No. 898,230. PATENTED SEPT. 8, 1908.

O. O. LAKE.

GAS ENGINE.

APPLICATION FILED MAY 17, 1907.

3 SHEETS—SHEET 1.

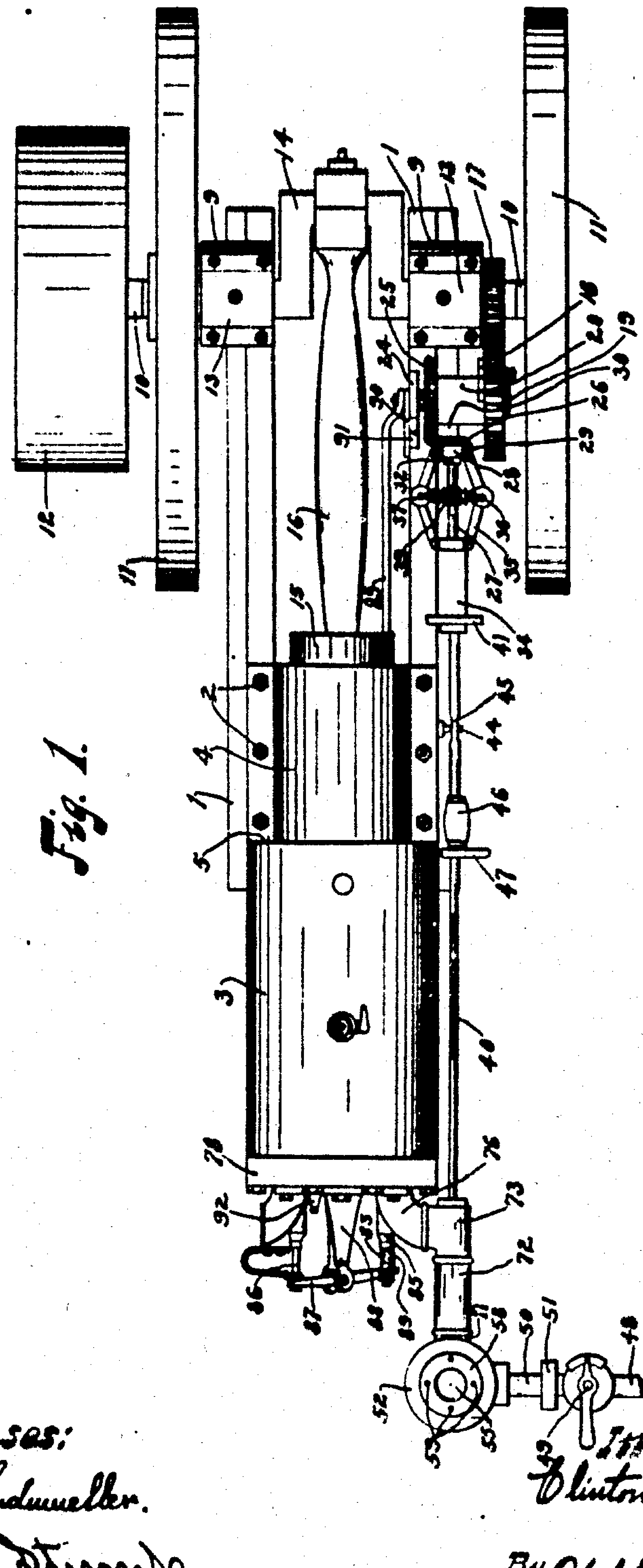

Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

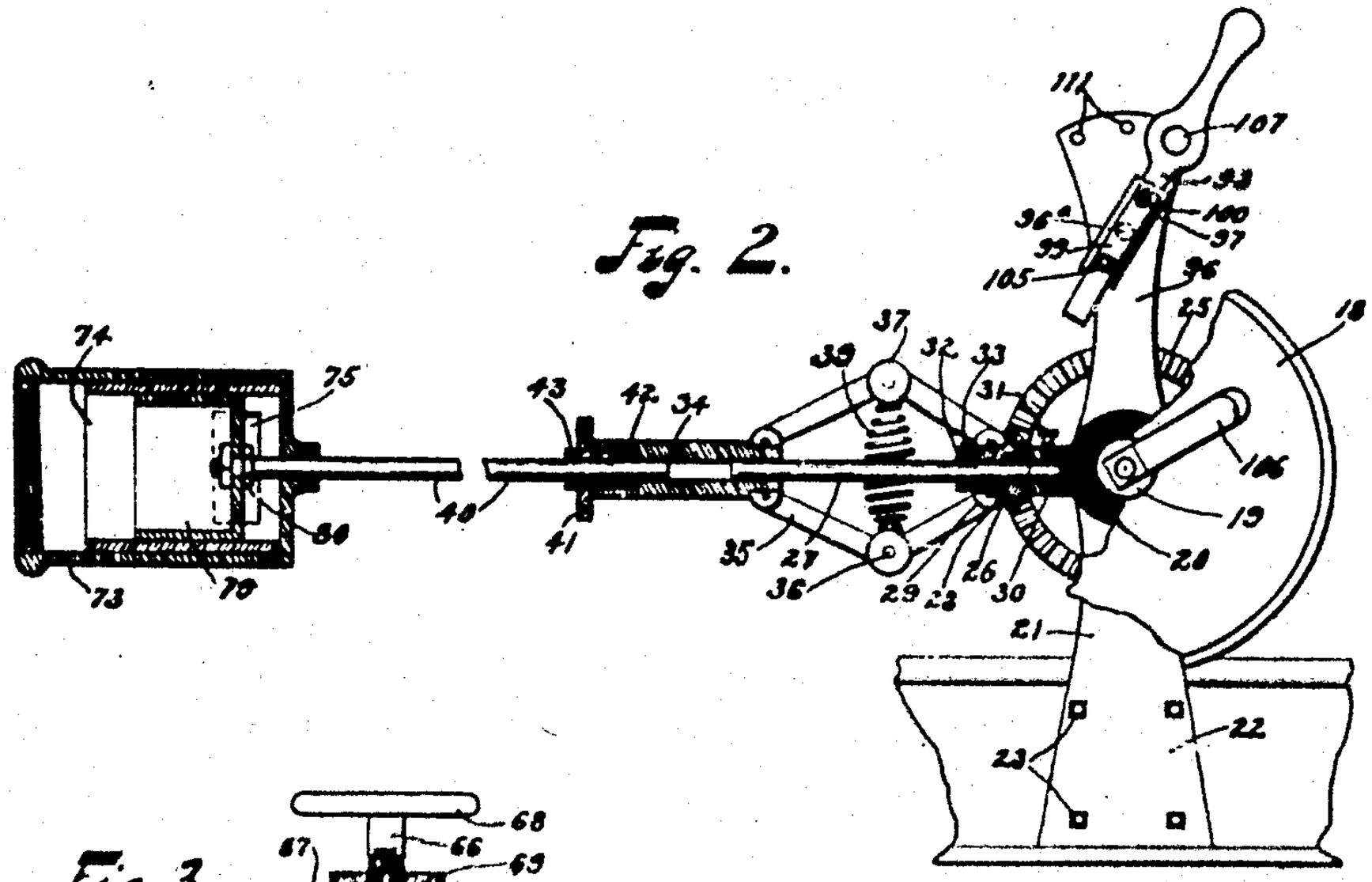


Fig. 3.

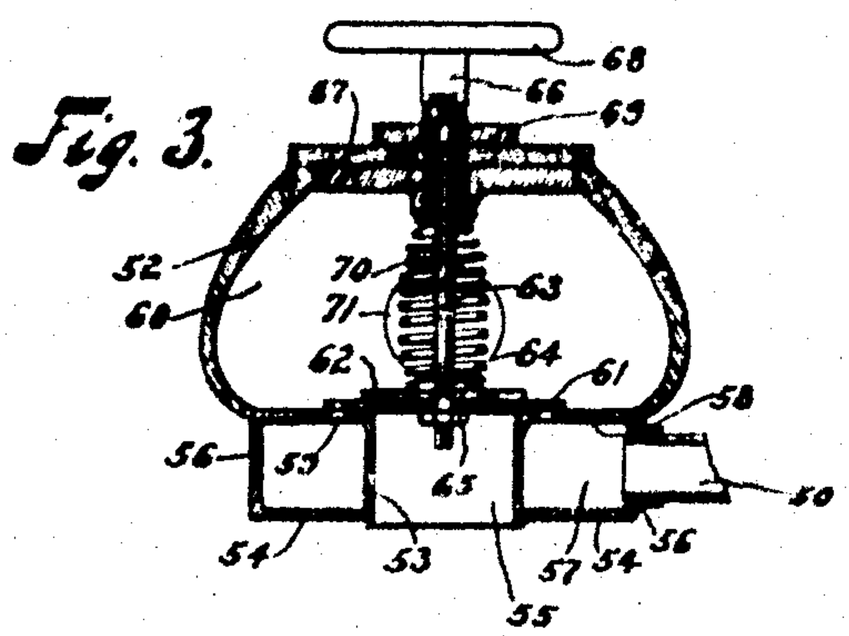
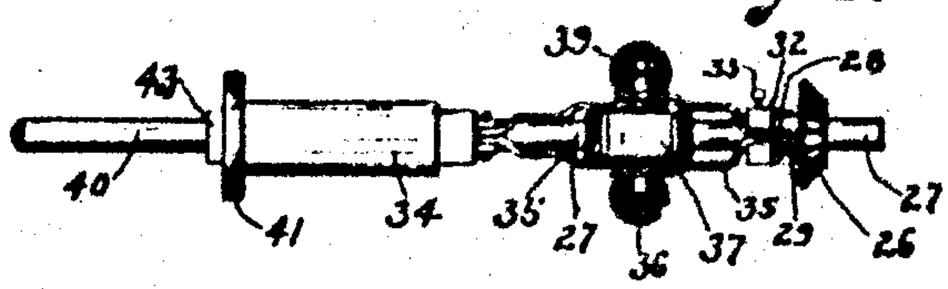


Fig. 4.



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GAS ENGINE.

APPLICATION FILED MAY 17, 1907. 2 SHEETS—SHEET 2.

Fig. 5.

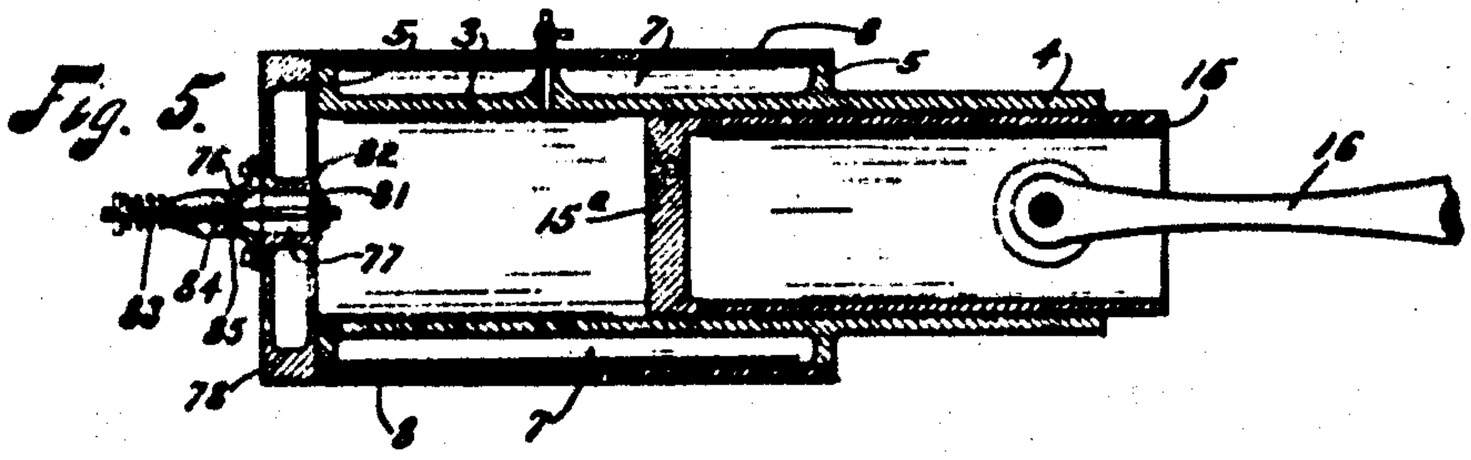


Fig. 6.

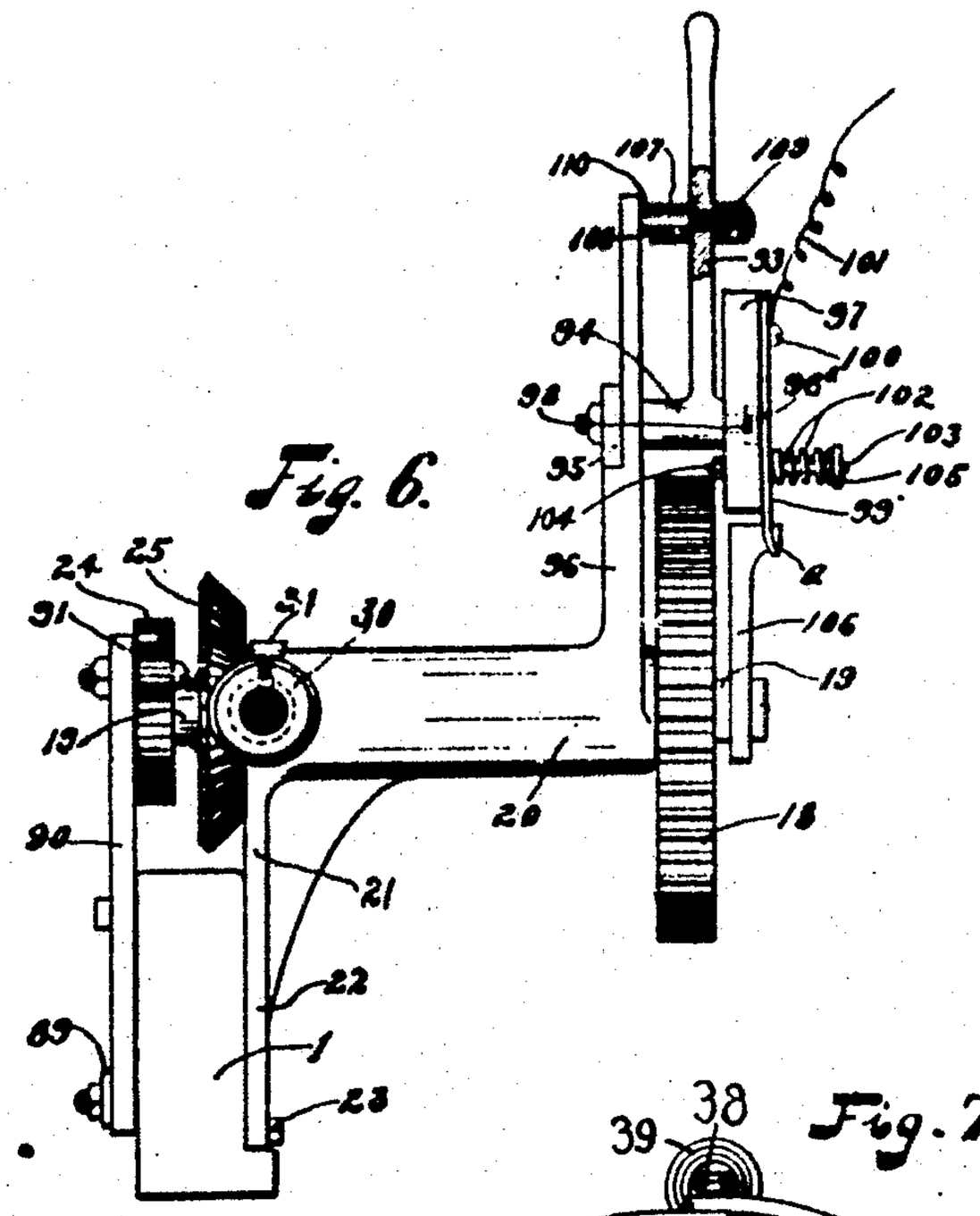
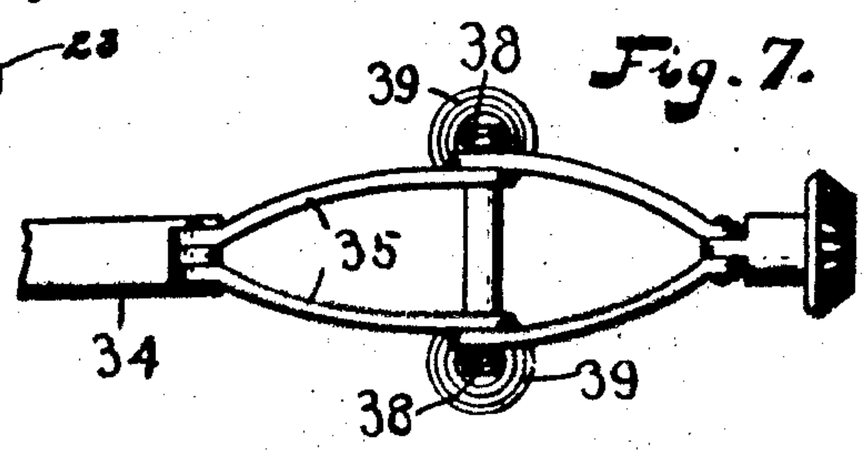


Fig. 7.



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UNITED STATES PATENT OFFICE.

CLINTON O. LAKE, OF SHREVE, OHIO.

GAS-ENGINE.

No. 898,230. Specification of Letters Patent. Patented Sept. 8, 1908.

Application filed May 17, 1907. Serial No. 374,288.

To all whom it may concern:

Be it known that I, CLINTON O. LAKE, a citizen of the United States, residing at Shreve, in the county of Wayne and State of Ohio, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

My invention relates to improvements in gas engines and the paramount object is to produce a generally-improved engine of this class which will be exceedingly simple in construction, cheap of manufacture, and efficient in use.

The invention relates more particularly to the governor mechanism, the combustible gas-inlet-valve, and the intermediate connections whereby the speed of the engine may be maintained constant under varying loads and conditions, and yet, at the same time, may be increased or decreased through said intermediate connections, as desired by the operator.

Another object is to provide a generally-improved gas-mixer mechanism whereby the richness of the combustible gas charge may be readily increased or decreased as desired under the conditions and circumstances of operation.

Another object is to improve the construction of the water-jacketed-cylinder and combustion-chamber.

A still further object is to provide a simple and effective timer mechanism for varying the time of ignition of the charge relative to the position of the piston in starting the engine, and the average rate of speed desired.

With these and other ends in view, the invention consists in the novel construction, arrangement and combination of parts, hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

Referring to the accompanying drawings, forming a part of this specification, Figure 1, is a top plan view of an engine constructed in accordance with my invention. Fig. 2, a longitudinal sectional view of the governor mechanism, the combustible gas-inlet-valve, and intermediate connections. Fig. 3, a sectional view of the improved mixer mechanism. Fig. 4, a plan view of the governor mechanism. Fig. 5, a longitudinal sectional view of the improved water-jacketed-cylinder and combustion-chamber. Fig. 6, a detail view of the timer mechanism. Fig. 7 is an enlarged detail of the governor mechanism.

Similar characters of reference designate like parts throughout all the figures of the drawings.

The present embodiment of my invention is of the four-cycle type,—*i. e.*—the crank-shaft makes two revolutions for each explosion of gas. The engine can be readily adapted for the use of gasolene by the addition of the usual attachments for this purpose, such as carburetor, atomizer etc. The engine is mounted and secured in position by means of the usual base-plate 1, which supports the front portion of the cylinder above and is secured thereto by means of the bolts and nuts 2.

The cylinder 3, is preferably cast, and comprises the usual piston and combustion-chamber at the rear, and a piston guide-head 4, at the front formed integral therewith. The walls of the cylinder are provided with the integral circumferential flanges 5, forming the supporting-ends for the ends of the jacket or sleeve-pipe 6, formed preferably of wrought-iron and shrunk upon the said annular flanges 5, and forming the annular water-chamber 7, for the purpose of cooling the walls of the cylinder about the combustion-chamber. The jacket 6, is provided with the usual pipe inlet and outlet openings 8, communicating with the water-chamber 7.

The base-plate 1, is provided near its front end with the usual integral pillow bearing-blocks 9, carrying the crank-shaft 10, provided with the usual fly-wheels 11, and drive-wheel or pulley 12. The crank-shaft 10, is removably-mounted and secured in the bearing-blocks 9, by means of the usual cap-blocks 13. The crank 14, is connected to the guiding-trunk 15, of the piston 15ª, by means of the usual connecting-rod 16, secured at the respective ends by means of the usual connections and bearings. A small gear-wheel 17, is mounted and secured to the crank-shaft 10, adjacent to the outer side of one of the bearing-blocks 9, and meshes with a larger or reducing gear-wheel 18, adapted to make one revolution to two of the former. The gear-wheel 18, is mounted upon and secured to a cam-shaft 19, revolubly-mounted in a horizontally and transversely-mounted main bearing-head or arm 20, of a bearing and supporting-bracket 21, having a depending-plate 22, secured to one side of the base

way a substantially constant and uniform speed is secured under varying loads and conditions of service. By increasing or decreasing the length of the connecting-rod 40, by means of the nut 46, the size of the inlet port-opening 77, may be correspondingly increased or decreased whereby to increase or decrease the speed of the engine.

The inlet-valve is of the usual construction, consisting of a valve-disk 81, slightly held in contact with the seat 82, by means of a spring 83, taking over the end of the movable stem 84, extending rearwardly through a guide 85, formed on the rear of the valve-pipe 76.

The outlet or exhaust valve comprises the usual spring-resisted stem 86, provided with a valve-disk normally closing the port-opening in the cylinder-head. The stem 86, is moved inwardly to open the port-opening for the exhaust of the products of combustion, by means of a lever 87, pivoted to a standard 88, one end of said lever being secured to the end of the stem 86, and the other being pivotally-secured to a horizontally-arranged connecting-rod 89, extending forwardly under the cylinder and connected to the lower end of a second lever 90, pivoted, in the present instance, to the inner side of the base-plate 1. The upper end of the lever 90, carries a roller 91, which rides over the cam 24, whereby the lever is reciprocated at the proper time to open the exhaust-valve.

The ignition of the charge is made by an electric ignition-plug 92, mounted in the cylinder-head, and the timer mechanism, for governing and regulating the time of sparking relative to the position of the piston in the cylinder, consists of a movable bar or lever 93, provided with a pivot-pin or trunnion 94, mounted in a bearing-opening 95, of an upwardly-extending arm or standard 96, of the bearing and supporting-bracket 21. The lever 93, is provided, opposite its trunnion 94, with a short pin-head or stud 96ª, carrying an insulating rubber-block 97, secured thereto by means of a cross-key 98. The block 97, is provided on its outer face with a brass plate 99, secured at one end to the block 97, by means of a screw 100, which screw also makes electrical connection with the plate 99, by engaging the end of the wire 101. The lower or free end of the plate 99, is yieldingly held against the face of the block 97, by means of a coiled spring 102, taking over, and secured in position by, a pin 103, secured to the block 97, by means of a nut 104. The opposite or outer end of the pin is provided with a nut 105, which takes over the outer end of the coiled spring 102, so that the tension of the spring upon the plate 99, may be varied as desired. The lower or free end of the plate depends from the block 97, and is adapted to be engaged by the end of a brass arm 106, fixedly-secured to the end of the revoluble shaft 19, and making, through the attached gear-wheel 18, one revolution to two of the crank-shaft gear-wheel 17. The free end of the arm 106, is provided with a laterally-extending beveled stud "a", adapted to engage with the depending free end of the plate 99. The upper portion of the lever 93, is provided with a socket-housing or head 107, provided with a socket-opening or recess 108, containing a coiled spring 109, and movable pin 110, extending from the socket-housing, and having a beveled or conical end adapted to take into and yieldingly engage with the reamed openings 111, formed at the upper end of the standard 96. As the conical end of the spring-resisted pin 110 does not enter the reamed openings 111 far enough to prevent the longitudinal movement of the upper portion of the lever 93, by the handle thereof, the lever may be moved to any of the positions indicated by the three openings 111, thereby moving the depending free end of the plate 99, to be engaged sooner or later by the free end of the arm 106, whereby to correspondingly regulate the ignition of the charge by the igniter with respect to the position of the piston in the cylinder, as desired in starting the engine and the speed attained.

From the foregoing description, taken in connection with the accompanying drawings, the operation and advantages of my invention will be readily understood.

Having thus described my invention, without having attempted to set forth all the forms in which it may be made, or all the modes of its use, I declare that what I claim and desire to secure by Letters Patent, is,—

1. In a gas-engine, a cam-shaft provided at one end with a cam and a bevel-gear and at the other with a gear-wheel and connecting-arm, a lever-bar pivotally-mounted above said cam-shaft and carrying an insulating-block, a depending plate secured to said block and adapted to be engaged by the free end of said connecting-arm, and means for securing said lever-bar in adjusted position.

2. In a gas-engine, a bearing and supporting-bracket provided with a standard, a cam-shaft carried by said bearing and supporting-bracket and provided at one end with a cam and at the other with a gear-wheel and a connecting-arm, a lever-bar pivotally-mounted in said standard and carrying an insulating-block, a spring-plate secured to said block and having its free end adapted to be engaged by the free end of said connecting-arm, and means for securing said lever-bar in adjusted position.

3. A gas-engine, comprising a cylinder, an outlet-valve mounted in the head thereof, a lever secured to said outlet-valve, a connecting-rod secured to said lever, a second lever secured to said connecting-rod and provided

or supporting-plate 1, of the engine by means of bolts 23. The shaft 19, is provided on its other or opposite end with a cam 24, and a bevel-gear 25, meshing with a small bevel-gear or pinion 26, revolubly-mounted on a stationary governor-shaft 27, and provided with a sleeve or collar 28, provided with oppositely-disposed lugs 29. The governor-shaft 27, is mounted in an opening formed in an integral shoulder 30, of the bearing-arm 20, and is secured therein by means of a set-screw 31. The gear or pinion 26, is held in mesh with the bevel-gear 25, by means of a collar 32, secured upon the shaft 27, by means of a set-screw 33.

The governor comprises a sleeve 34, slidably and revolubly-mounted on the end of the governor-shaft 27, and connected to the lugs 29, of the pinion 26, by means of toggle-arms 35, provided at their inner or connected ends and secured together by means of pivot-pins 36, carrying disk-blocks 37. The ends of the pivot-pins 36, preferably extend beyond the inner connected ends of the toggle-arms and are provided with annular grooves 38, adapted to receive and contain the looped ends of a pair of spiral springs 39, adapted to yieldingly hold the disk-blocks 37, in connection with each other. The sleeve 34, is revolubly-connected to a connecting-rod 40, by means of a hand-nut 41, provided with a threaded annular shoulder taking into a threaded opening of the end of the sleeve 34, and adapted to move the connecting-rod longitudinally toward the gear end of the governor by coming into engagement with an annular shoulder 42, preferably formed integral with said connecting rod 40. A second annular shoulder 43, is adapted to abut against the outside of the nut 41, so that the rod 40, will be moved longitudinally from the gear end of the governor by a corresponding movement of the sleeve 34.

In order to guard against any possible turning of the connecting-rod 40, a bracket-arm 44, is secured to the side of the base-plate 1, and forked at its upper end to take over flat sides 45, formed on the rod 40. In order to provide for the lengthening or shortening of the connecting-rod 40, for the purposes hereinafter described, said rod comprises two parts or members connected by means of an adjusting-link or nut 46, having its opposite ends provided with openings having right and left handed threads taking over correspondingly-threaded ends of the connected members. A lock-nut and lever 47, is mounted on one of the threaded ends of said members, adjacent to one end of the nut 46, for locking the same in any position to which it may be adjusted.

The gas is conducted through a pipe 48, provided with an ordinary valve 49, (see Fig. 1) and the pipe 48, is connected to a second pipe 50, by means of a union 51. The pipe 50, is suitably secured to the mixer comprising a main body portion 52, provided with a centrally-located depending tubular stem portion 53, threaded at its lower end, and a circular base portion 54, provided with a threaded central opening 55, in its bottom taking over said threaded portion of said stem portion 53, with the upper edges of the circular walls 56, abutting against the base of the main body portion 52, whereby an annular gas-chamber 57, is provided communicating with the gas-inlet-pipe 50, secured in an opening at the side (see Fig. 3).

The bottom or seat portion 58, is provided with a series of gas-inlet openings 59, communicating with the mixer-chamber 60, above, and normally closed by means of a valve-disk 61, preferably of rubber or leather, or other flexible or resilient material, secured to a disk-plate 62, by means of a stem 63, provided with an annular shoulder 64, and a nut 65, on the lower end thereof. The stem 63, is movably-mounted at its upper end in an opening of a threaded stem or spindle 66, mounted in a centrally-located threaded opening of a screw cap-plate 67, mounted within a threaded opening at the top of the main body portion 52. The spindle 66, is revolved by means of the usual wheel 68, and a lock-nut 69, enables the spindle to be locked in any position to which it may be adjusted. The stem 63, is surrounded by a coiled spring 70, one end of which impinges against the disk-plate 62, and the other against the lower end of the spindle 66, and by adjusting the latter the pressure of the spring 70, may be varied to regulate the lift and susceptibility of the movable valve-disk 61, to the suction impulses as the air enters through the depending stem portion 53, to mix with the gas in the mixing-chamber whereby to increase or decrease the richness of the charge drawn into the combustion-chamber of the cylinder.

A pipe-opening 71, leads from the mixing-chamber 60, and is connected to a pipe 72, the latter being, in the present instance, connected to an elbow pipe connection 73, containing a stationary valve-body 74, preferably of tubular form as shown (see Fig. 2) and having a vertical slot or port-opening 75, in its side communicating with the opening of the valve-pipe 76, leading to the inlet-port-opening 77, of the cylinder-head 78. A slide-valve 79, preferably of tubular form, is slidably-mounted within the stationary valve-body 74, and is provided at its front with a cross-arm 80, secured to the connecting-rod 40, passing through an opening in the pipe 73. The slide-valve 79, is adapted to decrease or increase the size of the inlet port-opening 77, as moved to and fro by the connecting-rod and governor corresponding with the increase or decrease, respectively, in the speed of the running of the engine. In this

with a friction-roller, a cam-shaft provided at one end with a cam adapted to engage said roller, a gear-wheel and a connecting-arm secured to the opposite end of said cam-shaft, a lever-bar pivotally-mounted above said cam-shaft and carrying an insulating-block, a plate secured to said block and adapted to be engaged by said connecting-arm, and means for securing said lever-bar in adjusted position.

4. In a gas-engine, a cylinder, an exhaust-valve, a lever secured to said exhaust-valve, a connecting-rod, a second lever secured at its lower end to said connecting-rod and carrying at its upper end a roller, a cam-shaft provided at one end with a cam adapted to engage said roller and at the other with a connecting-arm, a bearing-bracket carrying said cam-shaft and provided with a standard, a lever-bar pivotally-mounted in said standard and provided with a block, and a plate secured to said block and adapted to be engaged by said connecting-arm.

5. A gas-engine, comprising a cylinder, an exhaust-valve mounted in the head thereof, a lever secured to said exhaust-valve, a connecting-rod secured to said lever, a second lever secured to said connecting-rod and carrying a roller, a cam-shaft adapted to engage said roller, a connecting-arm secured to said cam-shaft, a lever-bar suitably mounted and carrying a block, and a plate secured to said block and adapted to be engaged by said connecting-arm as said cam-shaft is revolved.

6. A gas-engine, comprising a water-jacketed cylinder, inlet and exhaust valves mounted in the head thereof, a lever secured to said exhaust-valve, a connecting-rod secured to said lever and extending forwardly beneath said cylinder, a second lever secured at its lower end to the front end of said connecting-rod and provided at its upper end with a friction-roller, a cam-shaft suitably mounted and provided at one end with a cam adapted to engage said roller, a gear-wheel and a connecting-arm secured to the opposite end of said cam-shaft, a lever-bar mounted above said cam-shaft and carrying an insulating-block, a depending spring-resisted plate secured to said block, and means for securing said lever-bar in adjusted position.

7. A gas-engine, comprising a cylinder, an exhaust-valve, a lever pivotally-secured to the cylinder-head and connected to said exhaust-valve, a connecting-rod secured to said lever, a second lever secured to said connecting-rod, a cam-shaft provided with a cam adapted to engage one end of said second lever, a connecting-arm secured to said cam-shaft, a lever-bar pivotally-mounted and provided with an insulating-block, and a plate resiliently-secured to said block and having one end adapted to be engaged by said connecting-arm as said cam-shaft is revolved.

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

CLINTON O. LAKE.

Witnesses:
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LORENZO D. CORNELL.