(No Model.) 2 Sheets—Sheet 1.

C. D. ANDERSON.

GAS ENGINE.

No. 567,954. Patented Sept. 22, 1896.

Fig. 1.

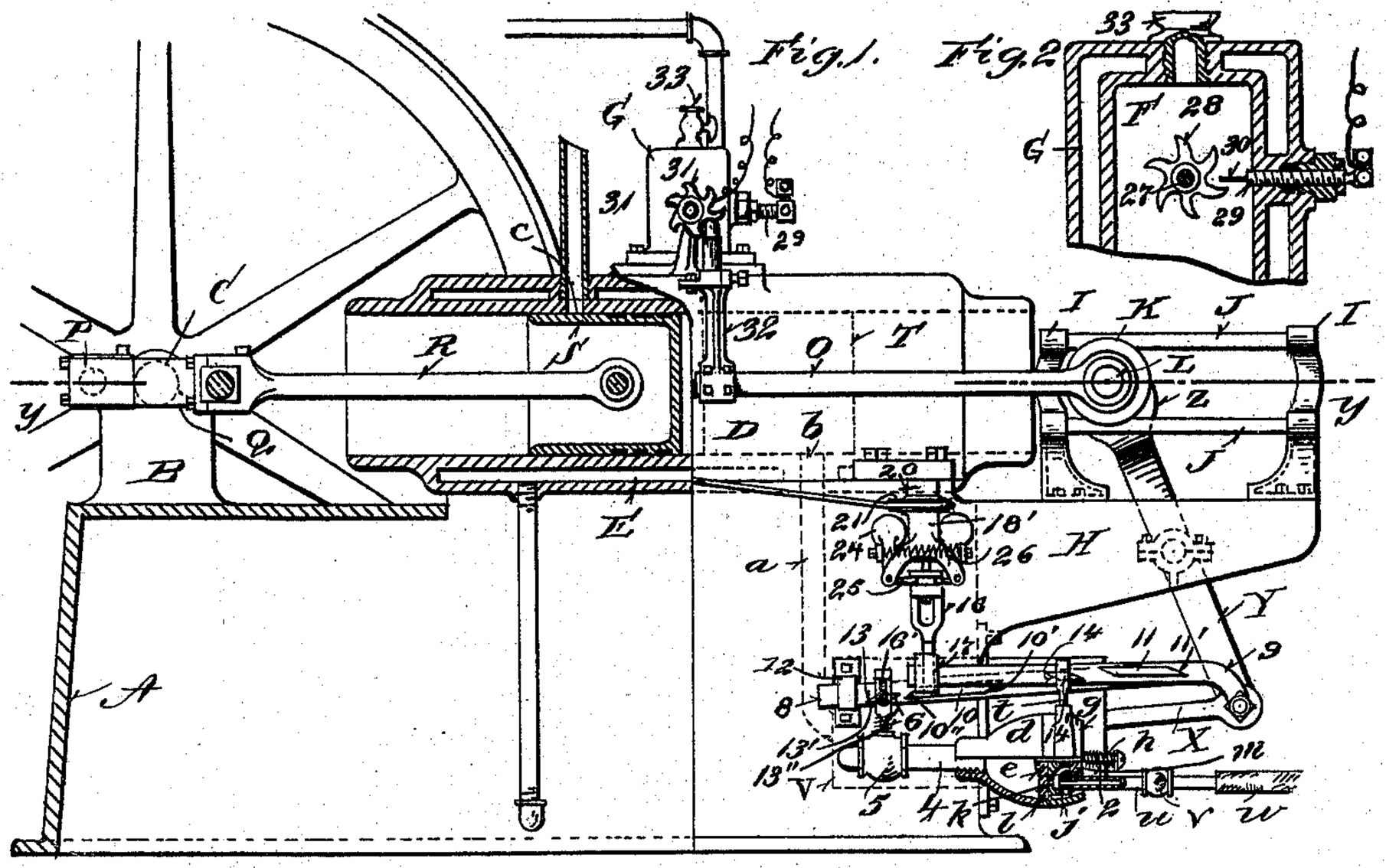


Fig. 2.

Fig. 3.

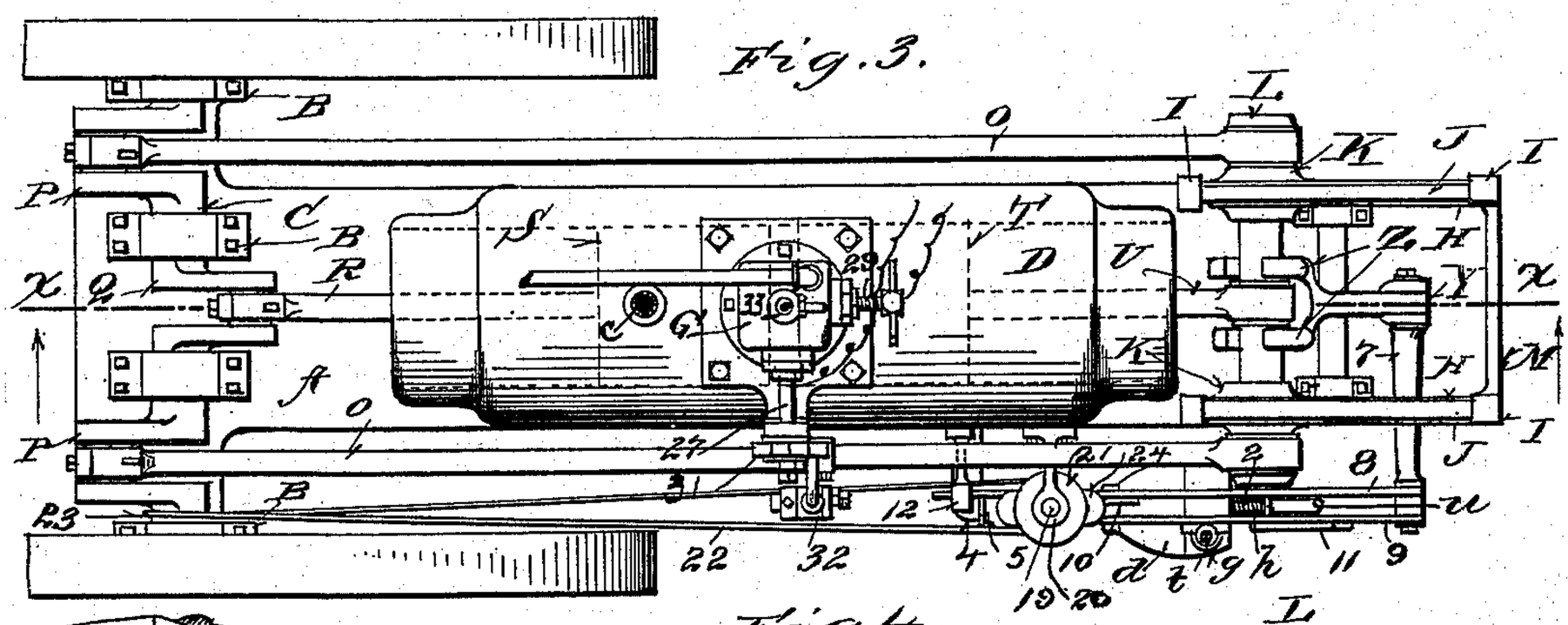
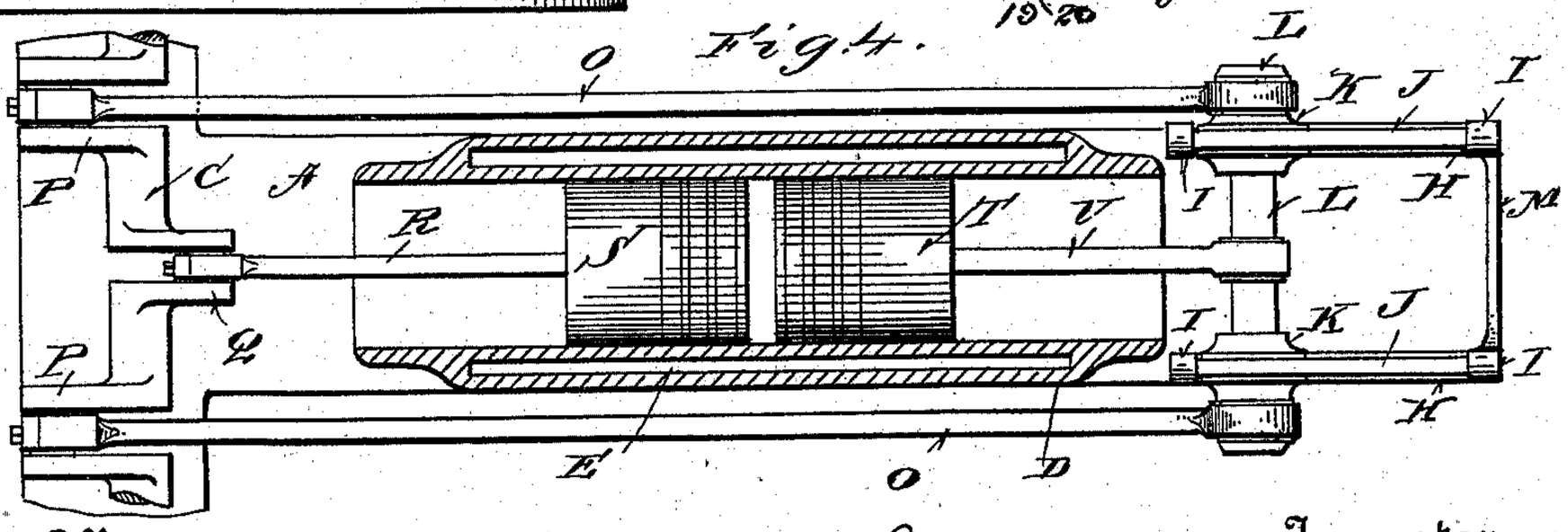


Fig. 4.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

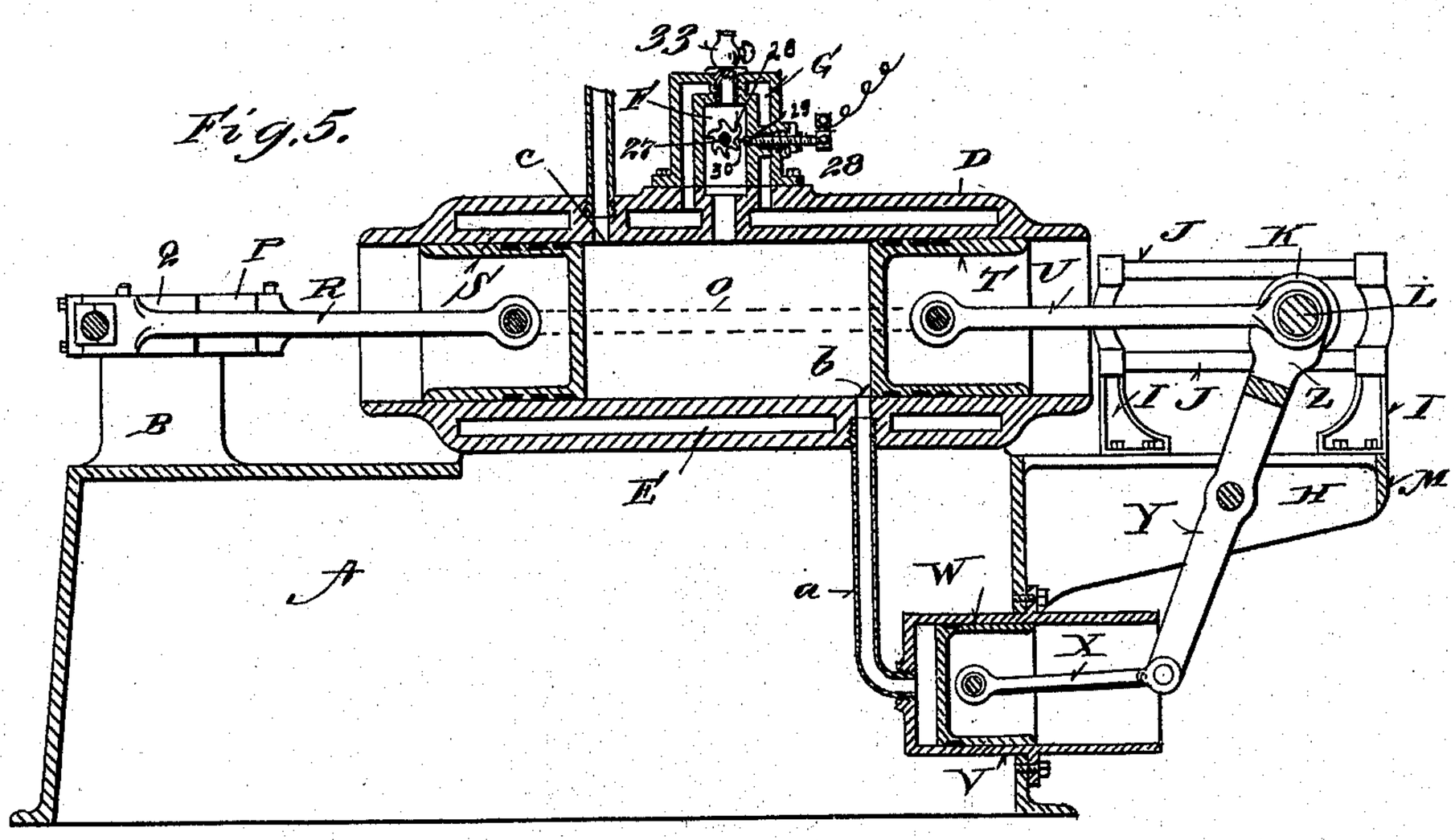

Fig. 6.

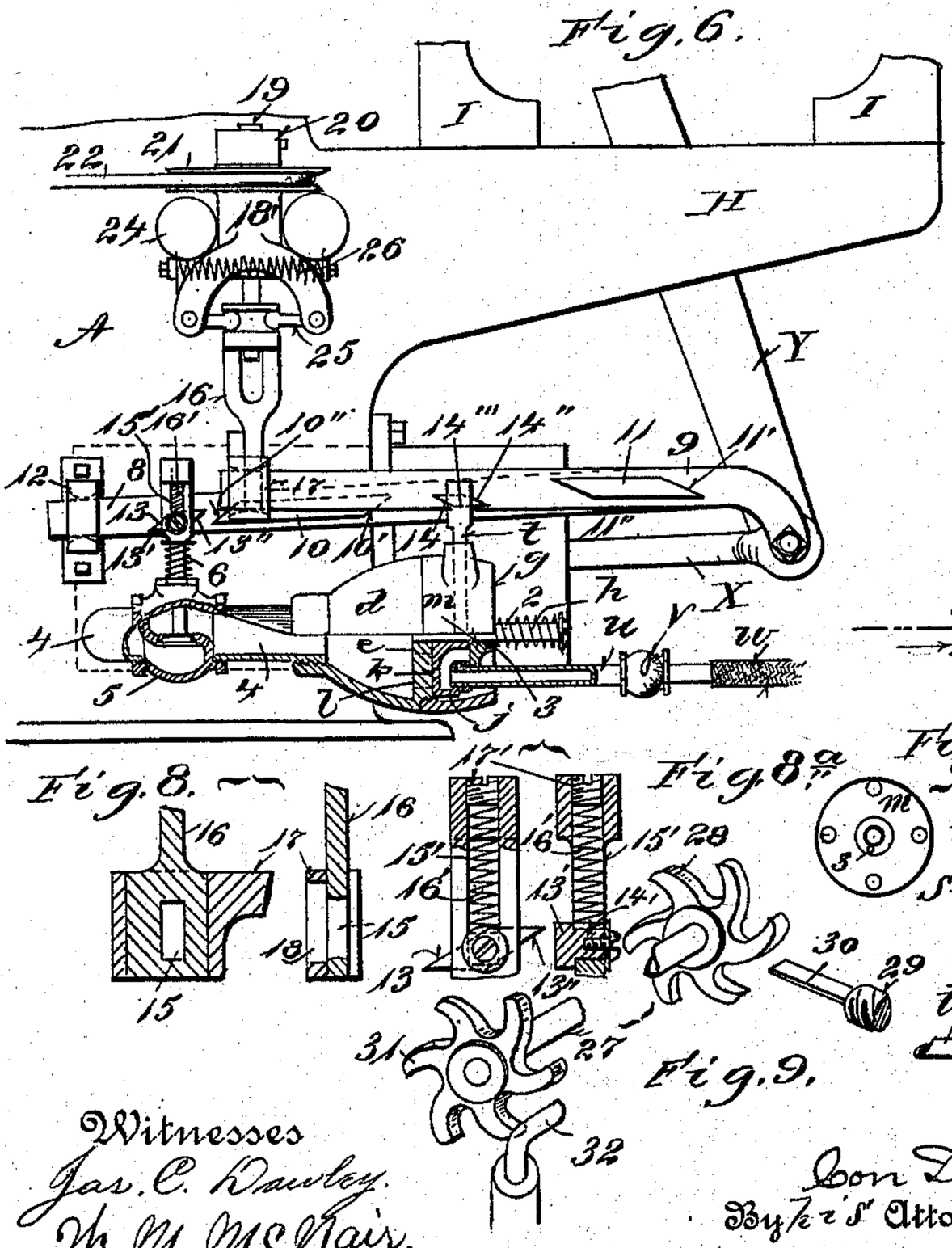

Fig. 7.

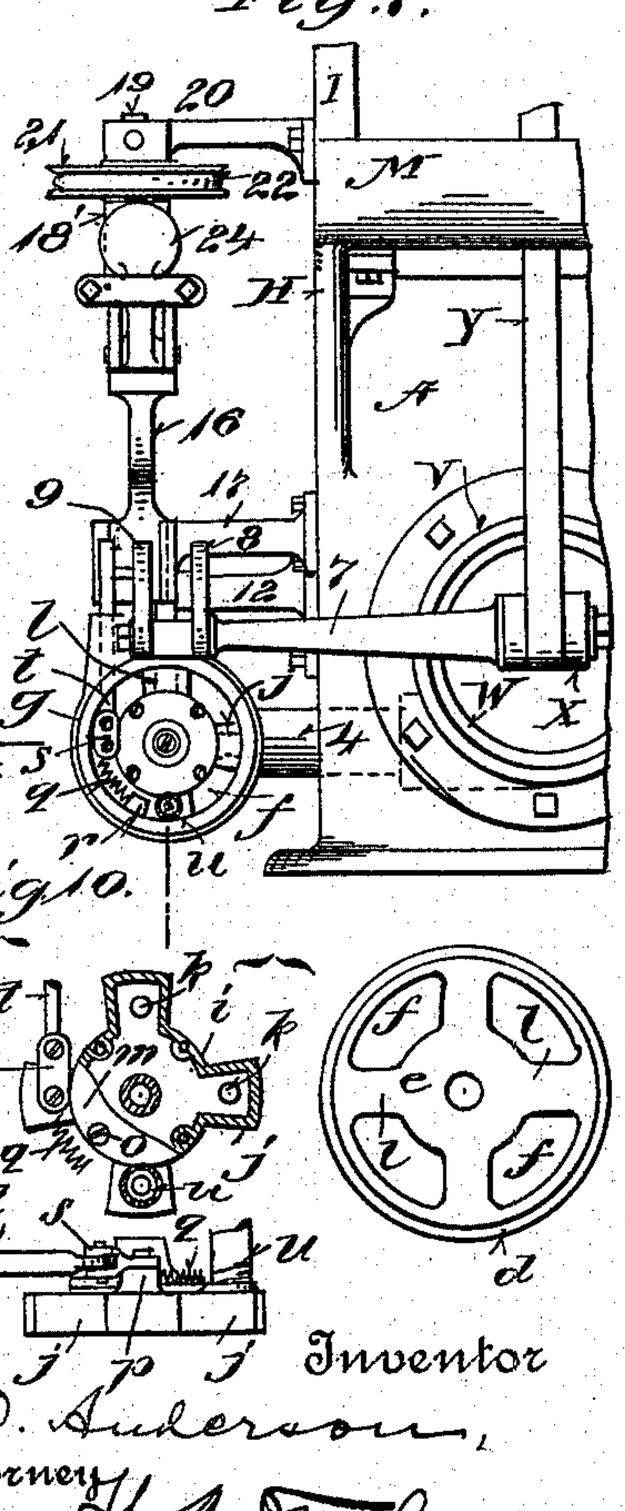

Fig. 8.

Fig. 8a.

Fig. 9.

Fig. 10.

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UNITED STATES PATENT OFFICE.

CON D. ANDERSON, OF SPRINGFIELD, OHIO.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 567,954, dated September 22, 1896.

Application filed April 1, 1895. Serial No. 543,930. (No model.)

To all whom it may concern:

Be it known that I, CON D. ANDERSON, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in gas-engines.

My improvements have reference to a new form of igniter; have reference to combining with a single cylinder with the two reciprocating pistons a charging and compressing pump for the explosive agent, whereby the cylinder is charged, making it possible to effect an explosion at every revolution of the shaft; have reference to an air and gas admission valve; have reference to an improved governor-controlled mechanism for operating said valve, and to other details hereinafter appearing.

In the accompanying drawings, on which like reference-letters indicate corresponding parts, Figure 1 is a partial side elevation and sectional view of my improved gas-engine. Fig. 2 is a detail and vertical section of the electrode and ignition-chamber; Fig. 3, a plan view of the engine entire; Fig. 4, a longitudinal horizontal sectional view on the line *y y* of Fig. 1; Fig. 5, a vertical sectional view of the engine on the line *x x* of Fig. 3; Fig. 6, an enlarged partial elevation and sectional view of the bed, the governor mechanism, pump-valve, and operating devices; Fig. 7, a rear elevation of the parts shown in Fig. 6; Fig. 8, detail sectional views of the governor-hanger and guiding-bracket; Fig. 8ª, detail views of the valve-stem and top; Fig. 9, a detail perspective view of the igniter, and Fig. 10 detail views of the air and gas valve.

A base A, preferably of cast-iron, has pillow-blocks B for the driving-shaft C, and supports the cylinder D with its water-jacket E, and dome or igniter-chamber F, having a water-jacket G. Extensions H of the base support standards I, in which are fastened ways or guides J, between which are mounted grooved traveling pulleys K, in which is fitted a cross-head L. The bar M braces the outer brackets I. Connecting-rods O connect the cross-head L directly with the cranks P of the driving-shaft C. In turn this shaft, through a crank Q and piston-rod R, connects with one of the pistons S, while the piston T connects by a piston-rod U with the cross-head L, and thence through the connecting-rods O with the driving-shaft. Thus both pistons are connected with the driving-shaft by intermediate reciprocating mechanism of a most direct and positive character. The cranks P and Q extend in opposite directions, and one piston pushes while the other pulls upon this shaft, the forces being exerted in opposite directions and the connections direct and through straight rods. The pistons are also in the same axial line, so that they receive the shock of the explosion equally and are constantly forced out with equal power and speed.

The explosive agent, when consisting of air and gas, natural or artificial, is introduced into the cylinder by the air and gas valve, presently to be described, whence the two ingredients pass together into a charging and compressing chamber consisting of a cylinder V, secured in the lower part of the base A, and of a piston W, operated by a piston-rod X, connected with a rocking lever Y, operated by connection with the cross-head L. The upper end of the lever Y is formed into jaws Z, which are bifurcated to receive the cross-head. A feed-pipe *a* connects the pump with the inlet-port *b* of the cylinder, which, it will be observed, (see Fig. 5,) is placed so as to be entirely open when the piston T is at its extreme outer position, at which time the pump-piston is at its extreme inner position, as shown in Fig. 5, and the fresh charge is being ejected from the pump. It will also be seen that as the piston T proceeded outward the pump-piston W proceeded inward, and hence the charge, having been drawn into the pump on the outstroke of the piston W, was being compressed until the inlet-port *b* was opened by the piston T. This done, the charge rushes into the cylinder with great rapidity. The spent gases are thus driven out, or assisted in being driven out, of the exhaust-port *c*, while a moment later the pistons S and T return inward and compress the charge. Then, just as the cranks are slightly off of the dead-center, the igniter operates

and, producing a spark, ignites the charge. Going back now to a description of the air and gas valve, it will be seen that a shell *d* has across its larger end a partition *e*, with openings *f*, and that a section *g* of the shell screws upon the section *d*, (see Fig. 6,) and a pin *h*, supported by the partition *e*, has mounted on it the valve proper, which fits snugly against the partition *e* and is composed of a cup *i* with hollow projections *j*, having perforations *k*, which normally stand over the arms *l* of the partition *e* and are closed by said arms. This cup has a cap or cover *m*, fastened to it by screws *o*. A lug *p* on a plate *m* supports a spring *q*, one end of which abuts against the lug *r* on the interior of the part *g* of the shell, which spring acts as a cushion between the cup *i* and the shell. The lug *p* also carries a pivoted link *s*, to which is pivoted a pitman *t*, which when reciprocated positively in an upward direction partially rotates the cup *i* and presents the perforations *k* opposite the openings *f*, whereby gas is permitted to enter the part *d* of the shell, being supplied to the cup *i* by a pipe *u*, having a cock and indicator *v* and a flexible section *w* to permit the pipe *u* to move when the cup is partially rotated, The cup is rotated back by the torsional action of the spring 2, secured to the pin *h* and to the plate *m* at 3. The air freely enters at all times into the shell *d* through the openings *f*. The parts are so timed that when the cup *i* is supplying gas to the openings *f* the pump-piston W is moving outward, so as to draw the air and gas into the pump. A pipe 4 conveys the mixture from the shell *d* to such pump. A check-valve 5 is in this pipe and held closed by a spring 6, but opened at the proper time to permit the passage of the charge. Referring now to the means for operating the valve 5 downward and the pitman *t* upward, it will be seen that a projection 7 is carried by the lever Y, and to the projection are connected bars 8 and 9, having cam-blocks 10 and 11, respectively. The bar 8 is guided in a bracket 12, secured to the base and reciprocated back and forth with the motions of the pump-piston. As the piston moves outward and sucks in the charge the incline 10′ of the cam 10 engages with the incline 13 of the trip 13′ and opens the valve 5. This trip has a square shank 14′, which fits a slot 15′ in the stem of the valve 5 and is held down in the slot by a spiral spring 16′, confined by a plug 17′. Thus when the pump-piston makes the instroke the incline 10″ of the cam 10 engages the incline 13″ of the trip and lifts the latter against the spring 16′, so that the valve is not operated by this movement.

As the pump-piston moves outward to draw in the charge the incline 11′ of the cam-block 11 engages with the incline 14 of the lug 14‴, fixed to the pitman *t*, and raises it so as to partially rotate the cup *i* to admit gas. The lower end of the incline 11′ stands a little below the upper end of the incline 14. The spring *q*, Figs. 7 and 10, holds the pitman *t* the proper height to preserve this relative position of the ends of said inclines. When the pump-piston moves inward to force out the charge, the gas-valve remains closed, and to this end the arms of the partition *l*, Figs. 7 and 10, are wide enough to keep the perforations *k* lapped across them, notwithstanding that there is a slight depression of the pitman *t* and slight rotation of the cap *i*.

It is desirable not to introduce any gas if the engine is running above the desired speed, and hence the cam-block 11 is put under the control of the governor, so as to be raised above the lug 14′ to escape it. For this purpose the bar 9 passes through a slot 15 in the hanger 16 of the governor, the hanger being guided in a bracket 17, secured to the base and also slotted at 18 to permit the bar 9 to pass through it. The governor consists, further, of a rotating head 18, mounted on a fixed shaft 19, carried by a bracket 20, fastened to the base. The head has a grooved pulley 21, operated by a belt 22, running from a pulley 23 on the main shaft. Governor-balls 24 are pivoted in the head 18 and through their inner arms 25 connect with the hanger 16. A spring 26 interconnects the balls 24. Thus if the engine is running too fast, as by the load being lightened, the cam-block 11 escapes the lug 14′ of the pitman *t* until the speed becomes normal, when the gas-valve will be opened at every revolution or cycle of operation.

In the chamber F, I mount an igniter-shaft 27, with a wheel having curved spokes 28, forming an intermittently-rotating electrode adapted to come in contact with a fixed electrode 29 with a flexible point 30. A wheel with curved spokes 31, also on the shaft 27, is intermittently engaged by a reciprocating striker 32, secured to one of the connecting-bars O. Thus the igniter is operated intermittently. The position of the striker 32 determines when the spark is made. A petcock 33 on the chamber F is for the purpose of relieving the pressure of air or gases in the engine when starting up the engine by hand.

While in the engine I have shown the valve, the operating mechanism, with the governor, and the electrodes shown have been used with success, still I wish to be understood as not limiting my arrangement of pistons, piston-rods, reciprocating cross-head, connecting-bars, and driving-shaft to an engine in which these details are used.

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

1. In a gas-engine, the combination with a cylinder having two pistons therein, and provided with an inlet-port located at the extreme outer limit of one piston and an outlet-port located at the extreme outer limit of the other piston, guides near one end of the cylinder, a driving-shaft near the other, piston-rods connecting the respective pistons with

the cross-head and shaft, and connecting-rods between the cross-head and said shaft.

2. In a gas-engine, the combination with a cylinder and pistons therein, the cylinder having an inlet-port located at the extreme outer limit of one piston, and an exhaust-port located at the extreme outer limit of the other piston, a pump connecting with the inlet-port, guides near one end of the cylinder, a cross-head carried thereby and connected to the pump-piston and to one piston of the engine, a driving-shaft connected to the other piston of the engine and connecting-bars from the cross-head to said shaft, the arrangement being such that when the engine-pistons are out the pump-piston is in.

3. In a gas-engine, the combination with a charging-chamber and a governor, of a valve-shell, a partition therein with openings, a rotatable cup fitted against the partition with perforations closed by the partition in one position and discharging into the openings in another position, a pitman connected to the cup and operated by said governor to retard the speed of the engine and a spring to return the cup to closed position.

4. In a gas-engine, the combination with a pump-supply pipe and its valve having a sliding trip, of a reciprocating bar having a cam with inclined ends, the cam passing over the trip in one direction to open the valve and under the trip in the other direction, the trip yielding in the latter operation.

5. In a gas-engine, the combination with a valve and a pitman connected thereto, with a trip on the pitman, of a reciprocating bar with raised inclined ends adapted to elevate the pitman by passing under the trip in one direction, and to pass over the trip in the other direction and but slightly move the pitman.

In testimony whereof I affix my signature in presence of two witnesses.

CON D. ANDERSON.

Witnesses:
HORATIO J. TORGY,
W. M. MCNAIR.