(No Model.) 2 Sheets—Sheet 1.

A. WINTON.

EXPLOSIVE ENGINE.

No. 582,108. Patented May 4, 1897.

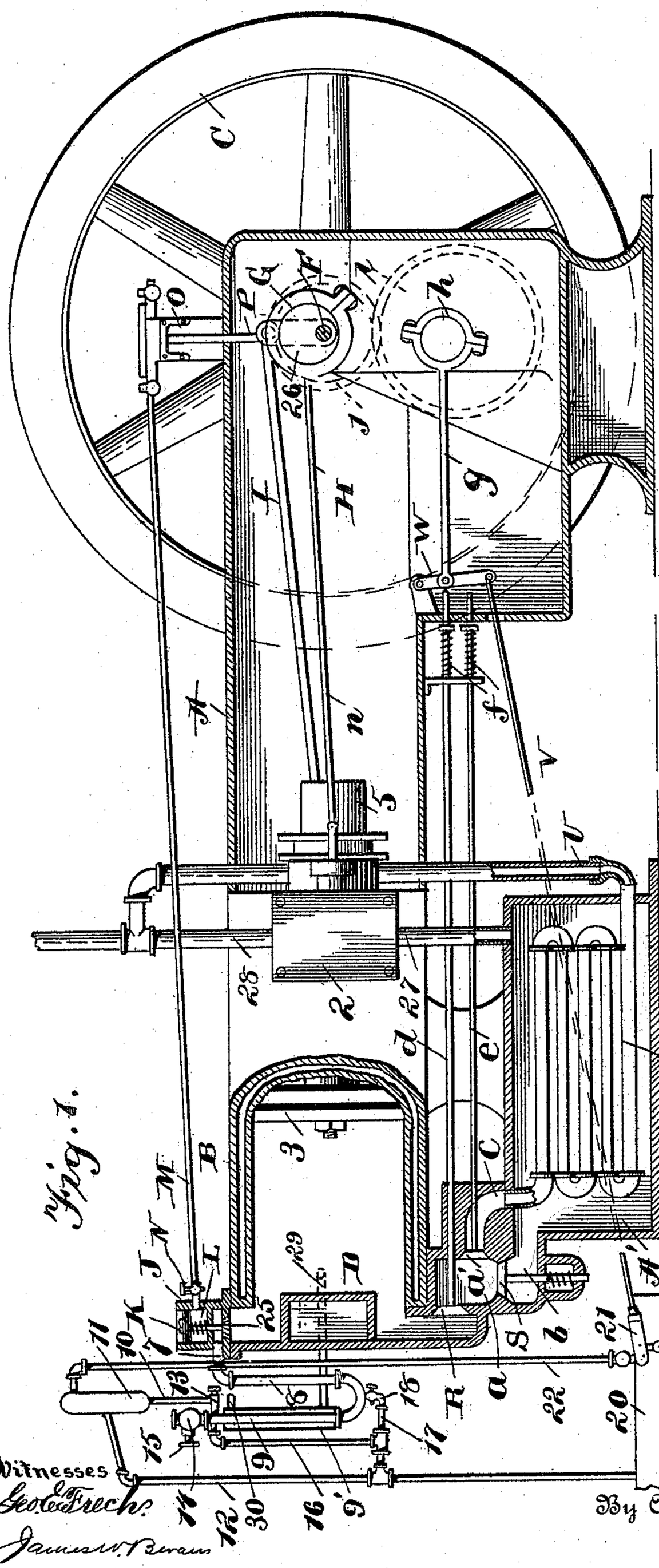

Fig. 1.

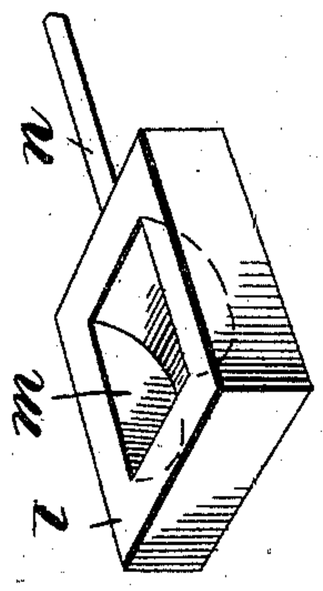

Fig. 6.

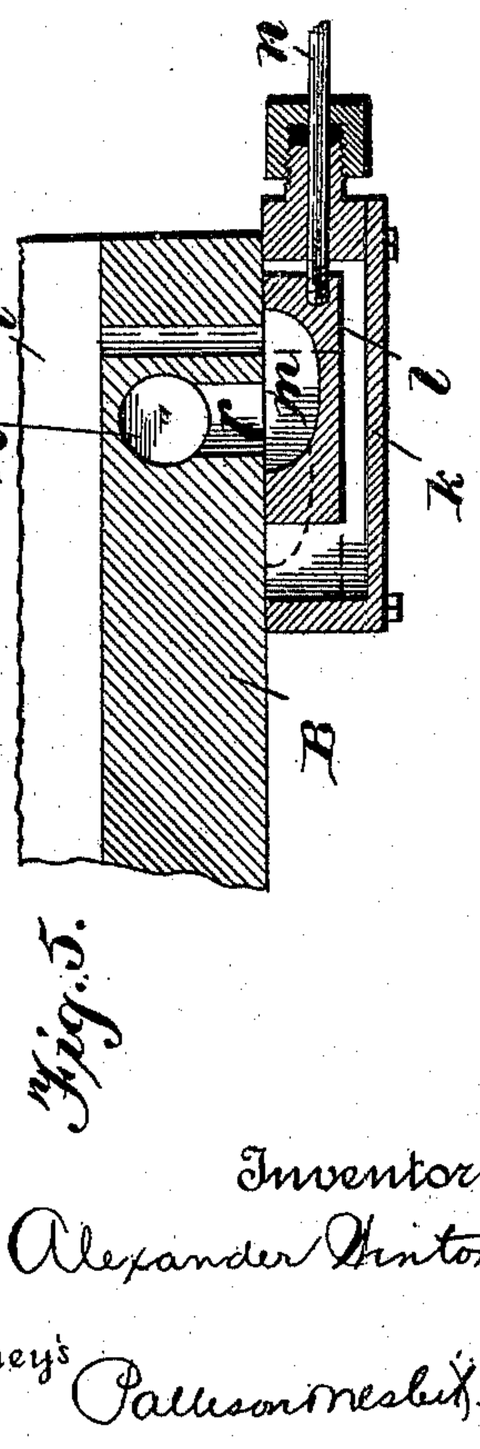

Fig. 5.

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Fig. 2.

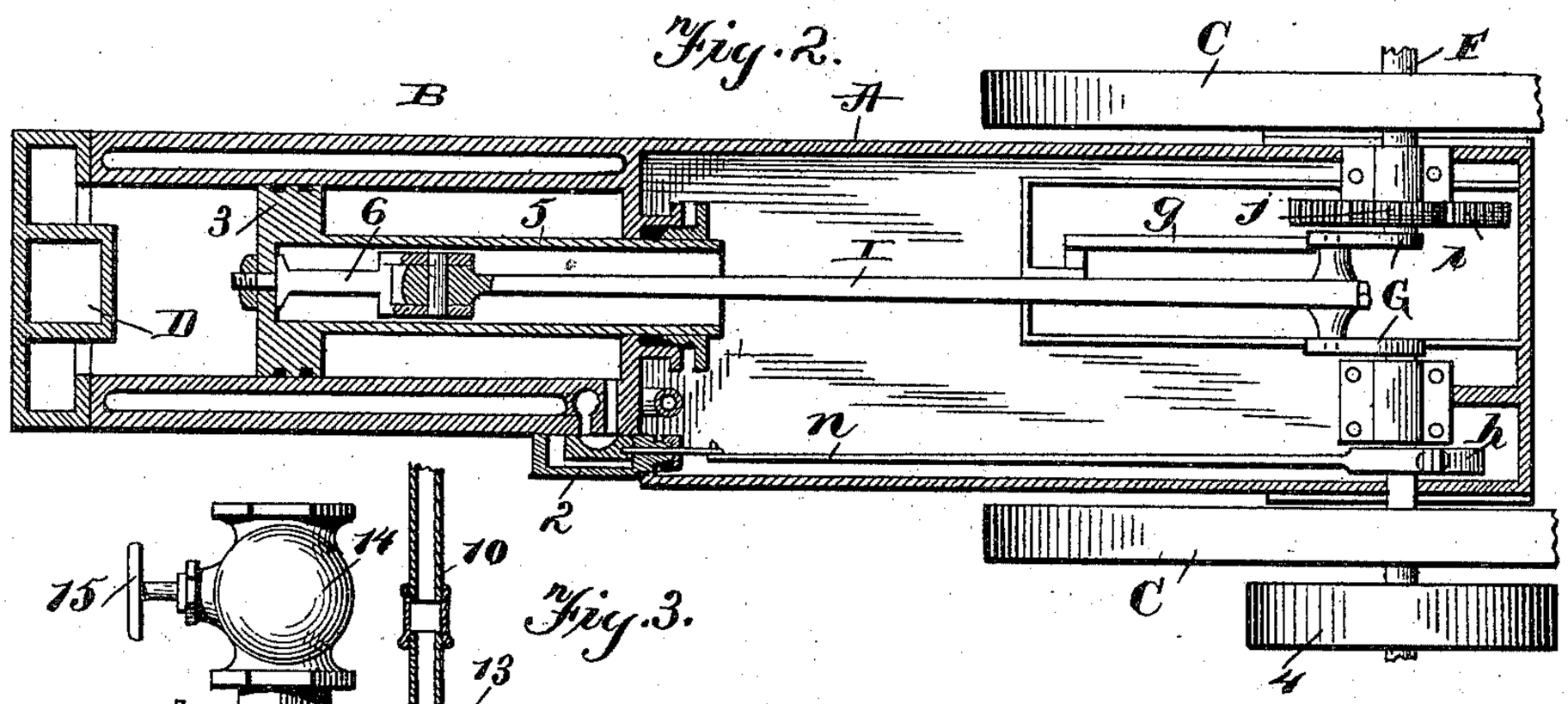


Fig. 3.

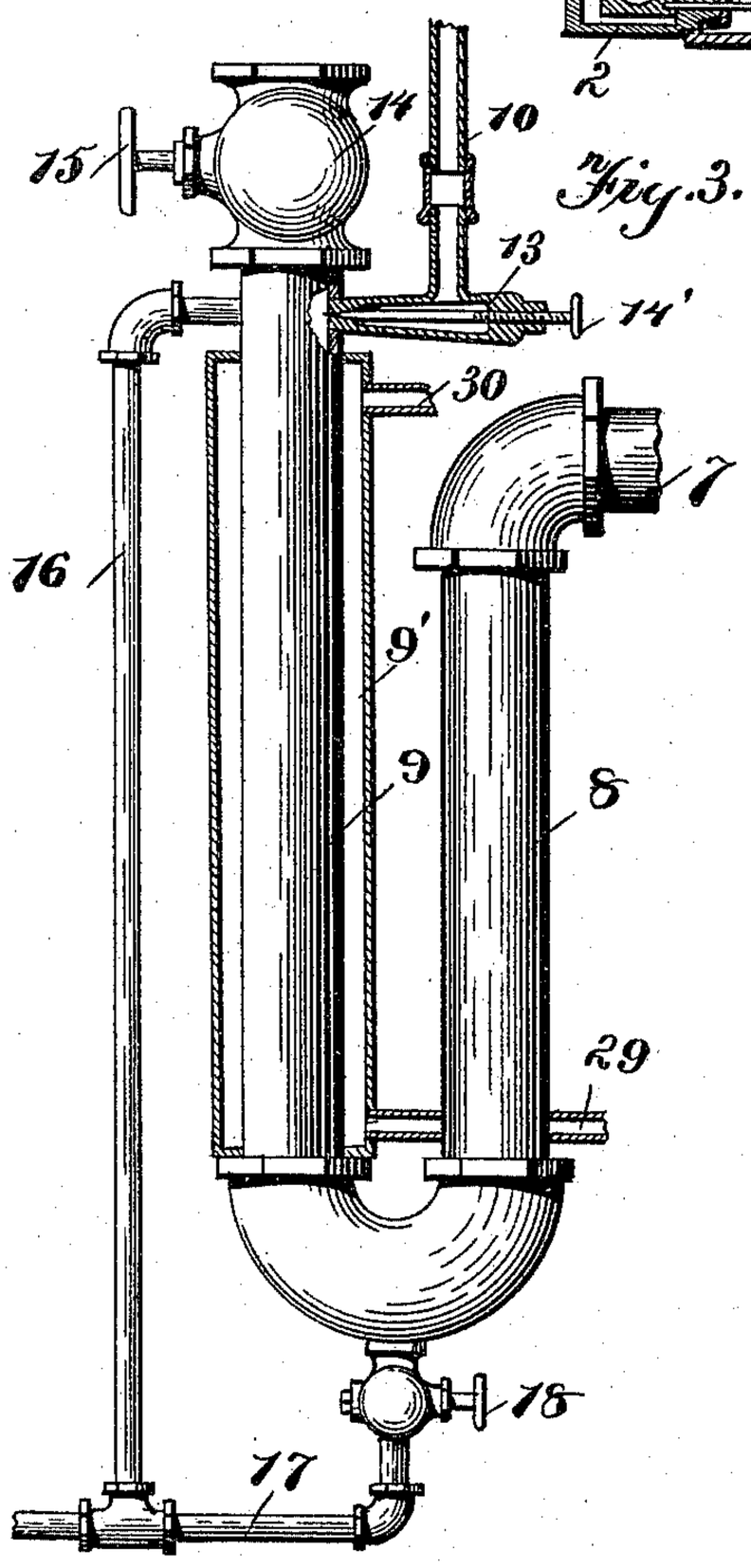
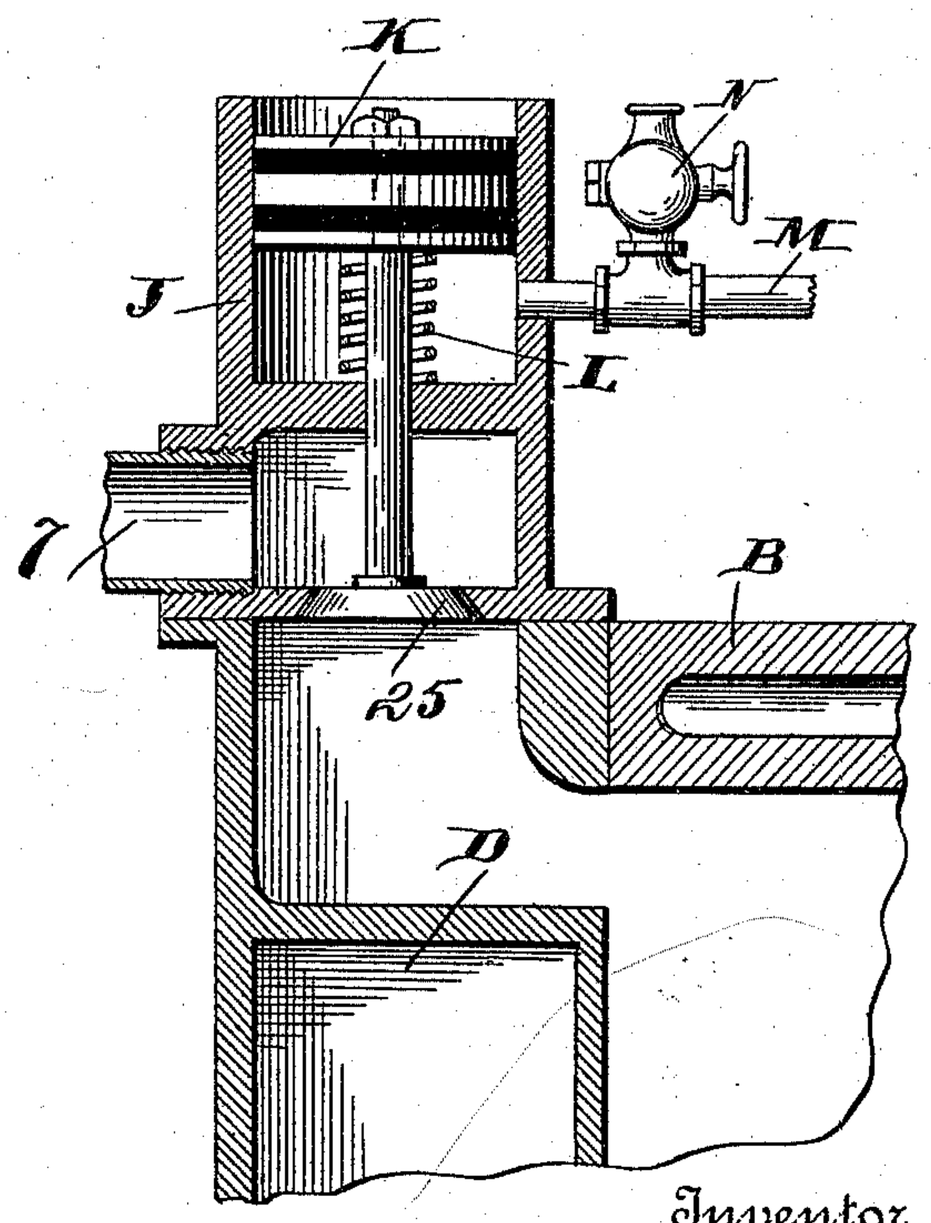


Fig. 4.



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UNITED STATES PATENT OFFICE.

ALEXANDER WINTON, OF CLEVELAND, OHIO.

EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 582,108, dated May 4, 1897.

Application filed March 18, 1896. Serial No. 583,840. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER WINTON, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Explosive-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to explosive-engines, and pertains more especially to gasolene-engines, though some of the mechanisms are adapted for use in other forms of explosive-engines.

One object of my invention is to provide an explosive-engine with a mechanism for using the exhaust for the backward stroke of the piston, thus producing a compound engine and a considerable increase in the power and efficiency thereof, and at the same time a muffle for the exhaust to prevent the usual noise therefrom.

Another object of my invention is to provide an air-cylinder for controlling admission of air and gas, and thereby the force of explosion, power, and speed of the engine.

A further object of my invention is to provide a feeding arrangement or mechanism for the fluid of gasolene or other similar engines to prevent flooding, and yet always insure an adequate supply of fluid for the working of the engine.

In the accompanying drawings, Figure 1 is a longitudinal vertical section of an engine embodying my invention, a portion of the mechanism being shown in full lines. Fig. 2 is a horizontal longitudinal sectional view taken on a line centrally through the cylinder, the feeding mechanism being omitted. Fig. 3 is an enlarged detached view of a portion of fluid-feeding mechanism, a portion of said view being in section. Fig. 4 is a sectional view, enlarged, of the air-governor.

Referring now to the drawings, A indicates the frame of the machine; B, the cylinder, having the usual water-jacket; C, the balance-wheels, of which there are preferably two, one on each side of the machine; G, the driven shaft, and I the pitman.

The pitman I has its inner end pivoted to the outer end of the bolt 6, connected to the piston-head 3 within a trunk 5, carried by the said piston-head, the object of the trunk being to reduce the interior dimensions of the cylinder at that side of the piston-head for the purpose of more effectually utilizing the exhaust for compounding, as will be fully described farther on.

The fluid is contained in a supply-tank 20 and forced upward through the pipe 22, by means of a pump 21, actuated by the engine in a manner which will be described hereinafter, to the feeder-tank 11. The feeder-tank 11 conveys the gasolene or other fluid through the pipe 10 to what may be appropriately termed the "needle-feeder" 13, having a needle-valve 14′. The liquid, by gravity, is thrown in a very small stream through this needle-valve feeder across the upper end of the pipe 9, said pipe having at a point above the said feeder 13 an air-inlet 14, adapted to be regulated by a valve 15. The air being drawn in by suction through the air-inlet 14, it passes down through the pipe 9 and upward through the leg or pipe 8, which together may be aptly termed a "mixer" for the evaporated gasolene and air, and from pipe 8, through the pipe 7, into the combustion end of the cylinder B.

The admission of mixed air and gas to the explosive-chamber is regulated by the valve 25, which is held to its seat by air or fluid pressure, the spring L serving to hold it to its seat when the engine is not in operation and in position for starting the engine.

The stem of the valve 25 is connected with a piston-head K in a cylinder J, or it may be connected with a diaphragm, and the said valve may be appropriately denominated a "pressure-regulated" valve.

Opposite the feeder 13 is a pipe 16, which receives any excess or unvaporized fluid delivered across the pipe 9 and conveys it downward to a supply-tank 20, as is clearly shown, and the feeder-tank 11 is connected to the supply-tank 20, above pipe 9, through the medium of a pipe 12, which forms an overflow in this tank 11 and keeps a predetermined pressure, and thereby a regular flow of fluid through the feeder, as will be readily understood.

The amount of charge delivered to the cylinder, and consequently the power and speed

of the engine, is regulated through the medium of the pressure-valve 25, before referred to. This pressure-valve is primarily held to its seat by means of air-pressure, though liquid-pressure might be substituted therefor. This pressure is created through the medium of a pump O, actuated by means of a pitman P, connected with and operated by an eccentric 26 upon the main shaft. This pump is connected with the cylinder J, beneath the piston-head K, by means of a pipe M, and the pressure created by the pump holds the valve 25 to its seat. The amount of pressure within the cylinder J, and consequently the seating-resistance of the pressure-valve 25, is regulated by means of an escape N, here shown as connected with the pipe M, though it could readily be connected with the cylinder J, beneath the piston-head K, as will be readily understood, and effect the same purpose. The escape N is a globe or other valve whereby the amount of pressure can be readily fixed to regulate the amount of charge delivered to the explosion end of cylinder B. The faster the engine runs the greater the pressure created, of course, against the diaphragm or piston of pressure-valve 25, which regulates accurately the charges of the engine.

I have not shown any sparking device, as the ordinary electric sparking mechanism will be used.

In my engine I utilize the exhaust for actuating the piston in its backward movement, thus producing a compound engine. This is effected by connecting the exhaust with that end of the cylinder opposite the explosion-chamber thereof and intercepting the exhaust by means of a valve which affords interrupted communication between the explosion-chamber and the opposite end of the cylinder. The specific mechanism as shown herein for producing this result consists in providing an exhaust chamber or box A′, preferably, though not necessarily, situated below the cylinder B, as shown. An exhaust-port is closed by means of the main exhaust-valve R, which establishes communication with the chamber *a*, and the chamber *a* is in communication with the exhaust box or chamber A′, said communication being closed by a spring and pressure actuated check-valve S, the said valve being held to its seat by means of a spring. A small passage *b* affords direct communication between the chamber *a* and the exhaust box or chamber A′, and the exhaust-chamber communicates with the compounding-valve chest 2 through the medium of a pipe 27. This compounding-valve is of the usual form used in steam-engines, as shown clearly in Fig. 5, the same having a cavity *m* on its inner side adapted to span the inlet-port *q* and the exhaust-ports *r* and *p*. As shown in Fig. 5, the engine is exhausting the valve forming communication between the port *q* and the exhaust-ports *r* and *p* into the pipe 28, which exhausts to the atmosphere.

The passage *c* establishes communication between the chamber *a* and the coiled pipe T, the said passage *c* having interrupted communication with the chamber *a* through the medium of a valve *a*′. The exhaust, after passing through the said coil, is conveyed through the pipe U to the pipe 28 beyond the compounding-valve, and then to the atmosphere through the said pipe 28.

The valves *a*′ and R are actuated through the medium of a lever W, which is operated by a rod *g*, which rod is actuated by an eccentric *h* upon a gear-wheel *i*. This gear-wheel *i* is driven by a gear-wheel *j*, about half the diameter of the wheel *i*, the gear *j* being upon the driven shaft F. Owing to the arrangement of the valve-rods *d* and *e*, connected with the valves R and *a*′, the main valve R is opened prior to the opening of the valve *a*′, the object of which will be fully stated later on. Owing to the gears *i* and *j*, the exhaust mechanism is operated only at every other stroke of the engine, the engine exploding only at every other stroke, as is usual in gas and gasolene engines, and which need not be further described herein, the same being familiar to those skilled in the art.

The operation of the engine is as follows: The fluid being fed, as described, and the mixed gas and air therefrom being admitted to the explosion end of the cylinder, as specified, an explosion occurs and the piston is driven forward, as shown in Fig. 1. The gears *i* and *j* and the mechanism actuated thereby are so timed that when the piston-head 3 has nearly reached the limit of its outward or forward movement the exhaust-valve R is opened, which allows the escape of part of the exhaust within the chamber *a* and to the exhaust chamber or box A′, through the port closed by the check-valve S, the said valve being opened by the pressure of the exhaust. The compounding-valve is so timed that when this occurs communication is shut off between the exhaust-chamber A′ and the other end of the cylinder B, but just after the piston-head starts in its backward movement the valve *a*′ is opened, which forms communication for the escape of the remaining or auxiliary exhaust through the coil T to the atmosphere, the check-valve S immediately closing and holding the exhaust-pressure within the exhaust-chamber A′. Almost simultaneous with this, but just thereafter, the compounding-valve 1 is moved to the position shown in dotted lines in Fig. 5, establishing communication between the exhaust-chamber A′ and the inner end of the cylinder B, the exhaust then serving to force backward the piston-head 3, as will be readily understood. The valve R is opened, as described, and remains open during the complete exhausting of the engine. The piston 3 being driven back by the exhaust-pressure from the exhaust-chamber A′, as it moves forward it takes another charge of mixed air and gas, and then moving backward it compresses the same, and just as it starts forward

again the explosion occurs, which operation is the same as that in other gas-engines. The valves R and a' are then operated again in the manner just described, the same operation taking place only at every other stroke of the engine.

By causing the auxiliary exhaust to pass through the coil T, when it is released to the atmosphere, it keeps the exhaust which is within the exhaust-chamber A′ heated and expanded, so that a greater power is obtained therefrom, as will be readily understood.

The trunk 5, carried by the piston-head 3, reduces the interior area of the compounding-chamber, but part of the exhaust is permitted to escape to the atmosphere, as before explained, and sufficient passes off in this way to allow that which passes in said compounding-chamber to expand to greater volume therein.

At the combustion end of the cylinder is a trunk or projection D for the purpose of reducing the area within the cylinder, which construction is common in explosive-engines.

The valves R and a' are held normally to their seats by means of springs f, carried upon the outer ends of the valve-rods d and e.

The pump 21 is actuated through the medium of a pump-rod V, having its outer end connected with the lever W, which lever serves the double function of actuating the pump and of actuating the valves R and a', before referred to.

I find that by an engine constructed as here shown I gain at least about ten per cent. increase of power of the engine.

The evaporation of the gasolene in the pipe 9 causes a cooling of the pipe and consequent condensation. To provide against this cooling and the consequent condensation, I provide water-jacket 9′, surrounding the pipe, having an inlet 29, connected with the water-jacket of the engine-cylinder, and an outlet-pipe 30. By this means the water from the cylinder water-jacket, which is warm, is caused to circulate around the pipe 9 and to keep an even temperature therein. The outlet-pipe 30 may or may not be connected with the water-jacket. While I prefer to supply the water-jacket from the cylinder water-jacket, this of course is not absolutely necessary, as it may be from other sources.

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

1. An explosive-engine comprising a cylinder having an explosion-chamber at one end, a valve mechanism establishing interrupted communication between the explosion-chamber and the opposite end of the cylinder therefrom, and an exhaust-passage for the explosion-chamber independent of the interrupted communication.

2. An explosive-engine comprising a cylinder having an explosion-chamber at one end, a compounding-valve establishing interrupted communication between said explosion-chamber, the opposite end of the cylinder and the atmosphere, and a valve establishing interrupted communication between said explosion-chamber and the atmosphere independently of the said compounding-valve.

3. An explosive-engine comprising a cylinder having an explosion-chamber at one end, the opposite end of the cylinder adapted to be used for compounding, an exhaust-chamber, a compounding-valve establishing communication between the exhaust-chamber and the compounding end of the cylinder, and a valve establishing interrupted communication between the explosion end of the cylinder and the exhaust-port independent of the compounding-valve.

4. An explosive-engine comprising a cylinder having an explosion-chamber at one end, an exhaust-chamber, a valve establishing interrupted communication between the said explosion-chamber and the exhaust-chamber and the atmosphere, a valve establishing interrupted communication between the exhaust-chamber and the opposite end of the cylinder from the explosion-chamber, and a check-valve interrupting backward pressure from the exhaust-chamber to the explosion-chamber.

5. An explosive-engine comprising an explosion-chamber having exhaust ports or openings therefor, a compounding-valve establishing communication between said explosion-chamber and the end of the cylinder opposite thereof and the atmosphere, a main valve interrupting the said communication between the explosion-chamber and the compounding-valve, when the explosion occurs, and an auxiliary valve establishing interrupted communication between said explosion-chamber and the atmosphere.

6. An explosive-engine comprising an explosion-chamber, an exhaust-chamber in interrupted communication with the explosion-chamber, a compounding-valve establishing interrupted communication between the opposite end of the cylinder from said explosion-chamber and the exhaust-chamber, and an exhaust pipe or passage through said exhaust-chamber to the atmosphere, and an auxiliary valve establishing interrupted communication through said pipe or passage to the atmosphere.

7. An explosive-engine comprising an explosion-chamber, an exhaust-chamber in interrupted communication with the explosion-chamber, the pipe-coil within the exhaust-chamber and communicating with the explosion-chamber and atmosphere independent of the exhaust-chamber.

8. An explosive-engine comprising an explosion-chamber, an exhaust-chamber, a compounding-valve establishing interrupted communication between the exhaust-chamber and the explosion-chamber, a main valve establishing communication between the explosion-chamber and the said exhaust-cham-

ber, and an auxiliary valve establishing interrupted communication between the explosion-chamber and the atmosphere, and a mechanism for operating the main valve in advance of the auxiliary valve.

9. In an explosive-engine, the combination of an explosion-chamber having an explosive-inlet port, a valve controlling the same, a pressure-producing device, a pressure-controlled member connected with the said valve, a communication between the pressure-producing device and the pressure-controlled member, and a regulating pressure-escape situated between the pressure-producing device and the pressure-controlled member.

10. In an explosive-engine, a pressure-actuated valve establishing communication with the engine-cylinder, a pressure-producing device operated by the engine, a communication between the pressure-producing device and the pressure-actuated valve, and an escape for the pressure at the pressure-actuated valve.

11. A hydrocarbon-feeder for explosive-engines comprising a pipe having one end open to the atmosphere and the opposite end in communication with the engine-cylinder, a fluid-feeder having an opening within the said pipe and adapted to deliver oil across the same, a fluid-tank, and an overflow-pipe having an inlet-opening in the fluid-receiving pipe at a point opposite the fluid-feeder whereby it is adapted to receive the unevaporated fluid and deliver it to the fluid-tank.

12. A fluid-supply for explosive-engines comprising an air-communication with the engine-cylinder, a fluid-supply tank, a feeder-tank above the supply-tank, a fluid-elevator establishing communication between the feeder-tank and the fluid-supply tank, a fluid-feeder between the feeder-tank and the supply-tank, an overflow communication between the air-supply pipe, the feeder-tank and the supply-tank.

13. The combination with an explosive-engine of a hydrocarbon-feeder comprising a U-shaped pipe having one end open to the atmosphere, the opposite end in communication with the cylinder, a fluid-supply at a point near the open end of said pipe, a fluid-tank, a pipe opening into the air and fluid supply pipes at a point opposite the fluid-feeder to receive the excess fluid and deliver it to the tank, and a pipe in communication with the doubled portion of the U-shaped pipe and the tank, the parts adapted for the purpose described.

14. In an explosive-engine, the combination of an explosion-chamber having an explosive-inlet port, a valve controlling the same, a pressure-producing device, a pressure-controlled member connected with said valve, a communication between the pressure-producing device and the pressure-controlled member, and a regulating pressure-escape regulating the pressure upon the pressure-controlled member.

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

ALEXANDER WINTON.

Witnesses:
PIERCE LONERGAN,
L. A. REED.