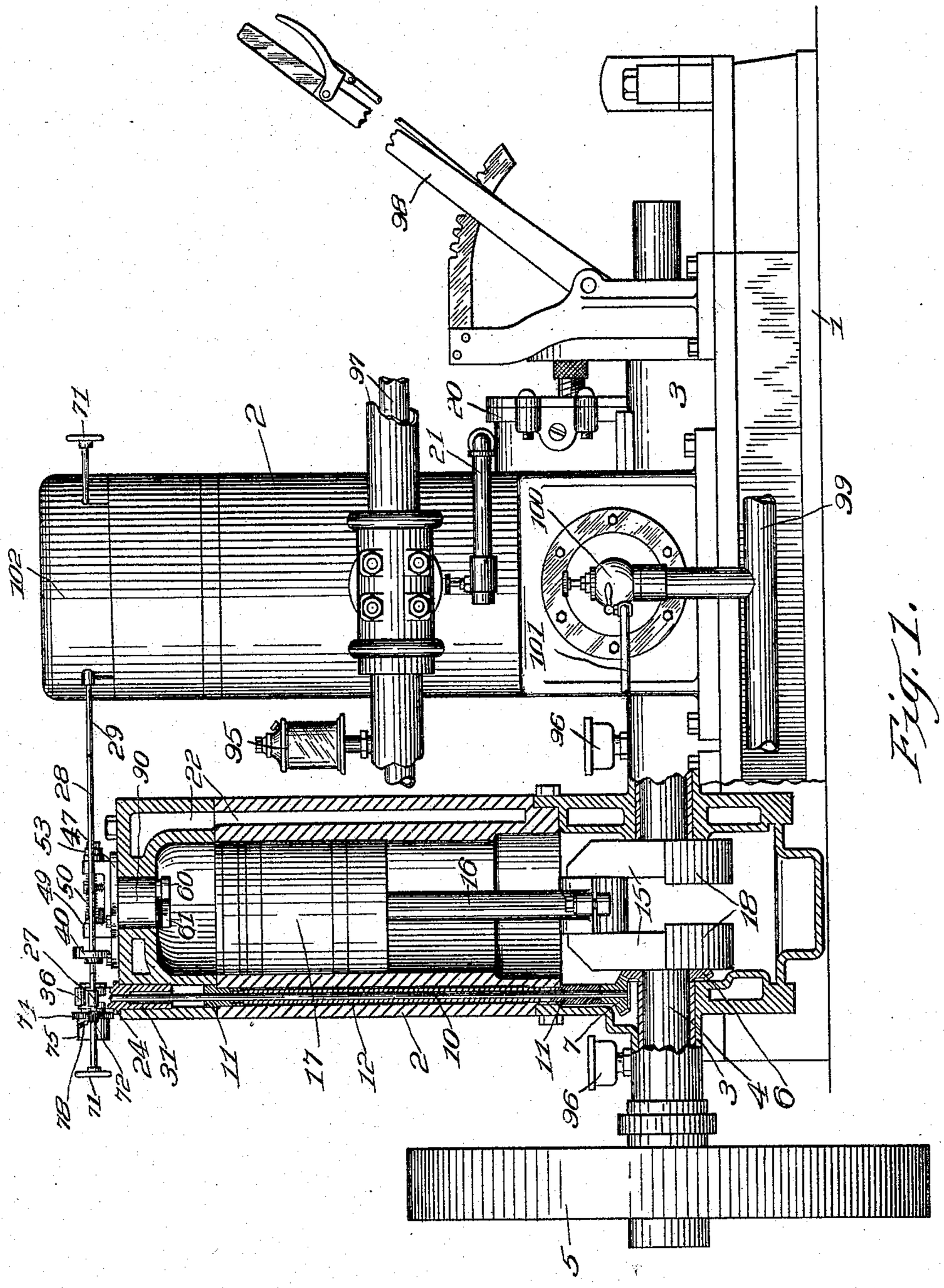

Fig. 1.

Witnesses
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2 SHEETS—SHEET 2.

Fig. 2.

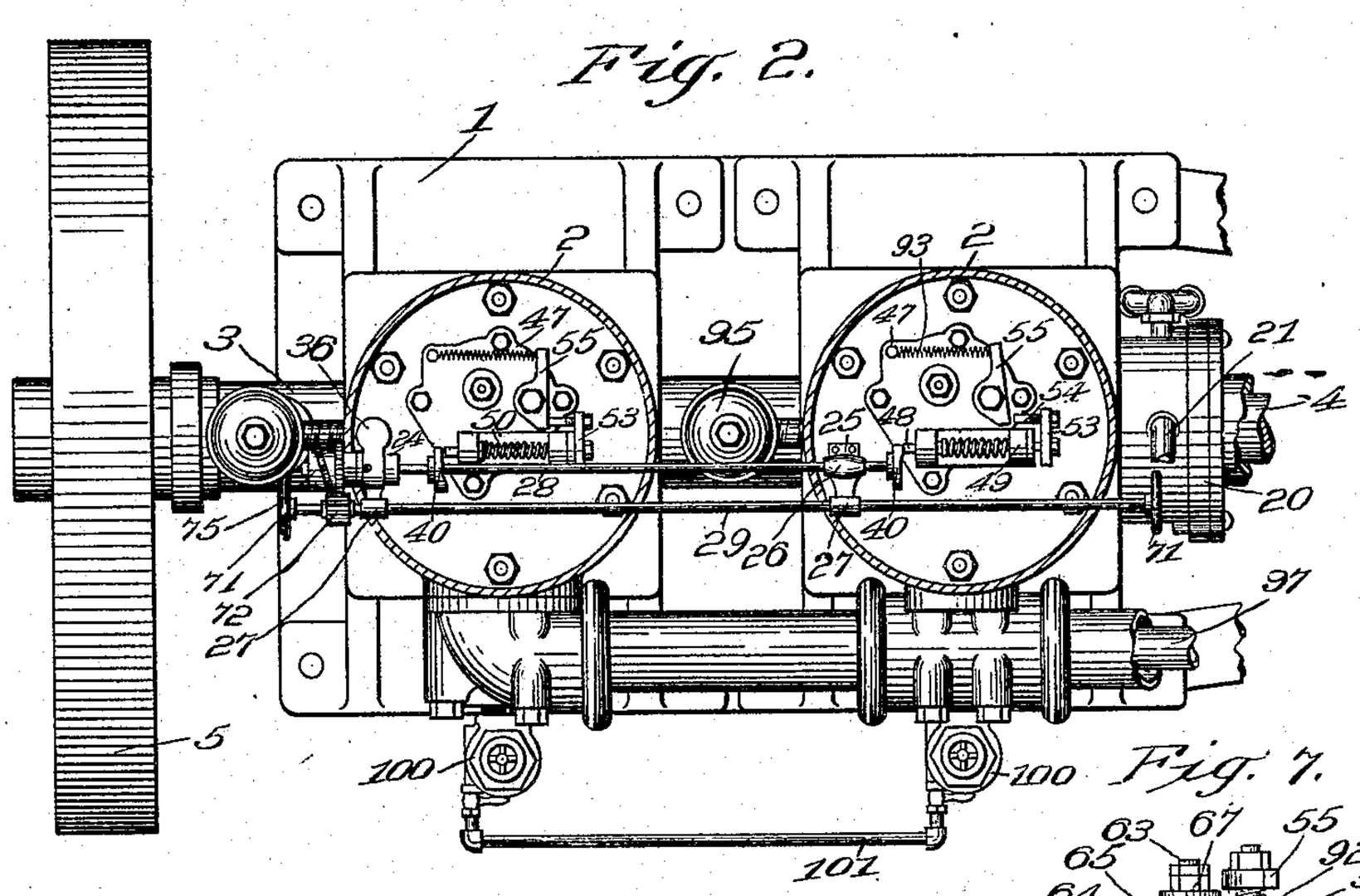


Fig. 7.

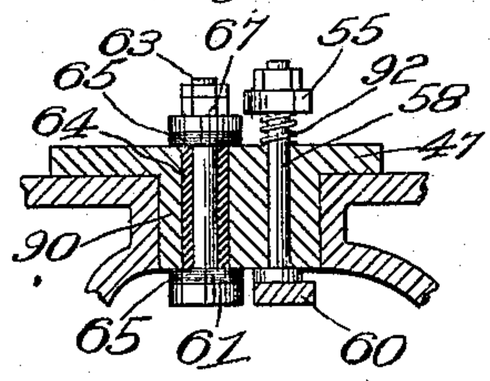


Fig. 10.

Fig. 5.

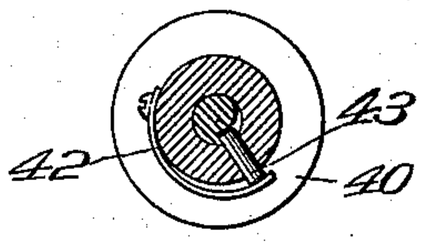


Fig. 4.

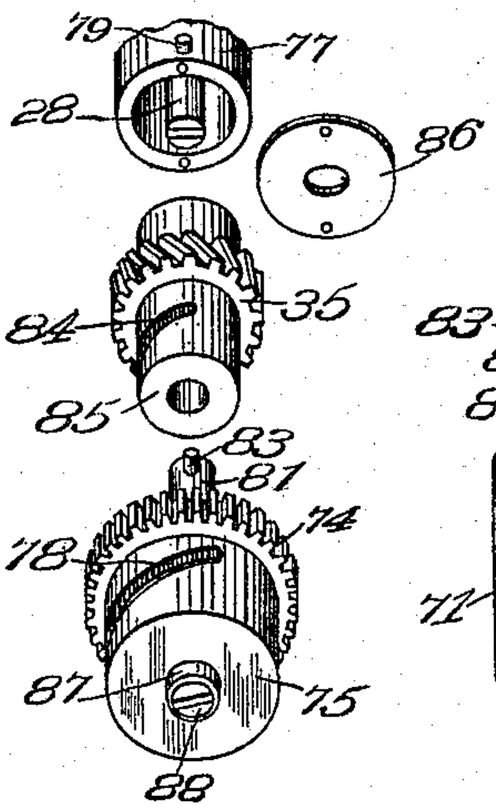


Fig. 3.

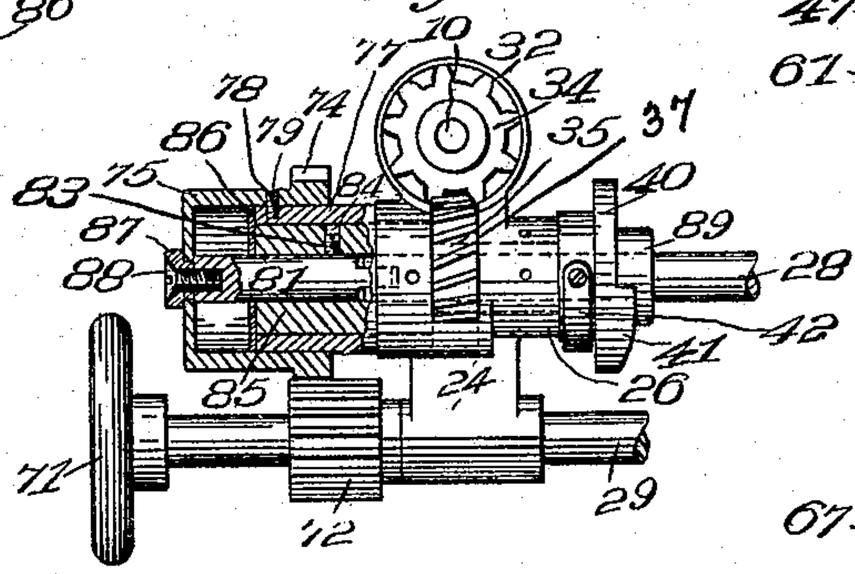


Fig. 8.

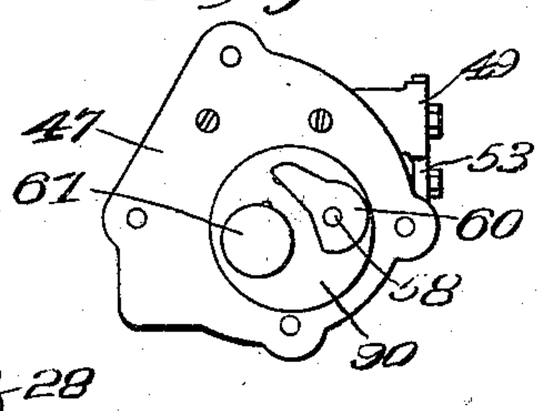


Fig. 9.

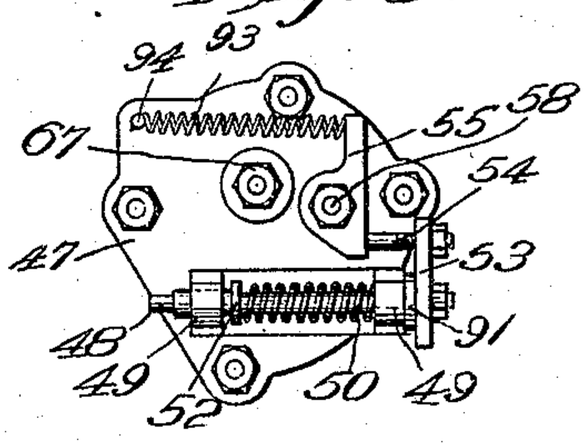
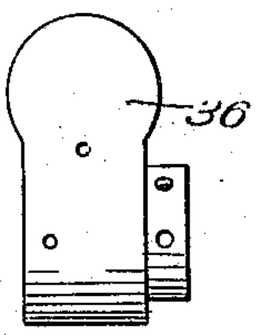


Fig. 6.



Witnesses

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H. C. Smith

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By his Attorney

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UNITED STATES PATENT OFFICE.

ERNEST SPENCER BOWEN, OF GENEVA, NEW YORK, ASSIGNOR OF ONE-HALF TO WALTER LESTER FAY, OF GENEVA, NEW YORK.

SPARKING MECHANISM FOR GAS-ENGINES.

No. 930,345. Specification of Letters Patent. Patented Aug. 10, 1909.

Application filed February 4, 1907. Serial No. 355,642.

To all whom it may concern:

Be it known that I, ERNEST S. BOWEN, a citizen of the United States, residing at Geneva, in the county of Ontario and State of New York, have invented new and useful Improvements in Sparking Mechanism for Gas-Engines, of which the following is a specification.

My invention relates to explosive vapor engines and consists of a new electric sparking mechanism and controlling mechanism therefor, whereby the parts are easily adjusted to control the time of the spark and the speed.

The invention also relates to certain details of construction, whereby a simple, compact, safe and reliable engine is produced.

My invention is fully illustrated in the drawing herein in which the reference numerals of the description indicate the same parts in all the figures.

Figure 1 is a side view of the two cylinder engine made according to my invention in which one cylinder is shown in elevation and one in section. Fig. 2 is a top plan. Fig. 3 is a partial, enlarged horizontal section of the controlling mechanism. Fig. 4 is a perspective view of certain detached parts. Fig. 5 shows the means for connecting the cams and cam-wheels to their shaft. Fig. 6 is a plan of a protective cap for some of the parts. Figs. 7, 8 and 9 are respectively an enlarged section, bottom plan and top plan of the igniter plug and parts thereon. Fig. 10 is a section showing in detail one of the contacts.

In the figures, 1 indicates the engine base, suitable for construction, to which are bolted the cylinders 2. In suitable bearings 3 in the crank case is arranged the crank-shaft 4, carrying the fly-wheel 5 and the beveled pinion 6, meshing with a similar pinion 7 on the igniter shaft 10, fitted to bearings 11 11, and entirely inclosed and protected in tube 12 in the side of the cylinder.

15 is the crank connected by pitman 16 to the piston-head 17 and provided with counter weights 18.

20 is a rotary pump of suitable construction, geared to the shaft, to force water through pipe 21 to the water spaces 22 entirely surrounding the cylinders and cylinder-heads.

On top of the cylinder heads are bolted the castings or supporting parts, 24 25 provided with horizontal bearings 26 and 27 for the cam-shaft 28 and the adjusting-shaft 29, arranged parallel. The casting 24, as shown, is provided with a tubular shank 31 fitting the cylinder head, and with a cup 32 to receive a spiral gear 34, on the upper end of the igniter shaft meshing with a similar spiral gear 35 fastened to sleeve 85 by key, said gear 35 being arranged in the cross groove 37 of the casting 24. 36 is a detachable cap bolted to the casting 24 to cover and protect said spiral gears.

To the cam-shaft 28 are fitted the cam-wheels 40, carrying the cams 41, and connected to be rotated by the cam-shaft by ratchet-pins 43 engaging with a cut-out, or ratchet tooth, on the cam-shaft. These pins are held in contact by springs 42, as shown in Fig. 5, whereby the cam-wheels are operated by their shaft, when it is turned in forward direction to separate the terminals, causing the spark. But in case of accidental backward turn of the cam shaft the ratchet-pin 43 slips over the ratchet-tooth, without rotating the cam or injuring the parts.

The terminals, arranged within the cylinder-head, and the parts immediately connected to and operating them, are carried on a plug-plate 47 having a boss 90 fitted to a hole in the cylinder-head. The plug-plate is bolted on the cylinder-head, and the terminals and all parts carried thereon may be removed as a single piece to clean or renew the terminals, or other parts, etc. or to examine the interior of the cylinder. The rotating-cams 41, each engages with a plunger 48 in bearings 49 on the plug-plate; this plunger is held in position by suitable spring 50, arranged between one of said bearings 49 and a collar 52 on the plunger. To the opposite end of the plunger is fitted the cross-piece 53, carrying the hammer 54, adjusted to strike the igniter arm 55, when the cam slips past the plunger, and thereby first to permit the terminals to make contact, and then to separate the terminals with an instantaneous break. This igniter arm is fitted on the outer end of pin 58, which is journaled in the plug-plate 47 and carries on its inner end, the moving terminal, or contact, 60, normally out of contact with the fixed terminal 61, on the inner end of contact-pin 63. This contact-pin 63 is suitably insulated by insulating bushing 64 and washers 65 and

is secured in the plug-plate by nut 67 so that it can be slightly rotated to shift its position for adjustment. One wire is connected to this nut and pin 63, and the other wire to the cylinder at some convenient point. The moving terminal 60 is fitted to boss 90 on the under side by a ground joint, and is held against the boss by spring 92 so that compression, or gases, from the cylinder cannot leak past the pin 58.

I have provided means for adjusting the length of time the terminals are in contact, which has two important advantages; first, the amount of electric current consumed is reduced to a minimum; second, the volume of the igniting spark can be adjusted to be equal for all speeds of the engine. When the hammer 54 strikes the igniter arm 55, the terminals are separated, breaking the electric current instantaneously, and they are held apart by the plunger spring 50 until released, and permitted again to make contact by the cam 41 on its next revolution, forcing the plunger outward. The moving terminal 60 is held in contact with the fixed terminal 61 by the spring 93, one end of which is attached to stud 94 and the other end to arm 55. Spring 50 is stronger than spring 93. A leather deadening washer 91 is used between the arm 53 and the bearing 49, to reduce the noise to a minimum. The hammer 54 can be adjusted in or out of cross-piece 53 by a thread and nut as shown. By adjusting hammer 54 toward the igniter arm 55, the length of time the terminals are in contact is decreased; by moving it away from the arm 55, the length of time the terminals are in contact is increased.

To shift the position of the cams and the time of the spark, I have provided a mechanism operated by the adjusting-shaft 29, which is an important part of my invention and is particularly adapted for use with engines having any desired number of cylinders, one or more. By this mechanism, the cams whether one or several, are all adjusted simultaneously and positively and with great accuracy and delicacy. This adjusting-shaft 29 has one or more hand wheels, or thumb-pieces, 71, and carries a gear 72 meshing with a (preferably) larger gear 74 on the cap 75, fitted to turn on head 77 of the casting 24. This cap 75 is provided with a cam-slot 78 engaging with the fixed-pin 79 on the head 77, whereby it occurs that when the adjusting-shaft is rotated to rotate the cap, the cap is forced to move longitudinally in or out, on the head 77. To the cap 75 is secured the short-shaft 81, by screw 88 and shaft-cap 87. This shaft-cap is a running fit in cap 75, so that it can rotate without rotating cap 75, but both will move together longitudinally. The short-shaft 81 is connected to the cam-shaft 28, by a tongue and slot so they rotate together, but the short-shaft can move longitudinally and independently of the cam-shaft a short distance. The short-shaft carries a stud 83, fitting in a spiral slot 84 in the sleeve 85. This sleeve 85 fits within the head 77, and around the short-shaft 81, and is prevented from moving longitudinally by the spiral gear 35 which runs in a groove in head 77, and also, if necessary, by a plate 86 secured to the head 77 and engaging with the end of said sleeve. As cap 75, (and consequently short-shaft 81), are moved longitudinally the stud 83 must move in the spiral slot 84, and as sleeve 85 cannot move longitudinally, the short-shaft 81, also the cam-shaft 28 and the cams 41, are forced to turn with reference to the crank, forward if cap 75 is moved in, and back if cap 75 is moved out, thus respectively advancing or retarding the spark, gradually to the desired point with great delicacy and certainty.

To make the initial adjustment the controlling cap 75 is moved to its extreme outward position and the spiral gears 34 35 are set so the spark occurs at the instant the crank passes its upper center. After the engine is under way the cap can be moved forward to any desired point by turning the adjusting shaft; the spark is thus advanced, and occurs before the crank reaches its upper center and the greatest power and speed of the engine is obtained. When it is desired to reduce the speed of the engine, the cap is moved toward the starting position, the spark is retarded and consequently the speed of the engine is reduced.

Whether the engine is running fast or slow a quick spark is obtained by the operation of the spring and momentum of the plunger slipping off the cam.

The gear head carrying the controlling cap, sleeve, short-shaft, also the cam-shaft and bearings, can be removed very easily as can also the plug with the contacts and connected parts without affecting the adjustment. The gear-head, controlling-cap, adjusting-shaft and the gears connecting the adjusting-shaft and controlling cap may preferably be made of bronze.

For convenience in arranging the parts and to operate the cam-shaft at the same speed as the crank-shaft, the beveled pinion 6 may have twice as many teeth as the beveled pinion 7, and spiral-gear 35 twice as many teeth as spiral-gear 34. Said spiral-gears are of the same diameter. This arrangement gears up the vertical igniter shaft from one to two, and then gears down the cam-shaft from two to one.

95 is the oil cup; 96 the grease cups; 97 the water jacketed exhaust pipe; 98 the reversing lever; 99 the air suction pipe to the vaporizers 100; 101 the gasolene pipe and 102 a cap to cover and protect the parts on top of the cylinder-head.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In an adjusting mechanism for the cams of a gas-engine sparking mechanism, the combination with suitable supports for the parts, of a cam-shaft journaled therein, a cam-wheel on said shaft, a cam on the cam-wheel, a short-shaft connected to the cam-shaft but movable longitudinally independently thereof, a sleeve surrounding the short-shaft and having a spiral slot, a stud on the short-shaft engaging with said spiral slot, means to prevent said sleeve moving longitudinally, a fixed pin on the support, a cap having a cam-slot engaging with said pin, said cap and short-shaft being connected to move together longitudinally but to rotate independently, and means to rotate the cap.

2. In an adjusting mechanism for the cams of a gas-engine, sparking mechanism, the combination with a suitable support for the parts, of a cylindrical hollow head on said support, a cam-shaft suitably supported and having a journal bearing in said support and head, a cam-wheel and cam on said shaft, a short-shaft connected to the end of the cam-shaft by a tongue and groove and a sleeve fitting within the hollow head and surrounding said short-shaft, said sleeve having a spiral slot, a stud on the short-shaft engaging with said slot, means to prevent said sleeve from moving longitudinally, a pin on the exterior of said head, a cap fitted to the exterior of said head and having a spiral slot engaging with said pin, a gear on the cap, an adjusting-shaft arranged in bearings parallel to the cam-shaft, thumb-pieces on the adjusting-shaft, and a gear on the adjusting-shaft meshing with said gear on the cap.

3. In a gas-engine sparking mechanism, the combination with an engine base, a cylinder, a crank-shaft in the base, a vertical shaft arranged in suitable bearings in the cylinder, connections between said shafts whereby the vertical shaft is rotated from the crank-shaft, a supporting part bolted to the cylinder-head, said supporting part being horizontally perforated to afford a bearing for a cam-shaft and having a cross groove, a second journal bearing for an adjusting-shaft, and a cylindrical hollow head; of a spiral gear secured on the upper end of the vertical shaft, a horizontal cam-shaft journaled in said supporting part, a cam-wheel on the cam-shaft, a cam on the cam-wheel, terminals suitably supported in the cylinder, intermediate connections between the cams and the terminals to separate the terminals and cause the spark, a sleeve fitting within the hollow head and having a spiral slot, a gear secured to said sleeve and arranged in said cross-groove in mesh with the spiral gear on the vertical shaft, a short-shaft arranged within said sleeve and connected to the end of the cam-shaft to rotate therewith but to move longitudinally independently thereof, a pin on said short-shaft engaging with said spiral slot, a cap fitting around said head and having a cam-slot, a pin on the head engaging with said cam slot, means connecting said cap to the short-shaft whereby the cap and the short-shaft rotate independently but move longitudinally together, a gear on the cap, an adjusting shaft arranged parallel to the cam-shaft in said second journal bearing, thumb-pieces on said adjusting shaft, and a gear on said adjusting shaft meshing with said cap gear, substantially as described and shown.

4. In a gas-engine sparking mechanism, the combination with an engine base, a cylinder, a crank-shaft in the base, a vertical-shaft arranged in suitable bearings in the cylinder, connections between said shafts whereby the vertical-shaft is rotated from the crank-shaft, a cast metal supporting part bolted to the cylinder-head, said supporting part being horizontally perforated to afford a bearing for a cam-shaft and having a cross groove, a second journal bearing for an adjusting-shaft, a cylindrical, hollow head and a cup; of a spiral gear secured on the upper end of the vertical shaft and arranged in said cup, a horizontal cam-shaft journaled in said supporting part, a cam-wheel on the cam-shaft, a cam on the cam-wheel, terminals suitably supported in the cylinders, intermediate connections between the cams and the terminals to separate the terminals and cause the spark, a sleeve fitting within the hollow head and having a spiral slot, a second spiral gear secured to said sleeve and meshing with the first spiral gear on the vertical shaft, said second gear being arranged in said cross groove, a short-shaft arranged within said sleeve and connected to the end of the cam-shaft by a tongue and groove, whereby said two shafts rotate together but the short-shaft can be moved longitudinally and independently a short distance, a pin on the said short-shaft engaging with the said spiral slot, a plate secured to the end of said head and engaging with the end of said sleeve, a cap fitting around said head and having a cam-slot, a pin on the head engaging with said cam-slot, a shaft cap and screw connecting said cap to the short-shaft whereby the cap and the short-shaft rotate independently but move longitudinally together, an external gear on the inner end of the cap, an adjusting-shaft arranged parallel to the cam-shaft in said second journal bearing, thumb-pieces on said adjusting-shaft, and a gear on said adjusting-shaft meshing with said cap gear, substantially as described and shown.

5. In an adjusting mechanism for the cams of a gas engine sparking device, the combination with suitable supports for the parts, of a cam shaft journaled therein, cams

carried on the cam-shaft, a short-shaft connected to rotate with the cam-shaft but movable longitudinally independently thereof, a sleeve surrounding the short shaft and having a spiral slot, a stud on the short shaft engaging with said spiral slot, means to prevent said sleeve moving longitudinally, means to rotate the sleeve and means to move the short-shaft longitudinally whereby the relation of the cams in respect to their operating means is adjusted and the spark controlled.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERNEST SPENCER BOWEN.

Witnesses:

HENRY BREWER,

FRANK POLE.