No. 705,897. Patented July 29, 1902.

R. L. BARNHART.

MOTOR.

(Application filed June 3, 1901.)

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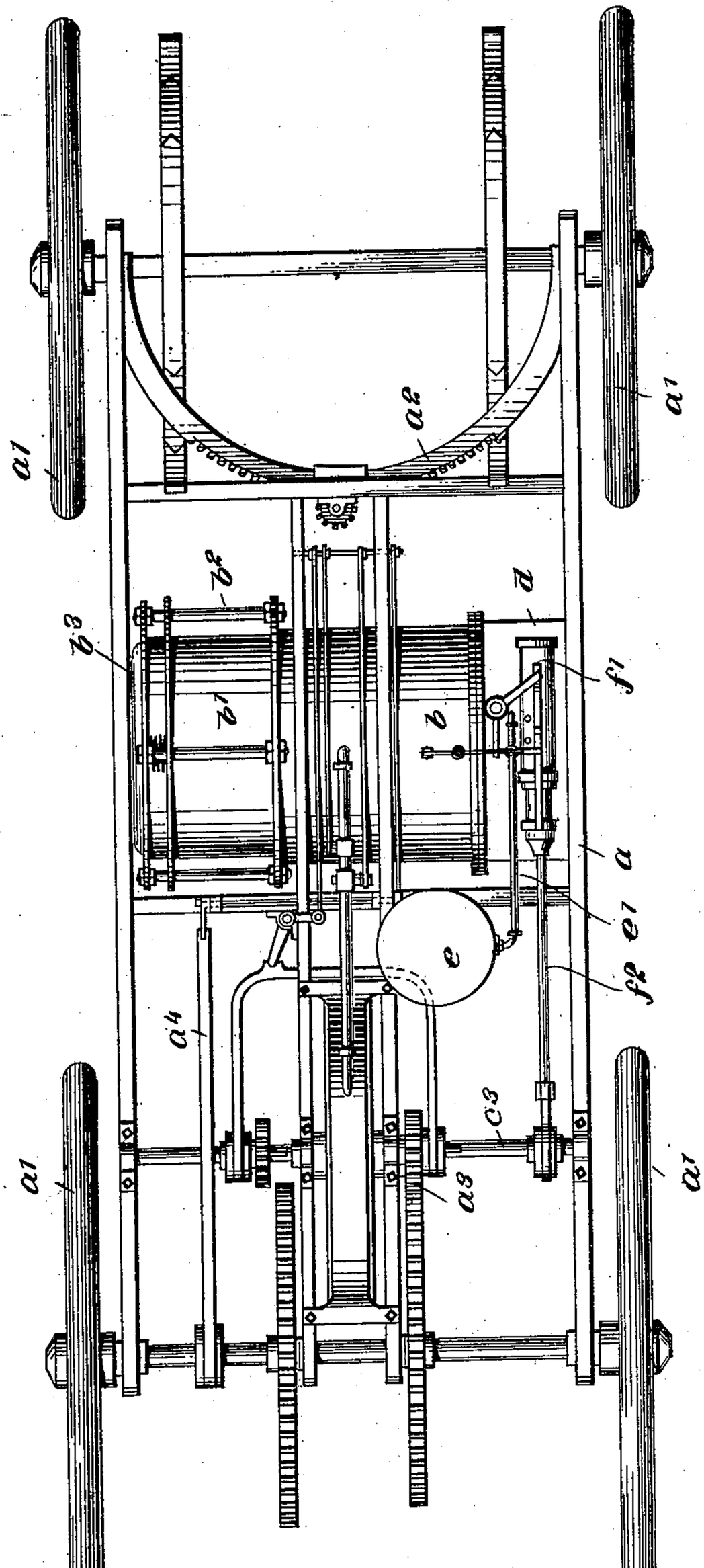

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

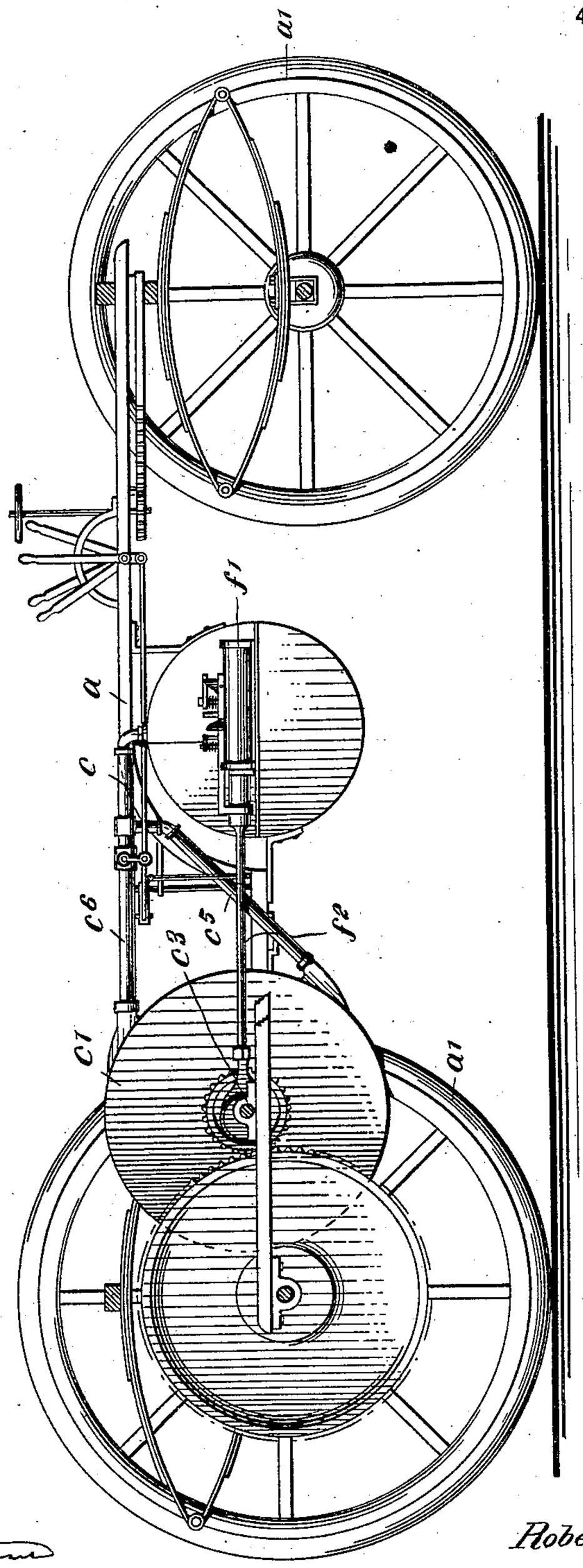

Fig. 2.

WITNESSES:

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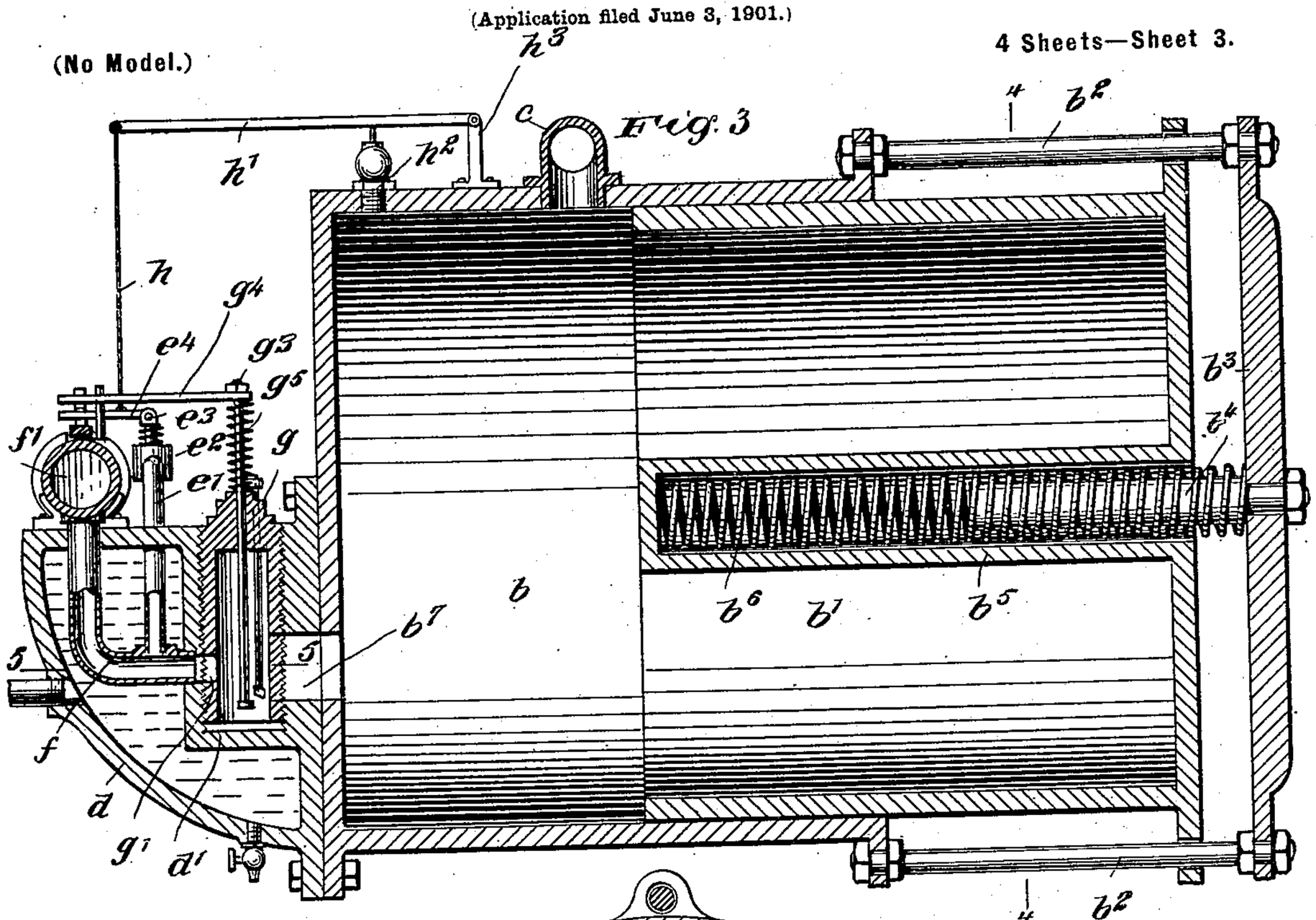

Fig. 3

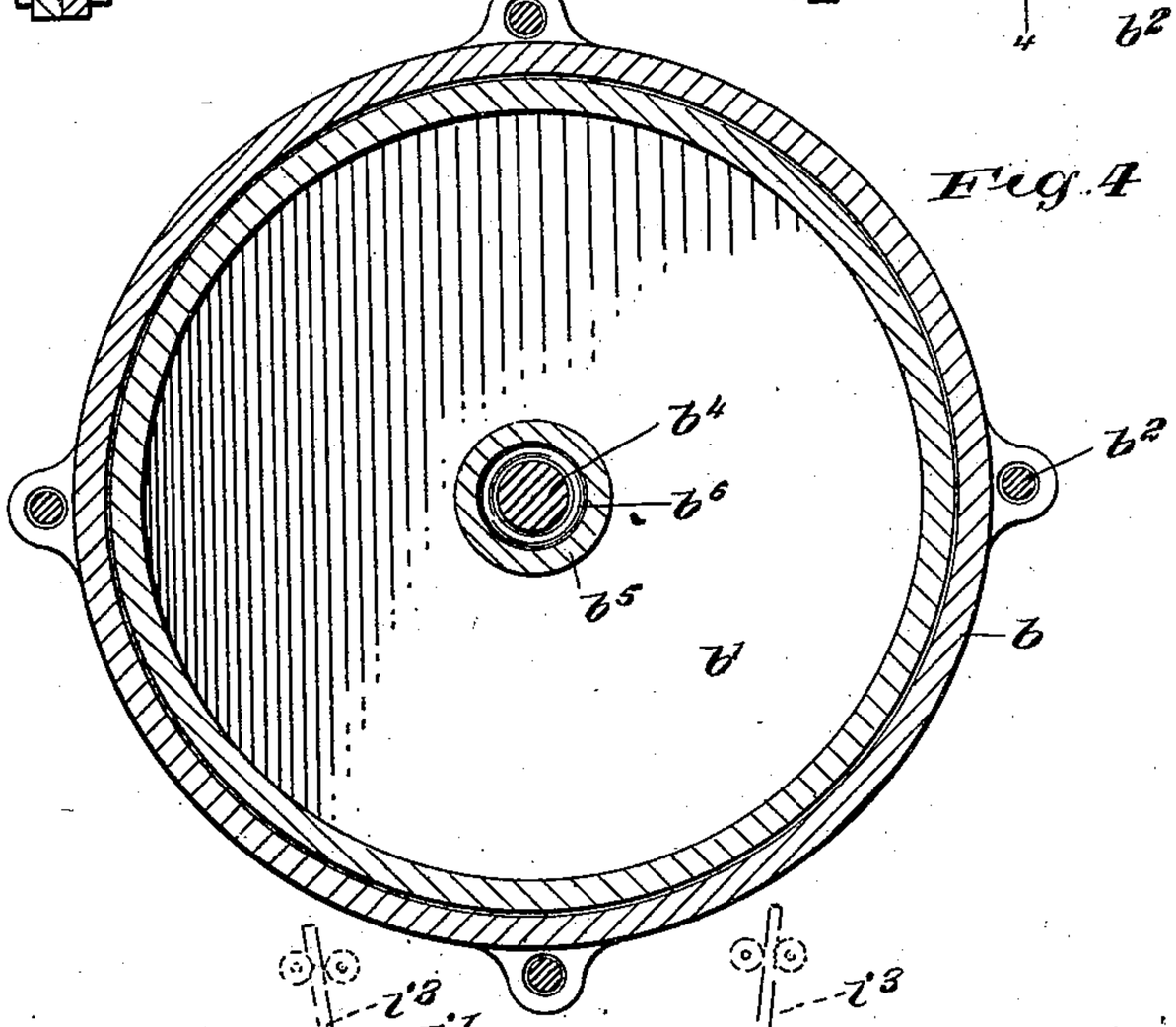

Fig. 4

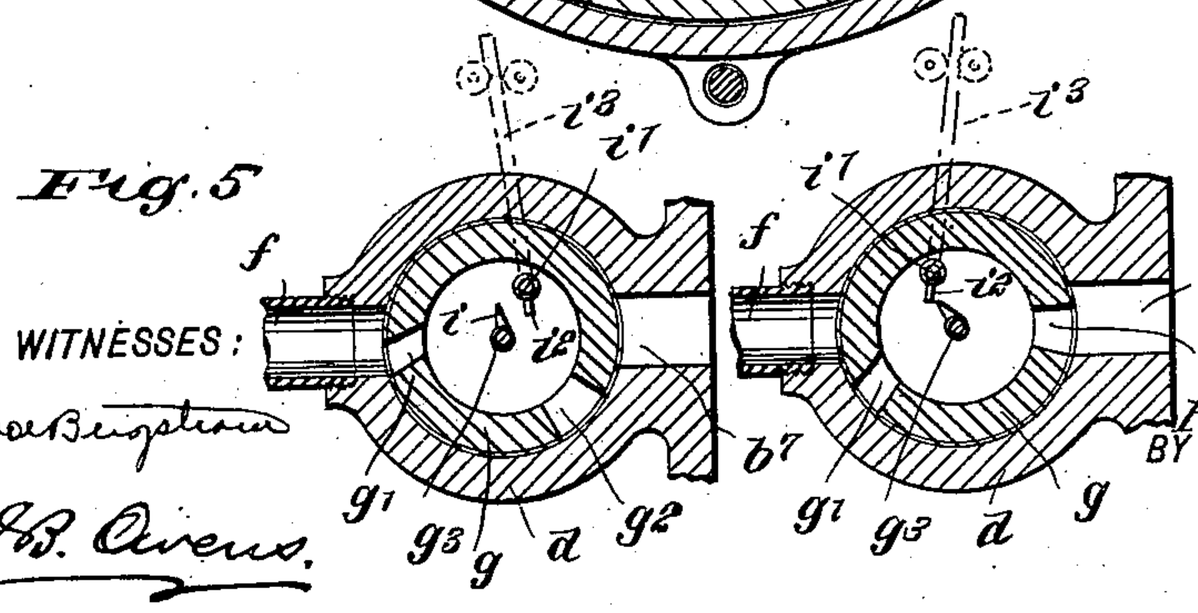

Fig. 5

Fig. 6

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(No Model.) 4 Sheets—Sheet 4.

Fig. 7

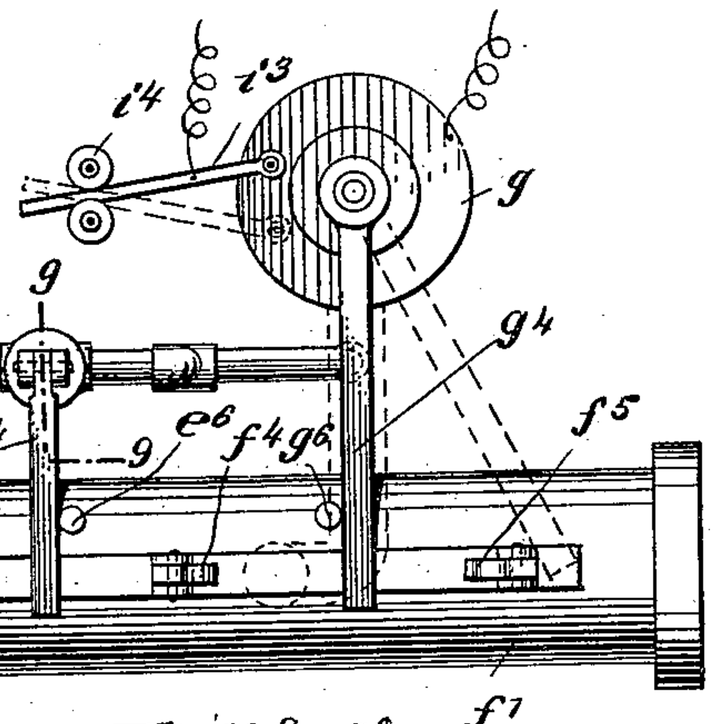

Fig. 8

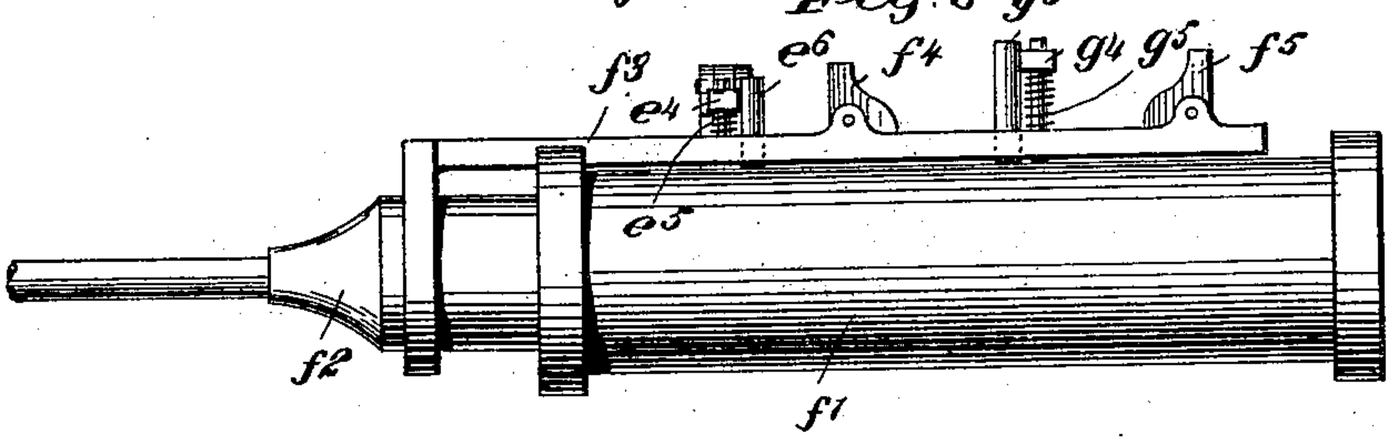

Fig. 11

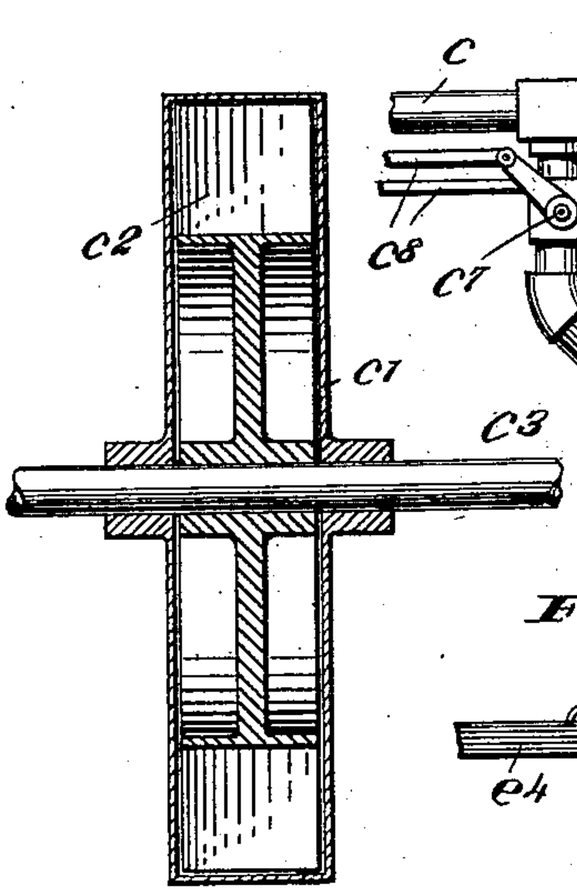

Fig. 10

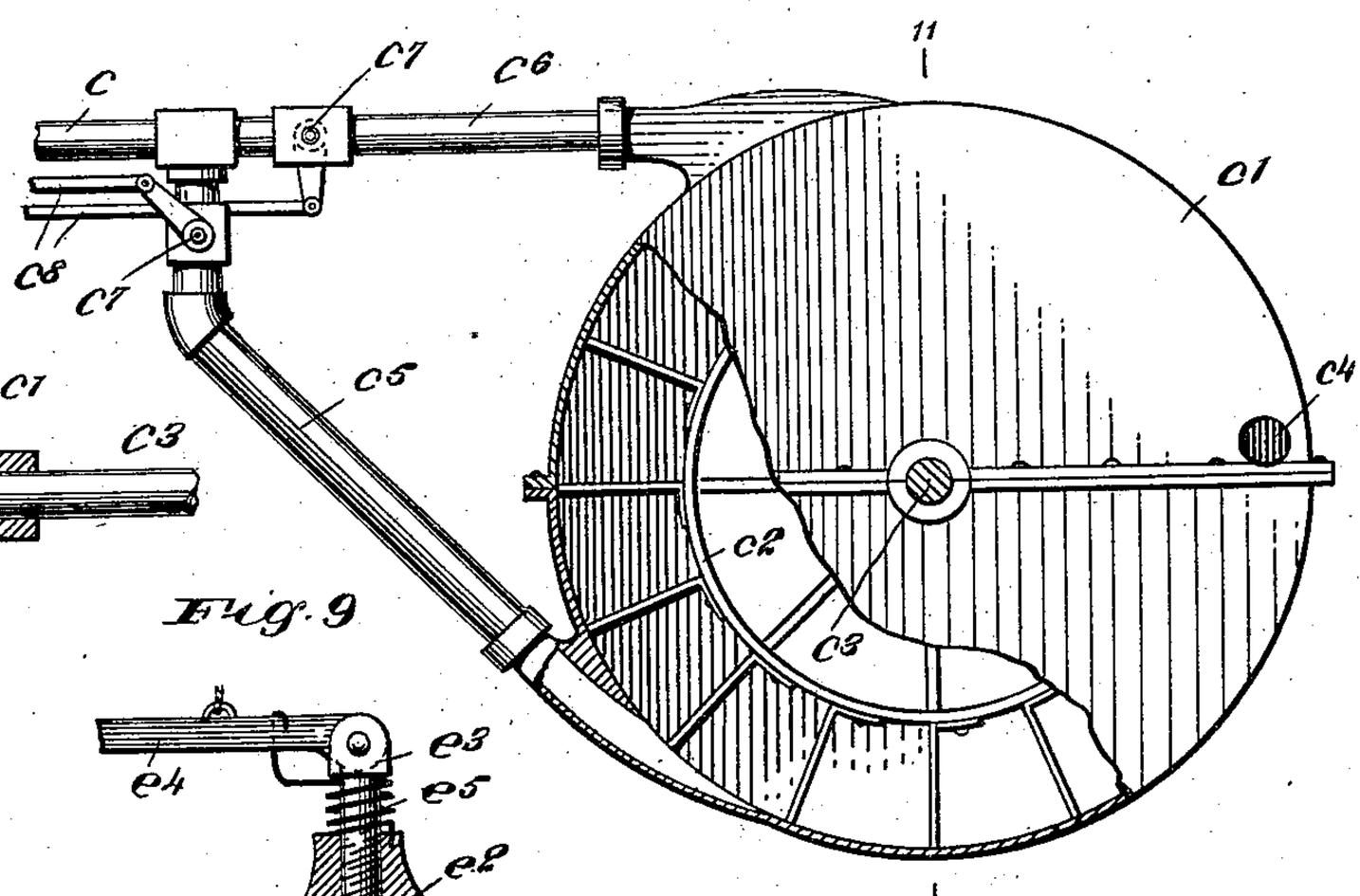

Fig. 9

WITNESSES:

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UNITED STATES PATENT OFFICE.

ROBERT LESSLEY BARNHART, OF CHARLEROI, PENNSYLVANIA.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 705,897, dated July 29, 1902.

Application filed June 3, 1901. Serial No. 62,961. (No model.)

To all whom it may concern:

Be it known that I, ROBERT LESSLEY BARNHART, a citizen of the United States, and a resident of Charleroi, in the county of Washington and State of Pennsylvania, have invented a new and Improved Motor, of which the following is a full, clear, and exact description.

This invention relates to an internal-combustion or explosive motor, the main feature of which lies in the provision of a receiver in which the charge is exploded and which serves to carry a continual pressure of gas, this pressure being communicated from the receiver to the motor, which is driven thereby.

This specification is a specific description of one form of the invention, while the claims are definitions of the actual scope thereof.

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 plan view of an automobile vehicle, showing my invention applied. Fig. 2 is a side view of the same. Fig. 3 is a sectional view showing the receiver and the mixing and igniting mechanism of the motor. Fig. 4 is a cross-section on the line 4 4 of Fig. 3. Fig. 5 is a sectional view on the line 5 5 of Fig. 3. Fig. 6 is a similar view showing the parts in a different position. Fig. 7 is a plan view showing the pump and the gear operated thereby. Fig. 8 is a side elevation of the same. Fig. 9 is a sectional view on the line 9 9 of Fig. 7. Fig. 10 is a view of the motor proper, and Fig. 11 is a section on the line 11 11 of Fig. 10.

Although I have here shown my invention applied to an automobile vehicle, I desire it distinctly understood that it is applicable to all purposes for which motive force is desired.

In Figs. 1 and 2, a indicates the framing of the vehicle, and a' the wheels thereof. This vehicle may be of any sort desired and may include a steering mechanism a^2, a movement transmitting and varying gear a^3, and a brake mechanism a^4.

The engine comprises a receiver made up of two cylindrical sections b and b', of which the former is mounted rigidly in the framing a or in any other suitable support. The latter section b' is slidable in the section b, and its movement is guided by rods b^2, fastened to the stationary section b. A cap b^3 is attached to the rods b^2, and this cap carries a pin b^4, which fits in a centrally-disposed socket b^5 in the sections b' and carries an expansive spring b^6, which presses the section b' inward and tends to contract the size of the receiver formed by the sections b and b'.

c indicates a pipe which passes from the section b of the receiver and communicates with the interior thereof. This pipe c extends to the motor proper, which comprises a suitable casing c', having a wheel c^2, mounted to turn around the axis of a shaft c^3, from which shaft the movement of the motor is transmitted.

c^4 indicates the exhaust from the casing c', and leading from the pipe c are two branches c^5 and c^6, which lead into the casing c' at opposite sides of the axis of the wheel c^2. Each branch c^5 and c^6 is fitted with a valve c^7, these valves controlling the passage of the gases through the branch pipes. Connected with the valves c^7 are rods c^8, which lead to suitable hand-levers or other devices for actuating the rods. By these means the valve c^7 may be thrown to command the branch pipes c^5 and c^6. If the valve of the pipe c^5 is closed and that of the pipe c^6 is opened, the wheel c^2 will be driven from left to right. (See Fig. 10.) If the valve of the pipe c^6 is closed and that of the pipe c^5 is opened, the wheel c^2 will be driven in the opposite direction.

e indicates the tank containing the liquid fuel, which may be any of the well-known hydrocarbons. From this tank e leads a pipe e', provided with a valve e^2. (See Figs. 3 and 9.) This pipe e' passes down into a water-tank d, fastened to the stationary part b of the gas-receiver. Within the tank d the pipe e' communicates with an air-pipe f, which passes into the tank d from a pump f', mounted on top of the tank d. The pump f' has its rod f^2 driven from the motor-shaft c^3 by an eccentric or any other suitable means.

d' indicates a valve-chamber which is formed in the water-tank d. Into this chamber the pipe f passes, and the valve-chamber d' communicates with the interior of the receiver b by way of a port b^7. Within the

valve-casing is arranged a hollow valve g, which is held to turn by being screw-threaded in the casing and is formed with a port g', adapted to register with the pipe f, and a port g^2, adapted to register with the port b^7. Connected with the rod f^2 of the pump f' is a slide f^3, which is mounted on top of the pump-cylinder and moves in time with the rod f^2. This slide f^3 is provided with two dogs f^4 and f^5, which are pivotally mounted on the slide and are so arranged that when moving in one direction they will act to transmit movement in a horizontal plane and when moving in the opposite direction they will turn on their pivots without transmitting any movement. The valve e^2 has a stem e^3, to which is pivoted a horizontally-disposed arm e^4, projecting over the slide f^3 of the pump. To the arm e^4 is connected a cord h, which passes upward and is connected to a lever h', forming part of a safety-valve h^2, the lever h' being fulcrumed on a bracket h^3 on the stationary section b of the gas-receiver. Normally the arm e^4 lies in the path of the dog f^4, so that when the slide f^3 moves leftward in Figs. 7 and 8 the dog f^4 will engage the arm e^4 and swing it in a horizontal plane, causing the stem e^3 of the valve e^2 to be turned, thus opening the valve and permitting a charge of fuel to pass through the pipe e' into the pipe f at a point within the water-tank d. Should the pressure of gas within the gas-receiver be sufficiently great to lift the lever h', the arm e^4 will be raised out of the path of the dog f^4, and the movement of the slide f^3 will therefore have no effect upon the arm e^4. A spring e^5 is attached to the casing of the valve e^2 and to the arm e^4 and tends to throw the parts e^4 and e^3 so as to keep the valve e^2 normally closed. As the dog f^4 moves to the left (see Figs. 7 and 8) sufficiently to ride off of the arm e^4 the spring e^5 immediately asserts itself and returns the arm to the closed position of the valve. A pin e^6 is fastened to the pump-cylinder f' to limit the return movement of the arm e^4. The hollow valve g has rigidly connected thereto a stem g^3, which extends upward and carries fixedly an arm g^4, projecting laterally over the slide f^3. A spring g^5 is connected to the stem g^3 and tends to throw the same, together with the valve g, to the position shown in Fig. 5, in which position the port g' registers with the pipe f and the ports g^2 and b^7 are out of communication. The arm g^4 is adapted to be operated by the dog f^5. When the slide f^3 moves rightward, (see Figs. 7 and 8,) the dog f^5 will engage the arm g^4 and throw the arm in the manner indicated by the dotted lines in Fig. 7. As soon as the pawl f^5 moves past the arm g^4 the spring g^5 will assert itself and throw back the arm to the position shown by full lines in Fig. 7, causing the ports of the valve to occupy the positions shown in Fig. 5. A pin g^6 is mounted on the cylinder f to limit the leftward movement of the arm g^4. The valve g carries an electric igniter. One terminal of the circuit is in connection with the body of the valve and through the medium of this element with the stem g^3. The lower end of the stem g^3 carries a contact i. Fastened in the valve g and projecting into the interior thereof is an insulated plug i', which carries a contact i^2 at its lower end. This plug i' is in connection with the other pole of a source of electrical energy. The plug i' is arranged to turn within the valve g. At the upper end of the plug i', above the valve g, is an arm i^3, which is fastened to the plug. This arm is held at its outer end by any suitable guide device i^4. (See Fig. 7.) This guide device I have here shown as composed of two guide-rollers bearing on opposite sides of the arms i^3 and adapted to be supported in any suitable manner. For example, they may be supported by brackets projecting from the water-tank d or from the section b of the receiver.

The parts thus constructed operate as follows: As the shaft c^3 turns the piston of the pump f' is driven and a blast of air is forced through the pipe f. As the slide f^3 moves leftward (see Fig. 7) the dog f^4 strikes the arm e^4 and throws the same, so as to open the valve e^2. A charge of fuel passes through the pipe e' into the pipe f, and then as the piston of the pump moves rightward it compresses a volume of air and forces it through the pipe f. The charge of oil is thereupon vaporized within the lower portion of the pipe and the hollow valve g, the parts being in the position shown in Fig. 5. The instant this occurs the dog f^5 strikes the arm g^4 and throws the hollow valve g to the position shown in Fig. 6. This cuts off the pipe f and opens the port b^7. As the valve g turns it carries the plug i' around with it, and this causes the contacts i and i^2 to come together, thus producing the spark which ignites the charge within the valve g. The explosion then takes place. Instantly after this period the dog f^5 rides off of the arm g^4 and the arm g^4 returns to the position shown by full lines in Fig. 7, placing the valve g in the position shown in Fig. 5. The operation above described is then repeated. As the explosion takes place the receiver is filled with the expanded gases and the section b' yields outward. The instant this occurs the port b^7 is closed and the gas-pressure is forced to pass out of the pipe c, thus driving the wheel c^2. The pressure within the receiver is continually replenished by the successive explosions, and thereby a uniform and steady gas-pressure is communicated to the wheel c^2.

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

1. In an explosive-engine, the combination of a receiver for the fluid-pressure of the engine, a valve commanding the fuel-supply, a movable arm connected with the valve, a device for engaging the arm to actuate the valve, and means controlled by the fluid-pressure

within the receiver, such means being capable of throwing the arm out of the path of the said device, for the purpose specified.

2. In an explosive-engine, the combination with a receiver for the fluid-pressure of the engine, of a valve commanding the fuel-supply, a swinging arm on the stem of the valve, a sliding actuating device for engaging the arm to operate it and thereby the valve, and means controlled by the fluid-pressure within the receiver for swinging the said arm out of the path of the sliding actuating device.

3. In an explosive-engine, the combination with a receiver, and a safety-valve therefor, of a valve for controlling the fuel-supply, an arm pivoted to the stem of the valve, means for operating the arm and thereby the valve, and a connection between the said arm and the safety-valve for swinging the arm into inactive position.

4. In an explosive-engine, the combination with the fuel-supply, and a spring-actuated valve therein provided with an arm extending from its stem, of a pump, and a pivoted dog connected with the pump-rod into the path of which the arm of the valve projects.

5. In an explosive-engine, the combination with the fuel-supply, and a spring-actuated valve therein, provided with an arm extending from its stem, of a pump, a slide on the pump-barrel and connected with the pump-rod, and a dog pivoted on the slide and into the path of which the arm of the valve projects.

6. In an explosive-engine, the combination with a receiver of a valve-chamber communicating with the receiver, a spring-actuated hollow valve in valve-chamber, a fuel-supply in communication with the valve-chamber, a pump also in communication with the valve-chamber, and means whereby the valve will be opened by the pump.

7. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a hollow valve in the chamber, means for normally holding the valve closed, a pump connected with the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, and means for operating the valve from the pump.

8. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a pump, a pipe leading from the pump to the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, a hollow and spring-pressed valve in the valve-chamber and provided with ports adapted to register alternately with the port leading into the receiver and with the pipe leading from the pump, and means connected with the pump-rod for operating the said valve, as set forth.

9. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a valve in the chamber, means for normally holding the valve closed, a pump connected with the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, means for operating the valve from the pump, and an igniting device controlled by the said valve.

10. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a hollow valve in the chamber, means for normally holding the valve closed, a pump connected with the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, means for operating the valve from the pump, and an igniting device in the hollow valve and controlled by the movement of said valve.

11. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a valve in the chamber, means for normally holding the valve closed, a pump connected with the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, a valve in the fuel-supply, and means for operating the said valves from the pump.

12. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a valve in the chamber, means for normally holding the valve closed, a pump connected with the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, means for holding the valve closed, means for operating the said valves from the pump, and an igniting device controlled by the first-named valve.

13. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a hollow valve in the chamber, means for normally holding the valve closed, a pump connected with the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, a valve in the fuel-supply, means for holding the valve closed, means for operating the said valves from the pump, and an igniting device in the valve and controlled by the same.

14. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a spring-actuated valve in the chamber and provided with an arm on its stem, a pump connected with the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, a spring-actuated valve in the fuel-supply and provided with an arm on its stem, a slide connected with the pump-rod, and pivoted dogs on the slide and adapted to engage the arms of the said valves.

15. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a normally closed valve in the chamber and provided with an

arm on its stem, a pump connected with the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, a normally closed valve in the fuel-supply and provided with an arm on its stem, a slide connected with the pump-rod, pivoted dogs on the slide and adapted to engage the arms of the said valves, and an igniting device controlled by the first-named valve.

16. In an explosive-engine, the combination with a receiver, of a valve-chamber communicating with the receiver, a spring-actuated hollow rotating valve in the chamber and provided with an arm on its stem, a pump connected with the valve-chamber, a fuel-supply connected with the pipe leading from the pump to the valve-chamber, a spring-actuated valve in the fuel-supply and provided with an arm on its stem, a slide connected with the pump-rod, pivoted dogs on the slide and adapted to engage the arms of the said valves, and an igniting device in the hollow valve and controlled by the movement of said valve.

17. In an explosive-engine, the combination with a receiver, and a safety-valve therefor, of a fuel-supply, a valve therein, provided with a pivoted arm on its stem, means for engaging said arm to operate the valve, a pivoted lever operated by the safety-valve, and a flexible connection between the lever and arm of the valve.

18. In an explosive-engine, the combination with a receiver, and a safety-valve therefor, of a pump, a fuel-supply, a valve therein, means for operating the valve from the pump, and means for controlling the operation of the said valve from the safety-valve.

19. In an explosive-engine, the combination with a receiver, and a safety-valve therefor, of a pump, a fuel-supply, a valve in the fuel-supply and provided with a pivoted arm on its stem, means carried by the pump-rod for engaging the arm of the valve-stem to operate the valve, and means whereby the arm of the valve-stem will be raised into inoperative position from the safety-valve.

20. A motor, comprising an expanding receiver, a motor proper with which the receiver communicates, a valve-chamber communicating with the receiver, a valve in the valve-chamber, a pump in communication with the valve-chamber, a fuel-supply also in communication with the valve-chamber, a valve in the fuel-supply, means for operating the valves from the pump, and an igniting device controlled by the first-named valve.

21. A motor, comprising an expanding receiver, a motor proper with which the receiver communicates, a valve-chamber communicating with the receiver, a hollow valve in the chamber, a pump in communication with the valve-chamber, a fuel-supply also in communication with the said valve-chamber, a valve in the fuel-supply, means for operating the valves from the pump, and an igniting device in the hollow valve and controlled by the movement thereof.

22. A motor comprising an expanding receiver having a safety-valve, a motor proper in communication with the receiver, a valve-chamber communicating with the receiver, a hollow rotating valve in the chamber, a pump in communication with the valve-chamber, a fuel-supply also in communication with the valve-chamber, a valve in the fuel-supply, means for operating the valves from the pump, means for controlling the operation of the valve in the fuel-supply from the safety-valve of the receiver, and an igniting device in the hollow valve and controlled by the movement thereof.

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

ROBERT LESSLEY BARNHART.

Witnesses:
N. F. THRONE,
H. F. PARSONS.