(No Model.) 4 Sheets—Sheet 1.

C. GUYER.

GAS ENGINE.

No. 596,809. Patented Jan. 4, 1898.

Fig. 1.

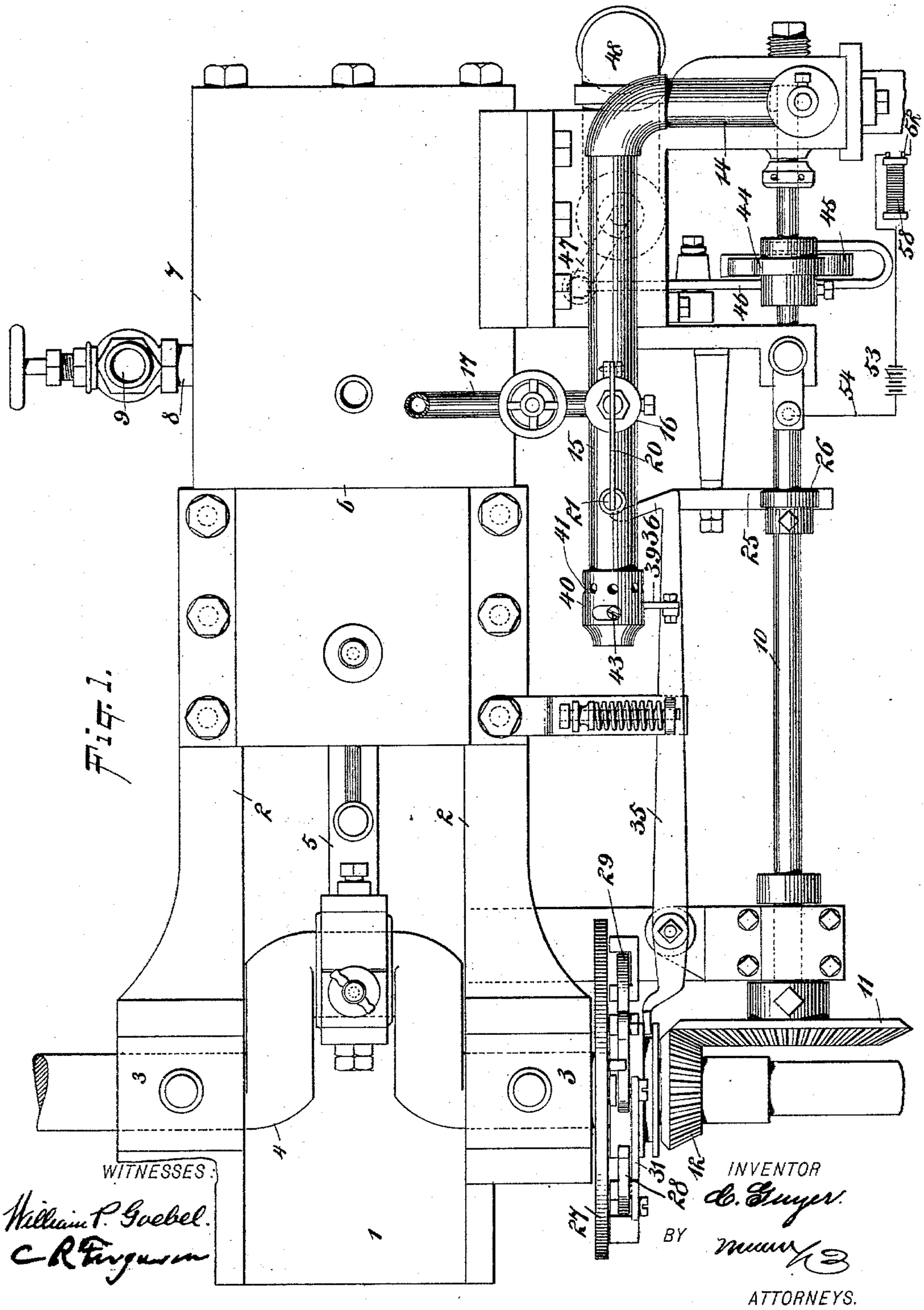

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Fig. 2.

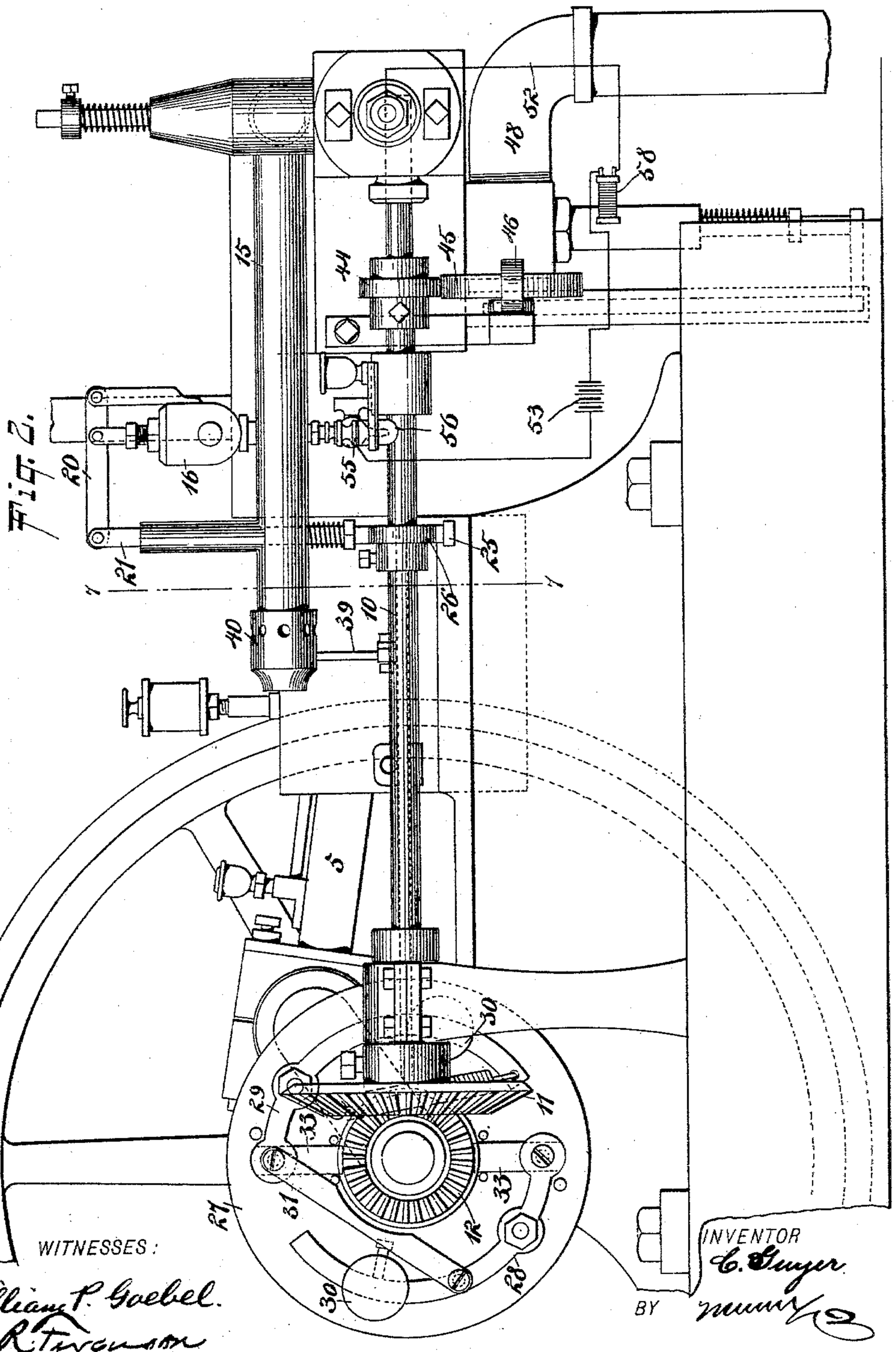

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Fig. 3.

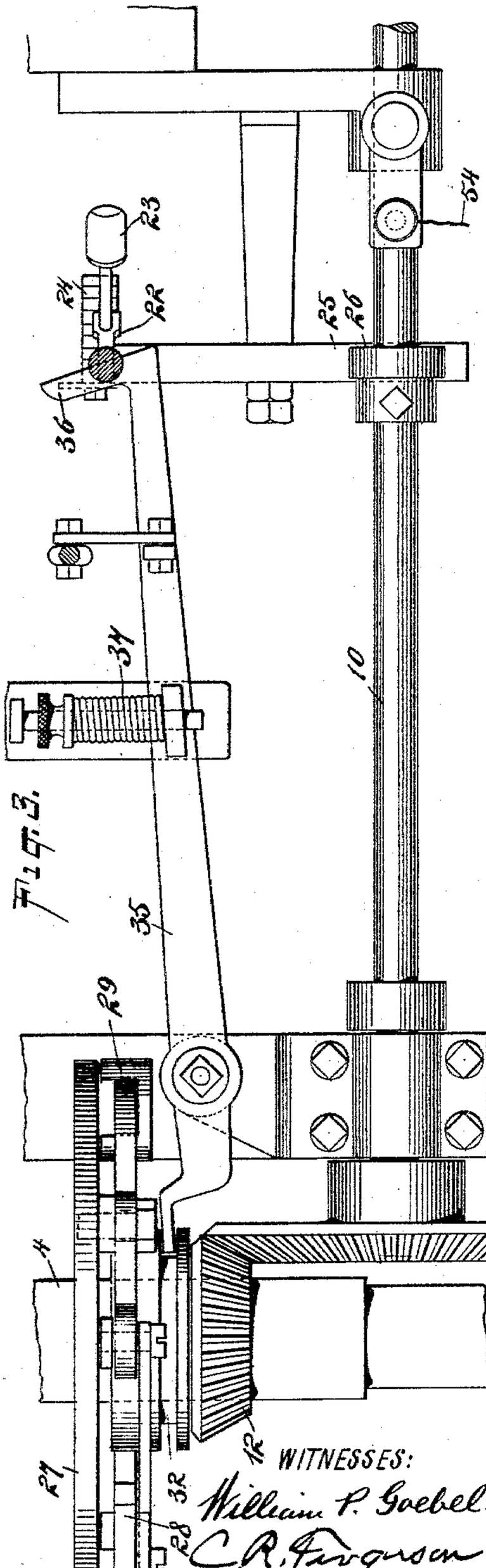

Fig. 4.

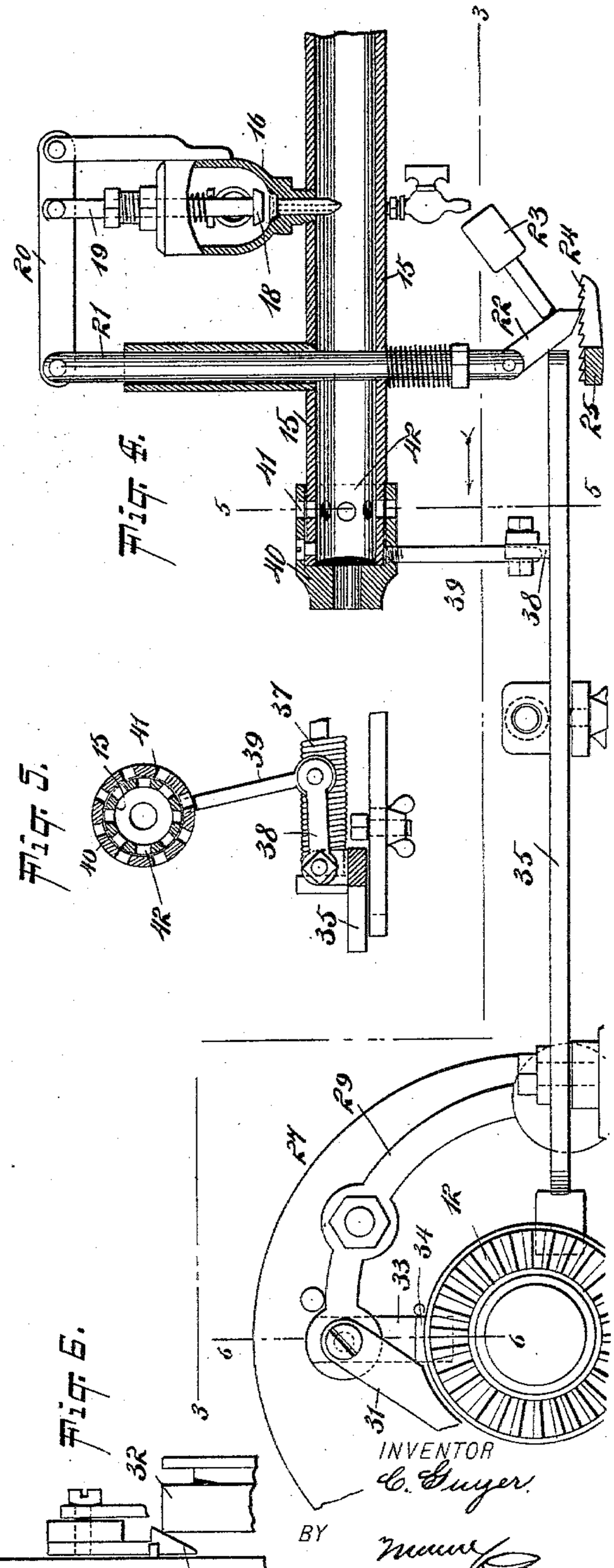

Fig. 5.

Fig. 6.

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GAS ENGINE.

No. 596,809. Patented Jan. 4, 1898.

Fig. 7.

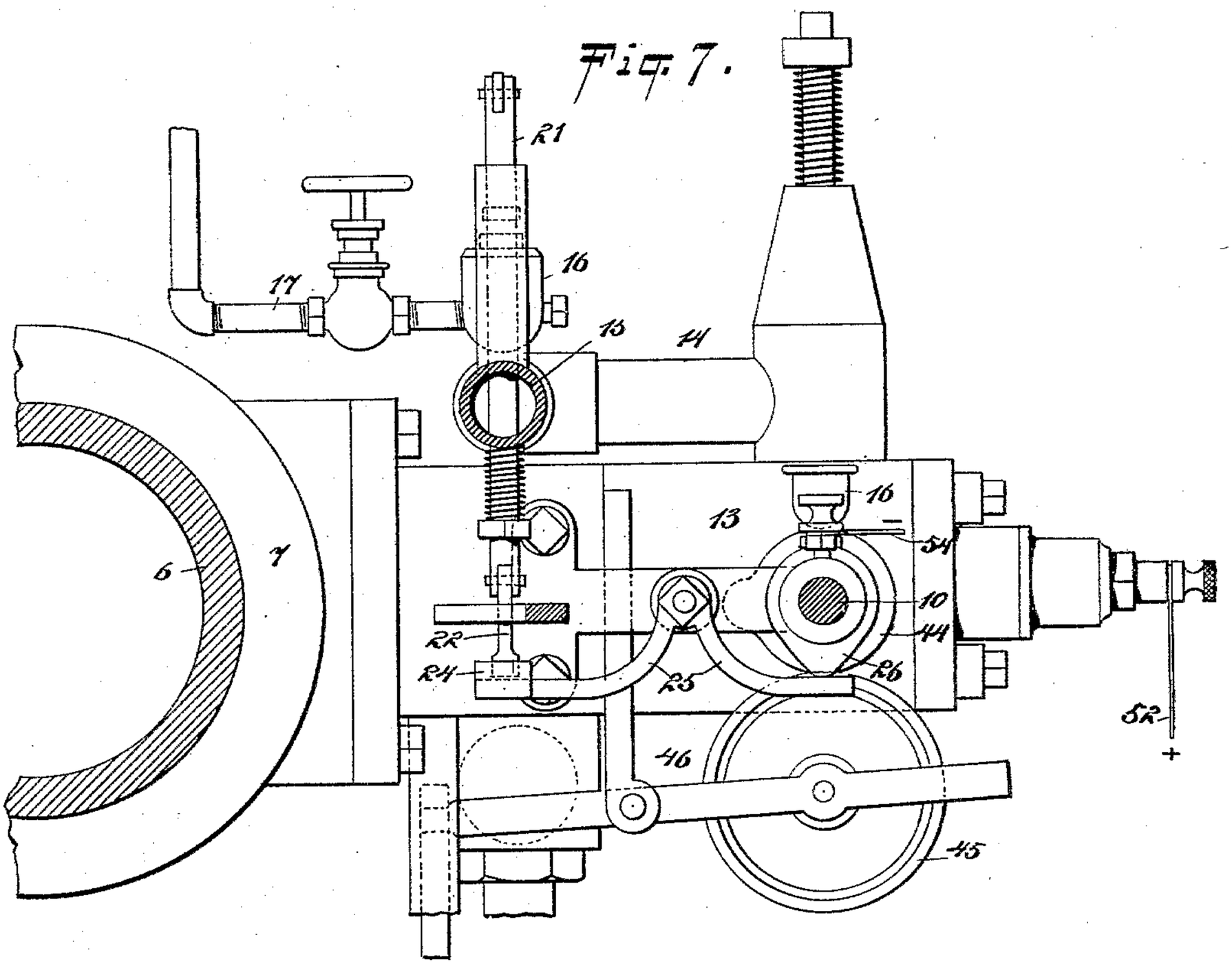
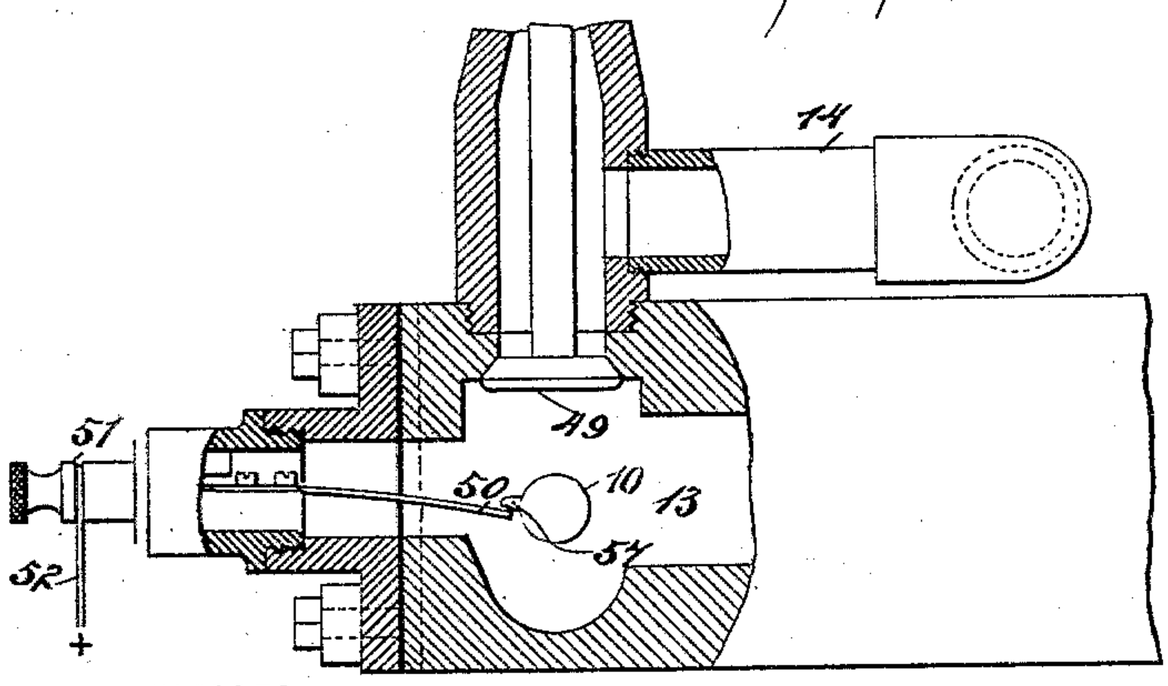


Fig. 8.



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UNITED STATES PATENT OFFICE.

CLINTON GUYER, OF MUNCY, PENNSYLVANIA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 596,809, dated January 4, 1898.

Application filed April 2, 1897. Serial No. 630,339. (No model.)

To all whom it may concern:

Be it known that I, CLINTON GUYER, of Muncy, in the county of Lycoming and State of Pennsylvania, have invented a new and Improved Gas-Engine, of which the following is a full, clear, and exact description.

This invention relates to that class of engines in which motion is imparted by the combustion of mixed gas and air; and the object is to provide a construction whereby the speed of the engine is fully under the control of an automatic governor, and, further, to so construct the engine that it takes a charge of gasolene or gas, as the work requires, (while running light the charges are very light, and as the load is thrown on the charges become larger,) and, further, to so construct the valve mechanism that the gas and air will be admitted in proper proportions to perform the work required of the engine.

I will describe a gas-engine embodying my invention and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a top plan view of a gas-engine embodying my invention. Fig. 2 is a side elevation thereof. Fig. 3 is a partial plan and partial section of the engine on the line 3 3 of Fig. 4 and showing the valve-operating devices and a governor for the same. Fig. 4 is a partial elevation and partial section of the valve mechanism and controlling devices. Fig. 5 is a section on the line 5 5 of Fig. 4. Fig. 6 is a section on the line 6 6 of Fig. 4. Fig. 7 is a section substantially on the line 7 7 of Fig. 2, and Fig. 8 is a sectional view of a combustion-chamber employed and certain parts operating in connection therewith.

I have not deemed it necessary to make a detailed illustration of the whole engine, as certain parts thereof are of the usual construction.

Referring to the drawings, 1 designates the bed-plate of the engine, having the cross-head guides 2 and bearings 3 for the crank-shaft 4. Extended from the crank-shaft 4 is a piston-rod 5, having connection with a piston operating in a cylinder 6, which for the purpose of cooling is surrounded by a water-jacket 7. A pipe 8 communicates with the interior of the cylinder, and this pipe 8 is provided with a relief-valve 9, which is designed to be opened when the engine is first started, but to be closed after such starting and while a small portion of gas remains in the cylinder.

Extended longitudinally of the engine is a valve-controlling shaft 10, on one end of which is mounted a bevel-gear 11, meshing with a bevel-pinion 12 of one-half the diameter of the gear 11. This pinion 12 is mounted on the crank-shaft 4, and it is obvious by the different sizes of the gear-wheels that the crank-shaft will make two complete rotations to one complete rotation of the valve-controlling shaft 10.

A combustion-cylinder 13 has communication with the interior of the piston-cylinder, and this combustion-cylinder also has a pipe connection 14 with a gas and air mixing cylinder 15, and mounted on said mixing-cylinder and having communication with its interior is a gasolene-receptacle 16, having communication with any desired source of supply through the pipe 17.

Movable in the gasolene-receptacle 16 is a valve 18 for controlling the communication between said container and the mixing-cylinder 15. From the valve 18 a stem 19 extends upward through the bonnet of the container and is pivotally connected to a pivoted lever 20, from which a rod 21 extends downward, as here shown, through the mixing-cylinder 15, and pivoted to the lower end of this rod 21 is a dog 22, having a counterbalance 23 and adapted to engage with its pointed free end in any one of the notches of a shoe 24 on the pivoted lever 25, the outer end of which is engaged by a cam 26 on the valve-controlling shaft 10. This cam 26 is designed to operate the lever 25 to more or less open or close the valve 18, and the object in employing a dog 22 in connection with the shoe 24 is so that the degree of movement of the valve may be automatically regulated, the means for which I will now describe.

Mounted on the crank-shaft 4 is a governor-disk 27, to the outer face of which governor-arms 28 and 29 are pivoted. These governor-arms 28 and 29 are arc-shaped and are pivoted

at opposite sides of the axis of the governor-disk. The arms 28 and 29 are each provided near their free ends with adjustable weights 30, and between the arm 28 and a point between the weight and the pivotal point of said arm a link 31 is pivoted, the other end of said link 31 being pivoted to the shorter end of the arm 29.

Movable longitudinally of the crank-shaft 4 at the outer side of the governor-disk 27 is a grooved wheel 32. As the governor-disk rotates and gradually increases in speed arms 33, connected to the shorter ends of the governor-arms 28 and 29 and having wedge-shaped ends 34, engaging against the rear side of the grooved wheel 32, will force said grooved wheel outward and operate the horizontally-swinging governor-bar 35, which has its end extended into the groove of the wheel 32. The opposite end of said governor-bar 35 has a toe portion 36, extended at an obtuse angle to the level of the bar and engaging against the dog 22. An expansion-spring 37, mounted on a fixed portion of the engine-frame and engaging with a lug on the bar 35, serves to move said bar in one direction to return it to its normal position, and consequently move the grooved wheel 32 to its inner or normal position.

Mounted on the bar 35 is an arm 38, from which a link 39 extends to a connection with a sleeve-valve 40, mounted to rotate on the end of the mixing-cylinder 15. The end of the sleeve-valve 40 is normally open, and it is provided in its body portion with a series of ports 41, designed to register more or less with a series of ports 42 through the wall of the mixing-cylinder 15. The rotary motion of the sleeve-valve is limited by means of a screw 43, extended from the cylinder 15 into a slot formed circumferentially in the sleeve-valve.

Mounted on the shaft 10 is an exhaust-controlling cam 44, engaging with a wheel 45, mounted in the yoke portion of a lever 46, fulcrumed to a hanger on the engine and pivotally connected with an arm 47, extended from a valve in the exhaust-pipe 48. An inwardly-opening valve 49 controls the communication between the mixing-cylinder 15 and the combustion-cylinder 13, and extended into this combustion-cylinder 13 is an electrode 50, which of course is insulated from the cylinder and has connection with a binding-post 51, having a wire connection 52 with one pole of a source of electricity, (here shown as a battery 53.) From the other pole of the battery 53 a wire 54 extends to a binding-post 55, having connection with a brush 56, which normally rests on the shaft 10, and this shaft 10, it will be seen, has its end extended into the combustion-chamber 13, and this inner end is provided with an electrode 57, designed to make and break connection with the electrode 50 and thus make a spark to ignite the mixed air and gas. The circuit comprising the wires 52 and 54 may contain a resistance-coil 58.

The complete operation of the engine may be described as follows: The first outstroke of the crank-shaft 4, by drawing out the piston in the piston-cylinder, draws in a charge of air through the sleeve-valve 40; also, at the same time the cam 26 on the shaft 10 comes in position to rock the lever 25 vertically, and consequently open the valve 18 to allow gasolene to be drawn into the mixing-cylinder 15 to mix with the air. At the same time the valve 49 is drawn open by the suction of the piston, allowing the mixed air and gasolene-vapor to enter the combustion-cylinder 13. When the crank-shaft has reached its farthest outstroke, the valve 49 will be closed, and as the crank of the crank-shaft returns on the under back stroke the charge of air and gasolene-vapor between the piston and cylinder-head will be compressed by the piston, and just as the crank-shaft 4 is leaving the center on the second outstroke the charge of air and gasolene-vapor will be ignited to impart an outward impulse to the piston.

As before stated, when first starting the engine the relief-valve 9 should be open. As the pinion 12 on the crank-shaft is one-half the size of the gear-wheel 11 on the shaft 10 the said crank-shaft, as before stated, will have two complete revolutions to one revolution of the shaft 10, and thus the electrodes 50 and 57 come in contact once while the crank-shaft 4 makes two turns, firing the charge in the combustion-cylinder at every other revolution. At every other revolution of the crank-shaft and on its return movement the exhaust-valve is operated or opened, allowing the burned gases to escape.

Should the speed of the engine reach too high a point, the governor-arms 28 and 29 will be thrown outward by centrifugal force, and the wedge-shaped ends 34 of the arms 33 operated thereby will move the grooved wheel 32 outward and rock the governor-bar 35, so as to cause its end 36 to move the dog 22 forward on the shoe 24. Thus as the end of the rod 21 is nearer the shoe 24 it is obvious that the valve 18 will be moved a shorter distance from its seat on the upward movement of the shoe. Should the speed become too low, the governor-bar 35 will be moved to its normal position by means of its spring 37 releasing the dog 22, so that the counterweight 23 will swing the dog to its substantially vertical position, giving a greater range of movement to the valve 18, and thus allowing for an increased flow of the gasolene. Of course during the movement of the bar 35 the sleeve-valve 40 will be moved to more or less open or close the inlet-ports.

It will be seen that the valve-operating shaft 10 forms a portion of the electric circuit. The electrode 50 may be made of several pieces of flat steel which will preferably be resilient. When the electrodes separate,

a very fine brilliant spark is made, and the sparking-points are kept from overheating by the fresh cool charge of air and gasolene-vapor that is drawn over them at each revolution of the engine.

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

1. In a gas-engine, a piston-cylinder, a piston operating therein, a crank-shaft having connection with the piston, a combustion-cylinder having communication with the piston-cylinder, a gas and air mixing cylinder having a valve-controlled communication with the piston-cylinder, a gasolene-container having a valve-controlled communication with the mixing-cylinder, an air-controlling valve on the end of said mixing-cylinder, and mechanism operated from the crank-shaft to open and regulate said valve, substantially as specified.

2. A gas-engine, comprising a piston-cylinder, a piston operating therein, a crank-shaft having connection with the piston, a combustion-cylinder communicating with the piston-cylinder, sparking devices in said combustion-cylinder, a mixing-cylinder communicating with the combustion-cylinder, a gasolene-container having a valve-controlled communication with the mixing-cylinder, an air-controlling valve on the mixing-cylinder, a valve-controlling shaft operated by the crank-shaft, a cam on said valve-controlling shaft, a fulcrumed lever with which said cam engages, a connection between said lever and the valve in the gasolene-container, and means operated from the crank-shaft to regulate the throw of said valve imparted by the valve-controlling shaft, substantially as specified.

3. A gas-engine, comprising a piston-cylinder, a piston operating therein, a crank-shaft having connection with the piston, a combustion-cylinder communicating with the piston-cylinder, igniting devices in said combustion-cylinder, a mixing-cylinder communicating with the combustion-cylinder, an air-controlling valve on the end of said mixing-cylinder, a gasolene-container having a valve-controlled communication with the mixing-cylinder, an inwardly-opening valve for controlling the communication between the mixing-cylinder and combustion-cylinder, a valve-operating shaft, a cam on said shaft, a fulcrumed lever with which said cam engages, a toothed shoe on said lever, a vertically-movable rod having connection with the lever for operating the valve of the gasolene-container, a counterbalanced pivoted dog on the lower end of said rod and engaging with the toothed shoe, and means operated from the crank-shaft for shifting said dog on the shoe as the speed of the engine increases, substantially as specified.

4. A gas-engine, comprising a piston-cylinder, a piston operating therein, a crank-shaft having connection with the piston, a combustion-cylinder communicating with the piston-cylinder, igniting devices in the combustion-cylinder, a mixing-cylinder having a valve-controlled communication with the combustion-cylinder, a gasolene-container communicating with the mixing-cylinder, a valve for controlling said communication, means for raising or lowering the said valve, a governor-bar for regulating the throw of said valve, and a governor on the crank-shaft for moving said governor-bar in one direction, substantially as specified.

5. A gas-engine, comprising a piston-cylinder, a piston operating therein, a crank-shaft having connection with the piston, a combustion-cylinder communicating with the piston-cylinder, igniting devices in the combustion-cylinder, a gas and air mixing cylinder having a valve-controlled communication with the combustion-cylinder, a sleeve-valve on the end of said mixing-cylinder, a gasolene-container communicating with the interior of the mixing-cylinder, a valve in said container, a valve-controlling shaft operated from the crank-shaft, a lever rocked by said valve-controlling shaft for raising the valve in the container, a horizontally-swinging bar for regulating the vertical movement of the valve, a connection between said bar and the sleeve-valve, for rotating said valve, a grooved wheel on the crank-shaft in which one end of said bar engages, and centrifugally-operated governor-arms for moving said grooved wheel outward to swing the bar, substantially as specified.

6. In a gas-engine, the combination with gas and air inlet controlling valves, of a means for controlling the same, comprising a swinging bar, a grooved wheel, in the groove of which one end of said bar engages, a crank-shaft upon which the grooved wheel is loosely mounted, a governor-disk mounted on the crank-shaft, curved arms pivotally connected to said disk and adapted to be moved outward by centrifugal force, and fingers pivoted to said arms and having wedge-shaped ends to engage against the inner side of the grooved wheel, to force it outward, substantially as specified.

7. In a gas-engine, the combination with gas and air inlet controlling valves, of a means for controlling the same, comprising a spring-bar, a grooved wheel in the groove of which one end of said bar engages, a crank-shaft, a disk mounted on the crank-shaft, curved arms pivotally connected to said disk, weights adjustably mounted on the arms, a link connection between the arms, and wedge-shaped fingers pivoted to the arms and movable against the rear face of the grooved wheel, substantially as specified.

8. A gas-engine, comprising a combustion-cylinder, a gas and air mixing cylinder having a valve-controlled communication with the combustion-cylinder, a gasolene-container communicating with the mixing-cylinder, a

valve for controlling said communication, an air-inlet-controlling valve on the mixing-cylinder, means for controlling said last-named valves, comprising a rotary shaft, a source of electricity, a resilient electrode connected to the said source of electricity and extended into the combustion-cylinder, an electrode on the end of the valve-controlling shaft extended into the combustion-cylinder, and a connection between said shaft and the source of electricity, whereby the shaft serves as a portion of the circuit, substantially as specified.

9. In a gas-engine, the combination with a gas and air mixing cylinder, of the gasolene-receptacle having communication therewith, a valve for controlling said communication, a pivoted lever having connection with the valve, a rod extended from the lever, a dog mounted to swing on the rod, a governor-lever for controlling the position of the dog, and a fulcrumed lever engaging with the dog and operating to open and close the valve, substantially as specified.

10. In a gas-engine, the combination with a gas and air mixing cylinder, of a gasolene-receptacle having communication therewith, a valve for controlling said communication, a rod having connection with the valve, a dog mounted to swing on said rod, a swinging lever having a cam and engaging with said dog, a pivoted lever having a notched portion with which the end of said dog engages, and a cam on a rotary shaft for operating the lever to open and close the valve, substantially as specified.

CLINTON GUYER.

Witnesses:
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D. W. BUFFINGTON.