(No Model.) 4 Sheets—Sheet 2.

E. PROUTY.

GASOLENE OR VAPOR ENGINE.

No. 570,500. Patented Nov. 3, 1896.

FIG. 2

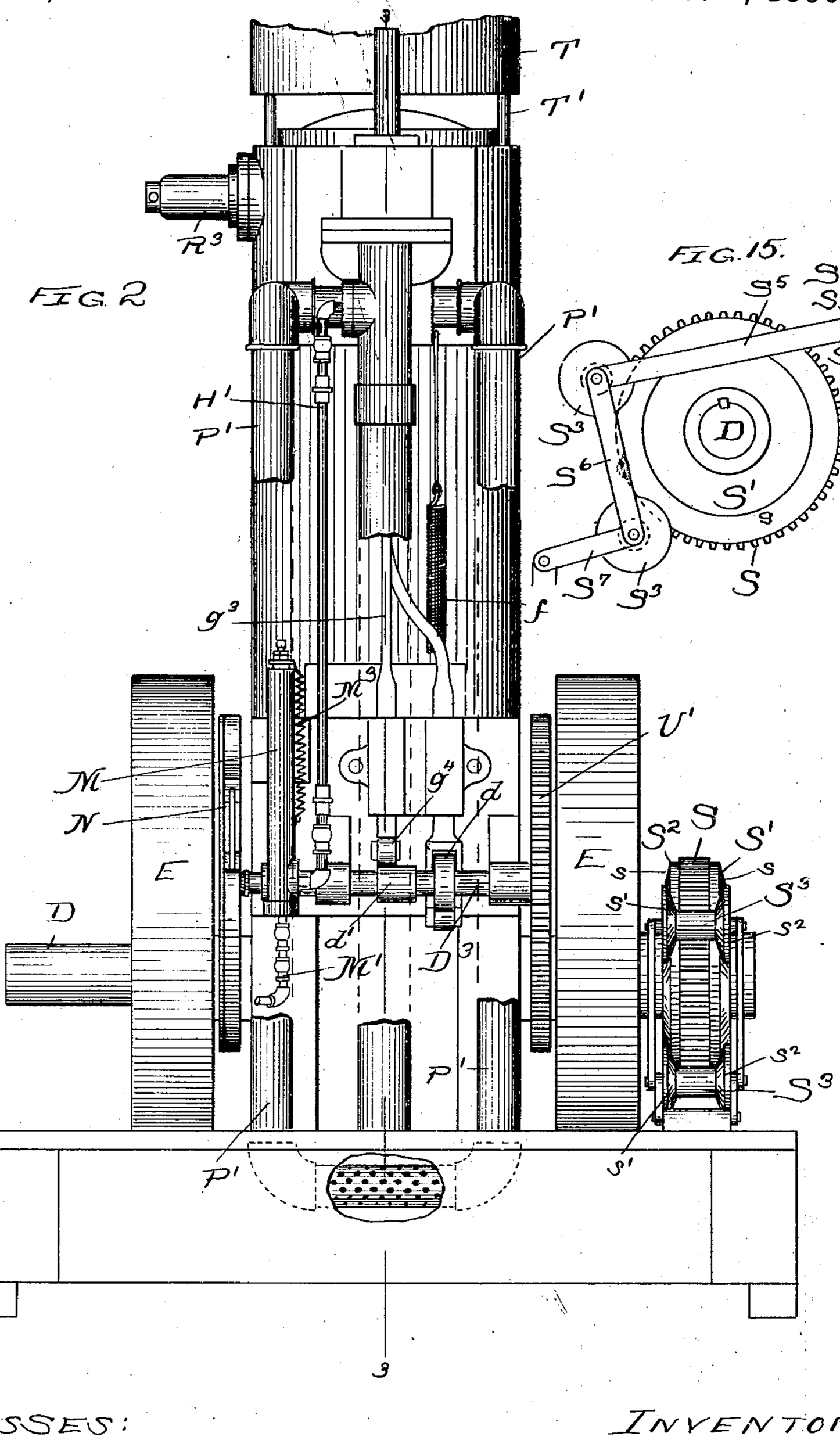

FIG. 15.

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HIS ATTORNEYS.

(No Model.)

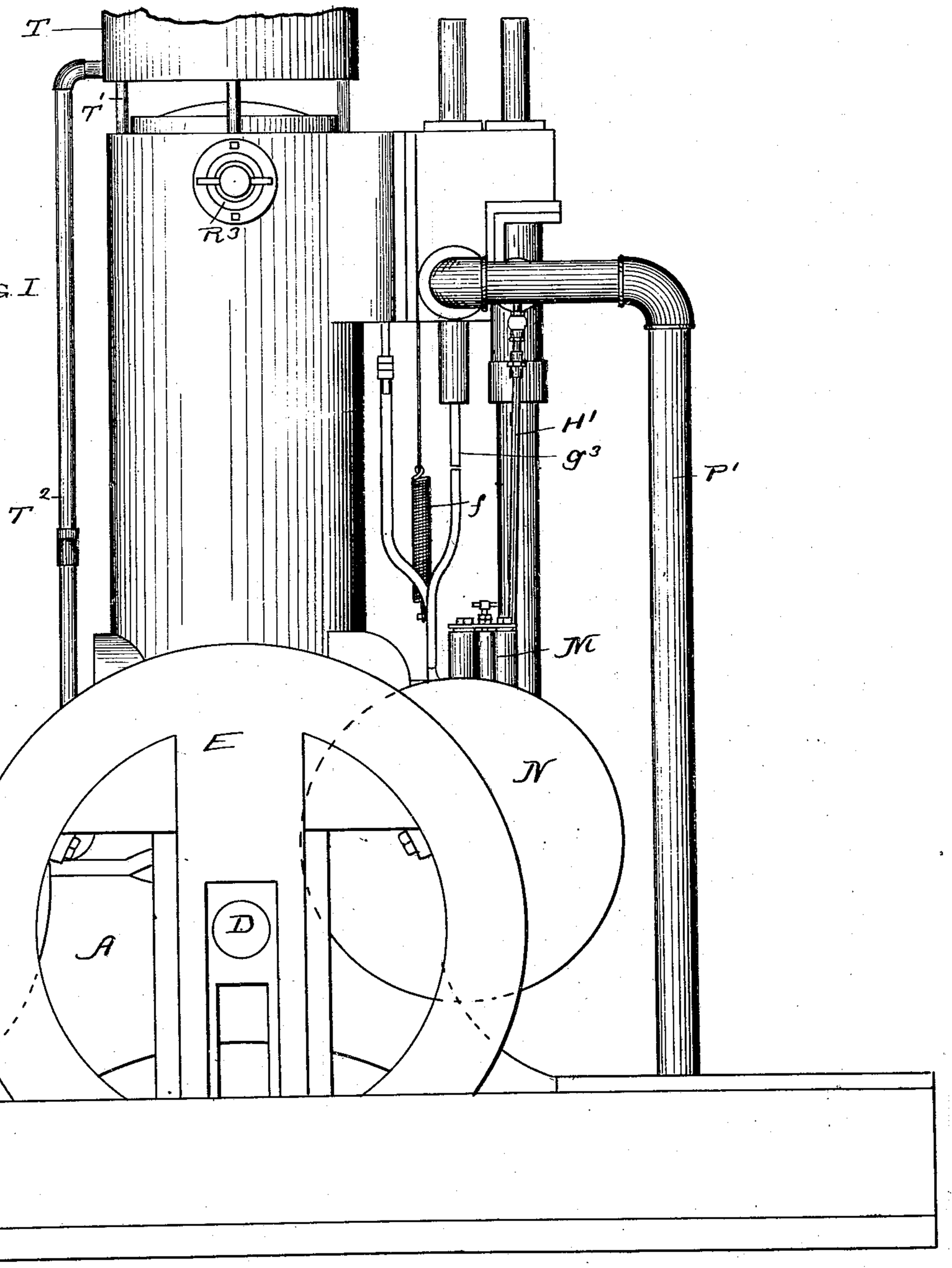
4 Sheets—Sheet 1.

E. PROUTY.

GASOLENE OR VAPOR ENGINE.

No. 570,500. Patented Nov. 3, 1896.

FIG. I



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(No Model.) 4 Sheets—Sheet 3.

E. PROUTY.

GASOLENE OR VAPOR ENGINE.

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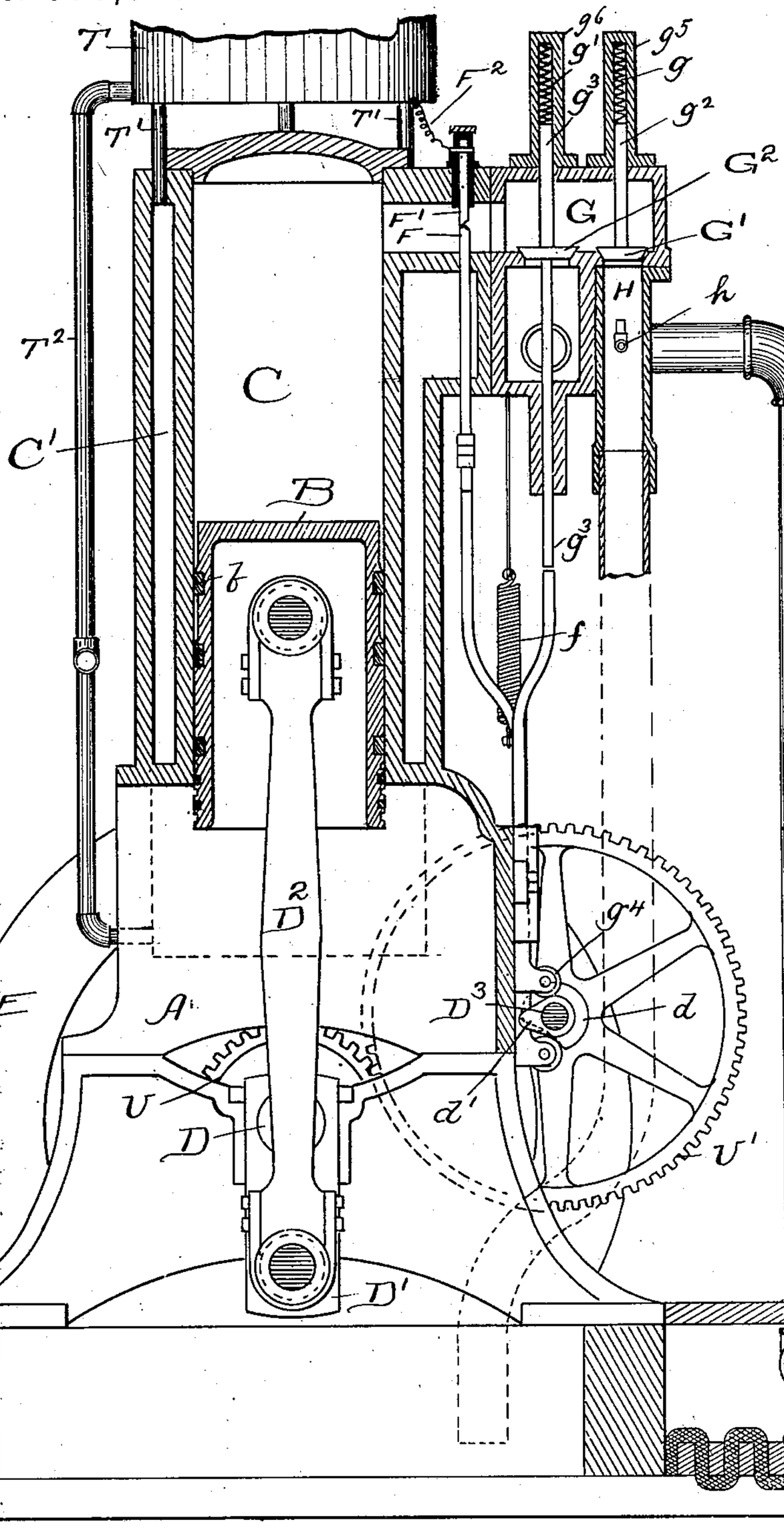

Fig. 3.

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(No Model.) 4 Sheets—Sheet 4.

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GASOLENE OR VAPOR ENGINE.

No. 570,500. Patented Nov. 3, 1896.

FIG. 4

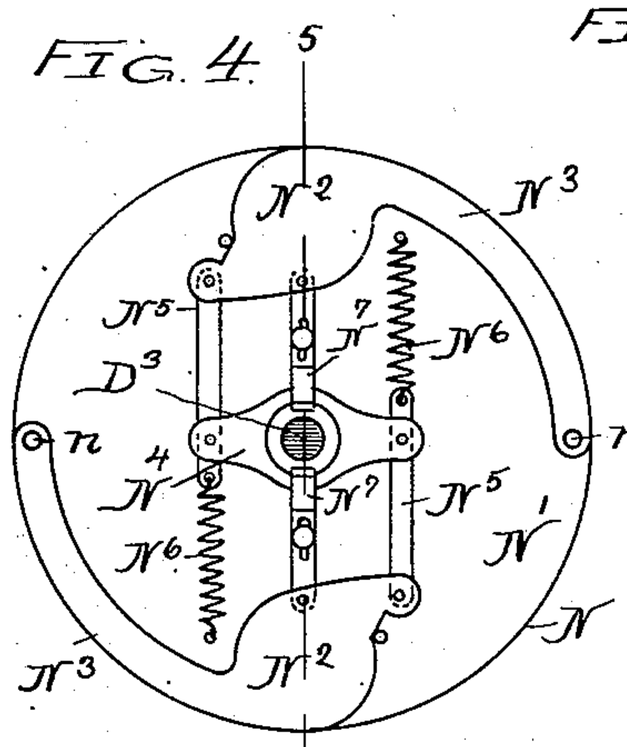


FIG. 5.

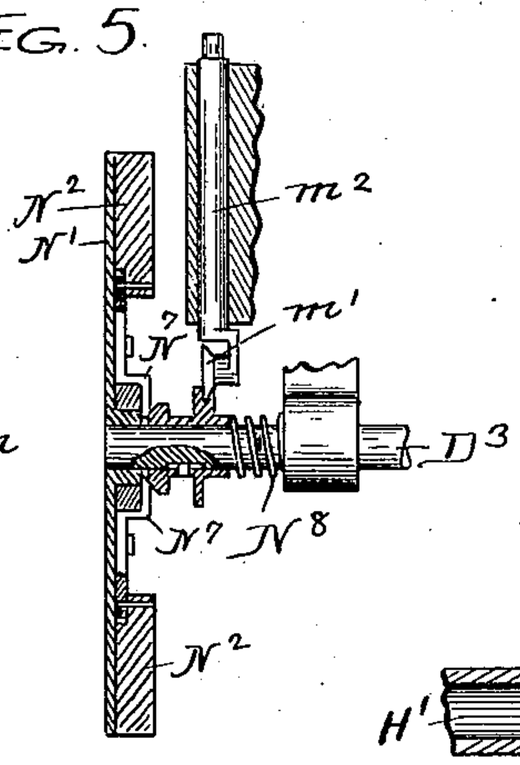


FIG. 9

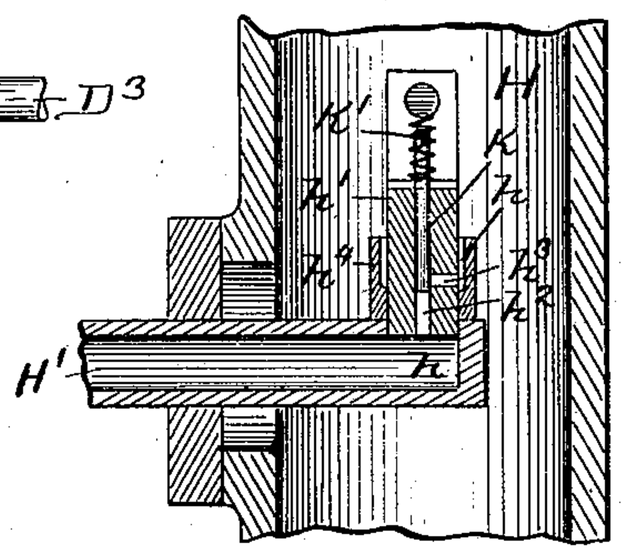


FIG. 6

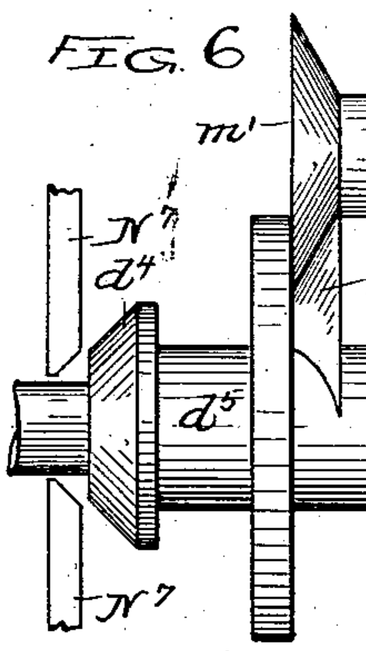


FIG. 7.

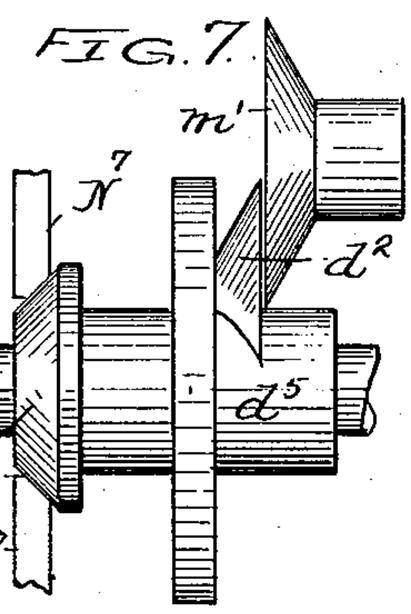


FIG. 8.

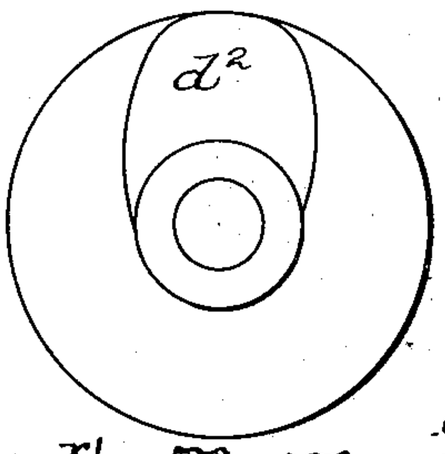


FIG. 14.

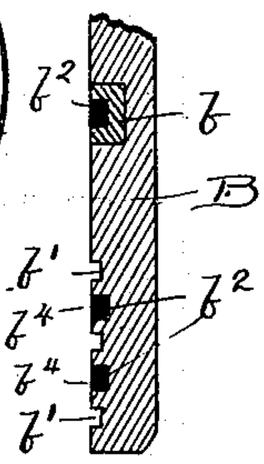


FIG. 11

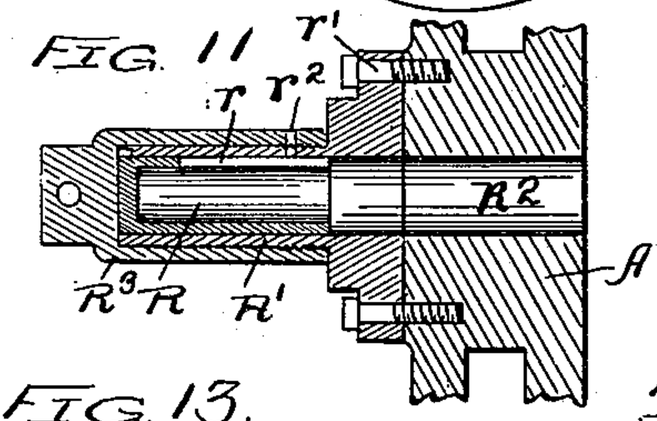


FIG. 10

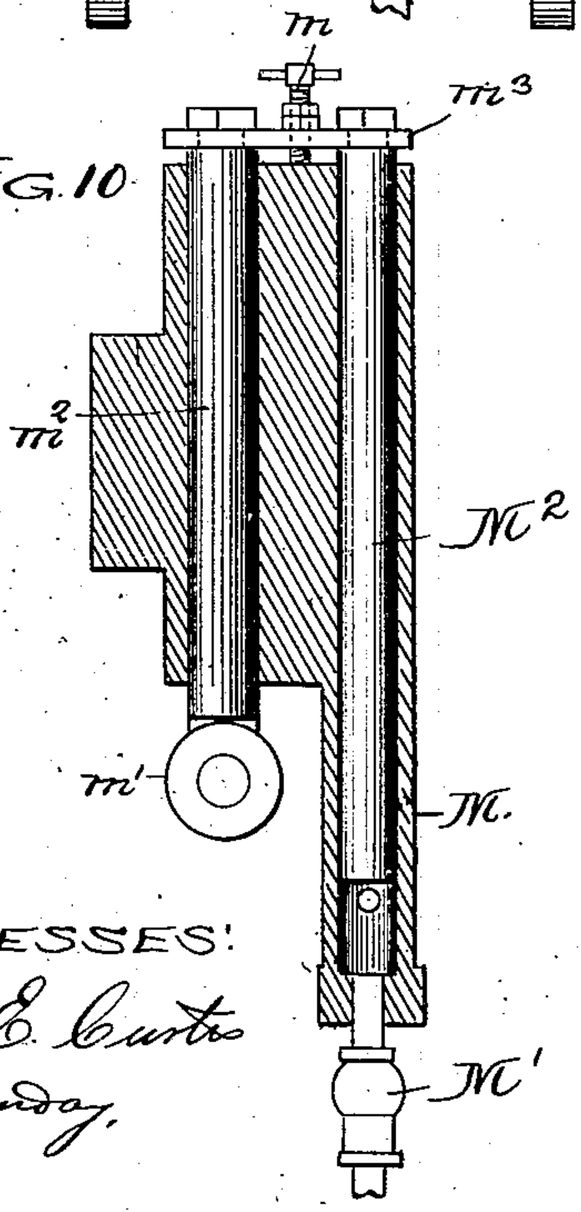


FIG. 13.

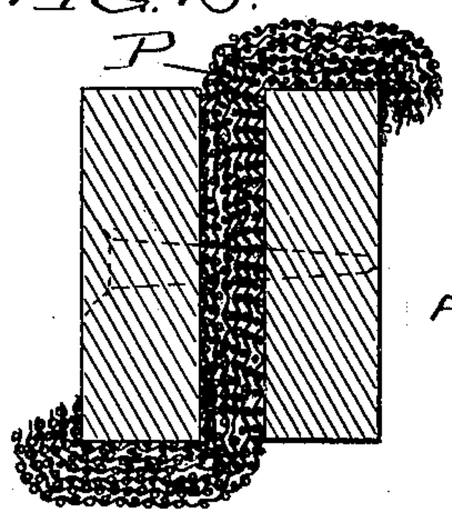
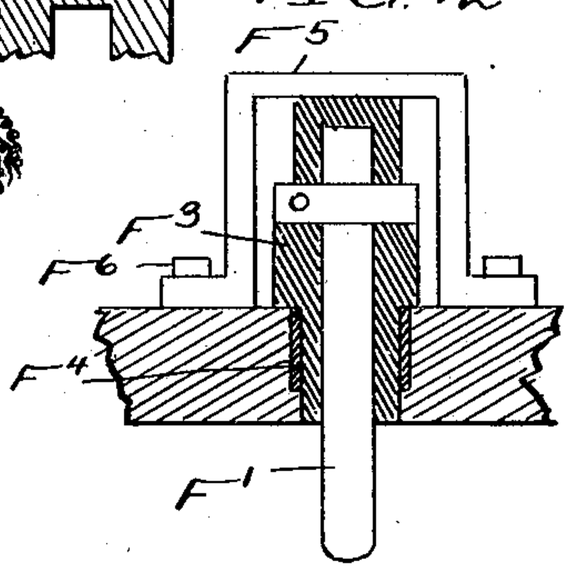


FIG. 12



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UNITED STATES PATENT OFFICE.

ENOCH PROUTY, OF CHICAGO, ILLINOIS, ASSIGNOR TO OLIVE S. PROUTY AND ENOCH PROUTY, OF SAME PLACE.

GASOLENE OR VAPOR ENGINE.

SPECIFICATION forming part of Letters Patent No. 570,500, dated November 3, 1896.

Application filed November 1, 1895. Serial No. 567,600. (No model.)

To all whom it may concern:

Be it known that I, ENOCH PROUTY, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Gasolene or Vapor Engines, of which the following is a specification.

My invention relates to gasolene or vapor engines.

The object of my invention is to produce a gasolene or hydrocarbon engine of a simple, efficient, and durable construction, that will operate economically, utilizing to the best advantage the power generated by the explosion of the compressed air and vapor mixture, and at the same time securing the proper admixture of air with the vapor, so as to produce the best results, and having a sensitive and effective means for governing and controlling the speed of the engine and also the feed of the liquid hydrocarbon to the engine, according to the varying requirements of the load or mechanism driven by the engine.

My invention consists in the novel devices and novel combinations of parts and devices herein shown and described, and specified in the claims.

In the accompanying drawings, forming a part of this specification, and in which similar letters of reference indicate like parts throughout the several views, Figure 1 is a side elevation of a hydrocarbon-engine embodying my invention. Fig. 2 is a front view. Fig. 3 is a section on the line 3 3 of Fig. 2. Fig. 4 is a detail elevation of the governor. Fig. 5 is a section on the line 5 5 of Fig. 4. Figs. 6 and 7 are detail elevations of the cam which is moved or controlled by the governor by which the feed-pump is operated, showing the sliding cam in different positions; and Fig. 8 is a detail plan or face view of this cam. Fig. 9 is a detail sectional view of the vaporizing-chamber and showing the positive cut-off or gate in the gasolene or hydrocarbon feed passage or pipe at or near the discharge orifice or nozzle. Fig. 10 is a detail sectional view of the feed-pump. Fig. 11 is a detail sectional view of the powder-charge starting device for the engine. Fig. 12 is a detail sectional view of the stationary contact-piece of the electric igniter. Fig. 13 is a detail sectional view of the muffler device through which the exhaust is finally discharged from the engine and by which the noise of the exhaust discharge is diminished. Fig. 14 is a detail sectional view of the piston, and Fig. 15 is a detail view of the friction-clutch mechanism on the driving-shaft of the engine.

In the drawings, A represents the frame of the engine; B, its piston; C, its cylinder; D, the driving shaft, having a crank D′, connected by a pitman-rod D^2 to the piston B, and E E are the fly-wheels, one being arranged, preferably, on each side of the cylinder.

The piston B is provided with the customary metallic packing-rings *b*, and with annular channels or grooves *b′* for receiving an oil or lubricant, and with a series of solid, compressed graphite plugs or disks b^2, rigidly and firmly inserted in suitable cavities bored in the piston to receive such graphite lubricating-plugs. The series of graphite plugs are preferably arranged in two or more annular rows b^4 b^4, extending around the cylinder.

The cylinder C is furnished with a water jacket or chamber C′ to prevent the cylinder from overheating. F is the movable contact-piece, and F′ the stationary contact-piece, of the electric igniter. The stationary contact-piece F′ consists of a metal pin connected with the electric circuit F^2, and insulated from the engine by a tubular bushing F^3 of fire-clay or other insulating material, surrounded with an asbestos or other packing F^4 where it enters the port of the engine, and which is held in place by a metallic cap F^5, rigidly secured to the engine by bolts F^6. The movable contact-piece F of the electric igniter consists of a sliding bar or rod which is moved into contact with the contact-piece F′ by means of the spring *f*, and separated therefrom by a positive-acting mechanism, preferably a cam *d* on the cam-shaft D^3, so that the two electrical connections F F′ may be thus brought yieldingly into connection with each other with the fixed and definite degree of pressure due to the tension of the spring and then positively separated by the operation of the cam or other like positively-acting mechanism, thus insuring with certainty the proper making and breaking of the circuit to

produce the requisite spark to cause the ignition of the gas. As the two contact-pieces are brought together by the spring the making of a perfect electrical connection between them on the one hand or the prevention of jamming or injuring the contact-pieces on the other hand does not depend upon the adjustment of the cam or positive mechanism for moving the movable contact-piece.

G is the valve-chamber, G′ the inlet-valve, and G² the outlet or exhaust valve. The valves G′ G² are normally held closed by springs *g g′*, acting against the valve-stems *g² g³*. The spring *g′*, which holds the exhaust-valve G² closed, is made sufficiently stronger than the spring *g*, that holds the inlet-valve G′ closed to cause the inlet-valve only to be opened by the suction of the cylinder when the piston B is making its outward stroke, so that the air and vapor can only be drawn into the cylinder through the inlet. The exhaust-valve G² is opened and held open to permit the discharge of the exhaust from the cylinder C by means of a cam *d′* on the cam-shaft D³ of the engine, and which engages an antifriction-roller *g⁴* on the stem *g³* of the valve G². The springs *g g′* are mounted in closed guides or caps *g⁵ g⁶*, attached to the valve-chamber shell, and which also form closed bearings for the valve-stems *g² g³* to reciprocate in. Although these guides or caps which contain the springs are closed, the springs are not injuriously affected by the heat, as the valve-stems close the communication with the valve-chamber approximately tight.

H is the vaporizing-chamber, connected directly with the valve-chamber, and H′ is the gasolene or other liquid hydrocarbon feed passage or pipe, the same terminating in a nozzle or feed-orifice *h* inside the vaporizing-chamber H. This nozzle or feed-orifice *h* projects, preferably, upward or toward the inlet-valve, and is preferably of an annular form, so that the liquid will be separated into a thin annular sheet as it is discharged from the same. The feed-passage, or the portion thereof connected directly with the annular feed-orifice *h*, is preferably formed in a cylindrical plug *h′* by forming a central bore *h²* through the same, and a radial bore *h³* communicating with the central bore and with the annular orifice *h*, so that the periphery of the plug may form the inner wall of the annular orifice. The outer wall of the annular orifice is preferably formed by a sleeve *h⁴*, surrounding the plug *h′*.

K is the positive cut-off or gate for closing the feed-passage H′ at or near its discharge orifice or nozzle. This positive cut-off or gate may be of any desired construction suitable for performing this function. It however preferably consists of a sliding pin or piston reciprocating in the central bore *h²* of the plug *h′* and operating to close the feed-passage at the radial bore *h³*. It is closed and held normally closed by a spring K′. It is opened by the stroke of the feed-pump M through the pressure of the hydrocarbon or liquid against the gate or cut-off overcoming the pressure of the spring K′. As the feed-passage is thus positively closed by a gate or valve near the feed-orifice the instant the required quantity of liquid is forced into the vaporizing-chamber by the feed-pump, the forcible suction of the air through the vaporizing-chamber is thus prevented when passing the feed-orifice from drawing or sucking the gasolene or hydrocarbon from the feed-passage and thus occasioning irregularities in the quantity fed at each successive time or stroke.

The feed-pump M, which operates to inject the gasolene or hydrocarbon in fixed and regular charges or quantities, as required, into the vaporizing-chamber, communicates with the reservoir containing the liquid or with the pipe M′ leading thereto, and also with the feed pipe or passage H′, leading to the vaporizing-chamber H. This pump preferably consists of a cylinder in which fits a piston M², furnished with an adjusting-screw *m* to regulate the stroke of the piston and thus the quantity of liquid fed at each movement. The piston of the pump is operated in one direction by a spring M³ and in the other direction by a cam *d²* on the cam-shaft D³, which engages an antifriction-roller *m′* on a guide-rod *m²*, connected with the piston of the pump by an arm *m³*.

N is the governor, the same comprising, preferably, a disk or wheel N′ and two diametrically opposite weights N² N² on quadrant-arms N³ N³, which are pivoted at *n* to the disk and which are connected to the opposite arms of an oscillating lever N⁴ on the cam-shaft D³ by means of pivoted links N⁵ N⁵. The weights or weighted arms are pulled toward each other by springs N⁶ N⁶ and are forced apart by centrifugal action as the disk revolves. Connected to the weights are a pair of slides N⁷ N⁷, that engage the tapering end *d⁴* of the sleeve *d⁵*, carrying the pump-operating cam *d²*. The sleeve *d⁵* is adapted to reciprocate on the cam-shaft D³, so as to throw the cam *d²* into and out of engagement with the roller *m′* on the pump-actuating slide. The roller *m′* and the cam *d²* are both made cone-shaped or flaring, so that a very slight sliding movement imparted to the sleeve *d⁵* by the governor-operated slides N⁷ N⁷ will suffice to move the sharp or tapering edges of the cam *d²* and roller *m′* into engagement or past each other, and then the further revolution of the cam, by reason of its tapering or inclined face, will itself operate to further reciprocate the sleeve *d⁵* and thus bring the cam *d²* into full and proper engagement with the roller *m′*. A very slight movement of the governor will therefore serve to control the pump and the consequent feed of hydrocarbon to the engine, so that I am thus enabled to keep the engine under perfect control. A spring N⁸ serves to move the reciprocating sleeve *d⁵* in the oppo-

site direction to that in which it is moved by the governor-actuated slides N^7 N^7.

The sound-muffler P consists, essentially, of a chamber preferably several times the capacity of the cylinder, into which the exhaust is led through a pipe P′ from the exhaust-valve, and which is furnished with an interwoven wood-slat and wire-screen bottom or side, there being preferably several thicknesses of wire screen or netting interwoven or interlaced with the wood slats, and through which the exhaust passes, and by which the force of the exhaust-blast is broken, scattered, or dissipated. The muffler-chamber P is preferably of wood.

The powder-discharge starting device comprises a metallic thimble, charger, or cartridge R, having a slot *r* at its upper side to permit ignition of the powder therein, in connection with an externally-screw-threaded socket or receiver R′ for the cartridge, which is securely fixed to the cylinder by threaded bolts or screws *r′* at the opening R^2 in the cylinder, and an internally-screw-threaded cap R^3, which serves to hold the cartridge R securely in place while being fired. The cartridge-receiver R′ and the cap R^3 are furnished each with a touch-hole opening r^2, registering with the slot *r*, through which the powder in the cartridge may be conveniently ignited by a match in starting the engine.

The driving-shaft D of the engine is provided with a loose gear or pulley S thereon, which is adapted to be gradually clutched to the driving-shaft, so as to revolve therewith, by means of two friction-disks S′ S^2, one on each side of the gear or pulley S, both of the disks being keyed so as to rotate with the shaft, and one or both of them, preferably one, being so keyed to the shaft that it may slide thereon while rotating therewith. These two disks S′ S^2 have slightly-beveled or cone-shaped outer faces *s s*, and they are forced together, so as to frictionally clamp the gear or pulley S between them, by means of a rotatable spool or wheel S^3, having two bevel-faced flanges or collars *s′* s^2, adapted to engage the bevel-faces *s s* of the disks S′ S^2. The flanged wheel or spool S^3 is moved into and out of engagement with the disks S′ S^2 by means of a clutch-lever S^4, connected by a pivoted rod or link S^5 with the spool S^3 or its hanger S^6. I preferably employ two spools S^3, the same being connected together by the common hanger-bar S^6, one end of the hanger-bar being connected by a pivoted arm or link S^7 with the frame and the other end of the hanger-bar being connected by the link S^5 with the clutch-lever S^4. The clutch-lever S^4 is provided with a pawl S^8, engaging a ratchet S^9, the pawl being operated by a pawl-lever connected by a link with the pawl. As one of the disks S′ S^2 is on each side of the gear or pulley S, it will be observed that though the friction between the disks and the pulley is produced by a pressure in the direction of the axis of the driving-shaft this pressure on the shaft is nevertheless equally balanced. There is therefore by this arrangement no side pressure or end thrust on the driving-shaft or crank-shaft of the engine tending to interfere with the proper operation of the piston in its cylinder or to produce friction or wear between these parts. As this clutch operates gradually and by friction to transmit the power of the engine to the gear or pulley S, the gear and pulley or machinery or mechanism to which it is connected may be rotated at any speed desired, whatever the speed of the engine, and any amount of power desired transmitted, by simply moving the clutch-lever.

T is a tank or reservoir for holding the water for cooling or keeping down the temperature of the cylinder C by circulation through the water-jacket C′ thereof. This tank has an open top and is located directly over the engine-cylinder, and communicates with the top of the water-jacket thereof by a number of straight direct passages or pipes T′, extending directly through the bottom of the tank, so that whatever steam may be generated in the water-jacket may escape directly into and through the body of water in the tank, and thus prevent any pressure or confinement of the steam in the water-jacket or in the pipes or passages leading from the water-jacket to the tank. A pipe T^2 leads from the lower end of the tank to the lower portion of the water-jacket, thus bringing the cooler water from the bottom of the tank directly to the lower portion of the water-jacket, while the hotter or heated water at the upper portion of the water-jacket C′ is continuously discharged directly into the open pan or tank T, from which the vapor can freely escape and thus permit the water to cool. By this means the water in the tank is prevented from being overheated, and at the same time a comparatively small tank or reservoir of water is rendered fully adequate to keep down the temperature of the cylinder, as required.

The cam-shaft D^3 is driven at half the speed of the crank or driving shaft D by gears U and U′.

I claim—

1. In a gasolene or hydrocarbon engine, the combination with a vaporizing-chamber, of a feed-pipe leading into the same provided with a plug furnished with a central bore and a radial bore, and a pin or valve reciprocating in said central bore for closing the feed-passage, substantially as specified.

2. In a gasolene or hydrocarbon engine, the combination with a vaporizing-chamber, of a feed-pipe leading into the same provided with a plug furnished with a central bore and a radial bore, a pin or valve reciprocating in said central bore for closing the feed-passage, a spring for holding said valve closed, and a feed-pump, substantially as specified.

3. In a gasolene or hydrocarbon engine, the combination with a vaporizing-chamber, of a feed-pipe leading into the same provided with

a plug furnished with a central bore and a radial bore, a pin or valve reciprocating in said central bore for closing the feed-passage, a spring for holding said valve closed, a feed-pump, and a sleeve surrounding said plug and forming in connection therewith an annular discharge orifice or nozzle, substantially as specified.

4. In a gasolene or hydrocarbon engine, the combination with a vaporizing-chamber or feed pipe or passage leading into the same, a positive shut-off, gate or valve for closing said feed-passage, a feed-pump, a governor for controlling the action of the feed-pump, a sliding beveled or taper-faced cam operated by said governor, and a bevel or cone-shaped roller connected with the piston of the feed-pump and adapted to engage said cam, substantially as specified.

5. In a gasolene or hydrocarbon engine, the combination with a vaporizing-chamber or feed pipe or passage leading into the same, a positive shut-off, gate or valve for closing said feed-passage, a feed-pump, a governor for controlling the action of the feed-pump, a sliding beveled or taper-faced cam operated by said governor, and a bevel or cone-shaped roller connected with the piston of the feed-pump and adapted to engage said cam, said governor comprising a rotating disk-carrying weight, arms connected by links to an oscillating lever on the cam-shaft and having slides engaging the sleeve of said sliding cam by which the pump is operated, substantially as specified.

6. In a gasolene or hydrocarbon engine, the combination with a feed-pump and a governor with a sliding bevel-faced cam actuated or controlled by the governor, and a bevel or cone-shaped roller connected to the piston of the feed-pump, so that the very slight movement of the cam by the governor will serve to throw said cam into engagement with said roller and thus sensitively and perfectly control the engine said cam being further moved by contact with said roller itself after the knife-edges of said cam-roller have been moved past each other by the governor, substantially as specified.

7. In a gasolene or hydrocarbon engine, the combination with a governor and a feed-pump, of a sliding cam having a beveled face so that it may be moved by said governor partially into position for operating the feed-pump and then be moved by the inclination of the cam-face itself completely into position for operating the feed-pump and a beveled roller connected to the piston of the feed-pump and adapted to engage said cam, substantially as specified.

8. In a gasolene or hydrocarbon engine, the combination with a governor and a feed-pump, of a sliding cam having a beveled face so that it may be moved by said governor partially into position for operating the feed-pump and then be moved by the inclination of the cam-face itself completely into position for operating the feed-pump and a beveled roller connected to the piston of the feed-pump and adapted to engage said cam, a vaporizing-chamber, a feed pipe or passage leading from said pump to said chamber, and a valve or positive shut-off for closing said feed pipe or passage near is discharge-orifice, substantially as specified.

9. In a gasolene or hydrocarbon engine, the combination with a governor and a feed-pump, of a sliding cam having a beveled face so that it may be moved by said governor partially into position for operating the feed-pump and then be moved by the inclination of the cam-face itself completely into position for operating the feed-pump and a beveled roller connected to the piston of the feed-pump and adapted to engage said cam, a vaporizing-chamber, a feed pipe or passage leading from said pump to said chamber, a valve or positive shut-off for closing said feed pipe or passage near its discharge-orifice, and a spring for holding said valve or shut-off normally closed, substantially as specified.

10. In a gasolene or hydrocarbon engine, the combination with the feed-pump of a sliding cam for operating it, a spring for moving said sliding cam in one direction and a governor for moving said sliding cam in the opposite direction, comprising a rotating disk, weighted arms pivoted thereto, an oscillating lever, links connecting the arms of said oscillating lever with said weighted arms, springs for counteracting the centrifugal action of said weighted arms, and radial slides connected to said weighted arms and engaging the sleeve of said sliding cam, substantially as specified.

11. In a gasolene or hydrocarbon engine, the combination with a feed-pump, mechanism for operating the pump and a governor for controlling the pump-operating mechanism, consisting of a rotating disk having spring-held weighted arms pivoted thereto and connected together by an intermediate lever and links and provided with one or more radial slides and mechanism connecting said radial slides with said pump-operating mechanism, substantially as specified.

12. In a gasolene or hydrocarbon engine, the combination with a feed-pump of a rotatable cam d^3 for operating it, having a cone-faced sleeve d^5, a cam-shaft D^3, a rotating governor-disk N′, weighted arms N^3 N^3, oscillating lever N^4 on said cam-shaft, connecting-links N^5 N^5, springs N^6 N^6 and slides N^7 N^7, engaging the cone-faced sleeve of said cam, substantially as specified.

13. In a vapor-engine, the combination with a cylinder and piston, of a powder-charge starting device therefor comprising a charger or cartridge R, a socket or receiver R′ fixed to the cylinder at the opening therein, and a cap R^3 fitting over said receiver to hold the cartridge or charger therein, said cartridge, receiver and cap having radial openings through the same for igniting the powder, said radial

opening in said cartridge R being a longitudinal slit adapted to hold a priming of quick-firing powder, and thus ignite a slow-firing powder in the cartridge simultaneously throughout the length of the cartridge and prevent the powder being blown into the cylinder before ignition, thereby enabling a small amount of slow-firing powder to start the engine substantially as specified.

14. In a vapor-engine, the combination with a cylinder and piston, of a powder-charge starting device therefor comprising a charger or cartridge R, a socket or receiver R′ fixed to the cylinder at the opening therein, and a cap R^3 fitting over said receiver to hold the cartridge or charger therein, said cartridge, receiver and cap having radial openings through the same for igniting the powder, said receiver and cap being furnished with screw-threads to hold the cap in place, said radial opening in said cartridge R being a longitudinal slit adapted to hold a priming of quick-firing powder, and thus ignite a slow-firing powder in the cartridge simultaneously throughout the length of the cartridge and prevent the powder being blown into the cylinder before ignition, thereby enabling a small amount of slow-firing powder to start the engine substantially as specified.

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Witnesses:
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S. E. CURTIS.