No. 642,949. Patented Feb. 6, 1900.

J. L. BAILLIE & P. B. VERITY.

COMBUSTION ENGINE.

(Application filed Aug. 5, 1898.)

(No Model.) 3 Sheets—Sheet 1.

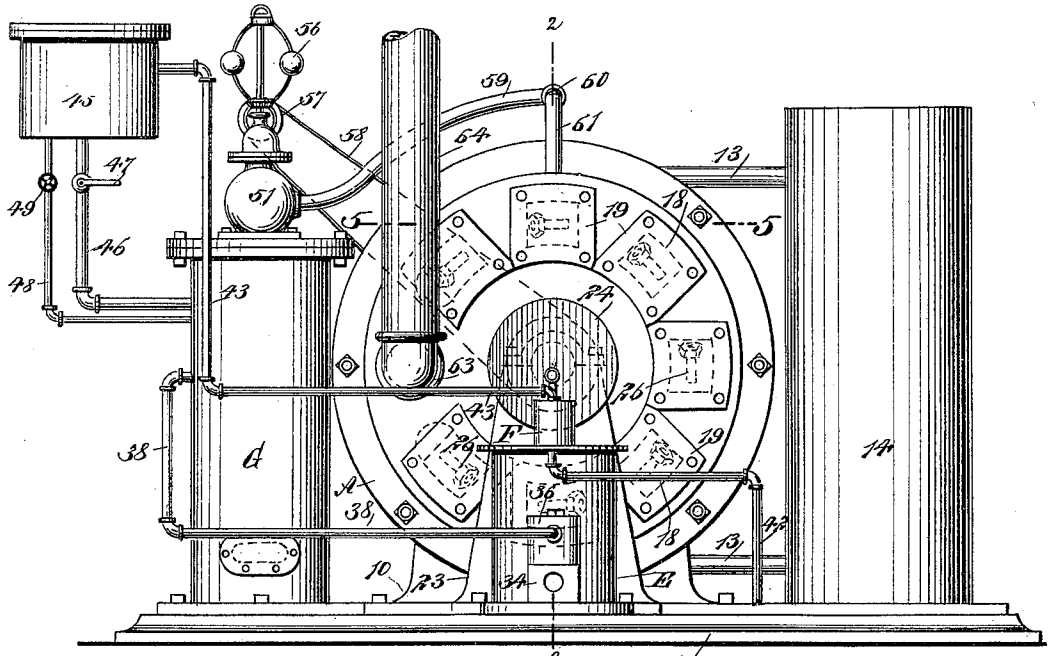

Fig. 1

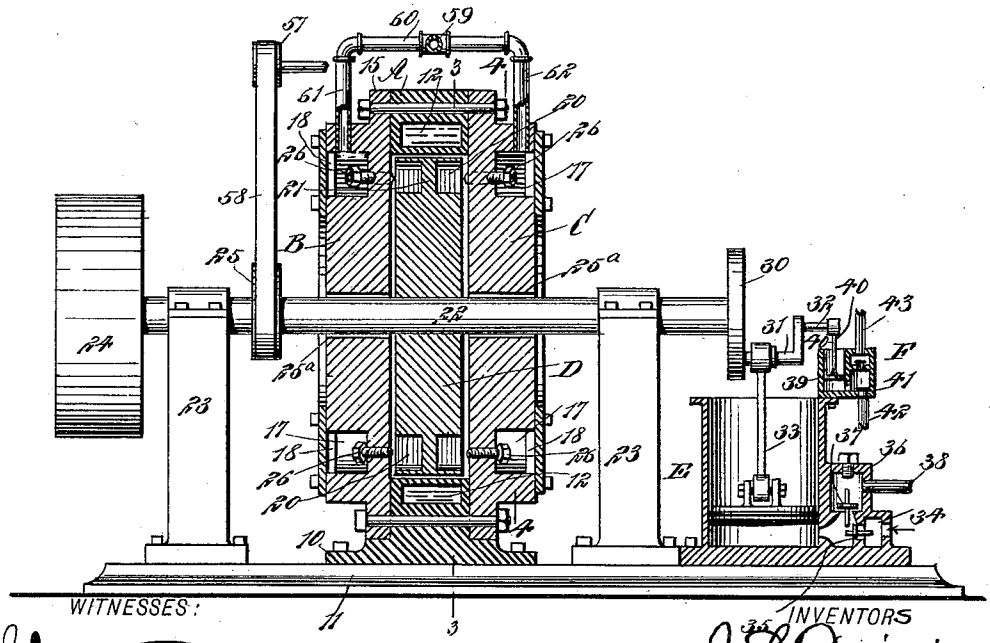

Fig. 2

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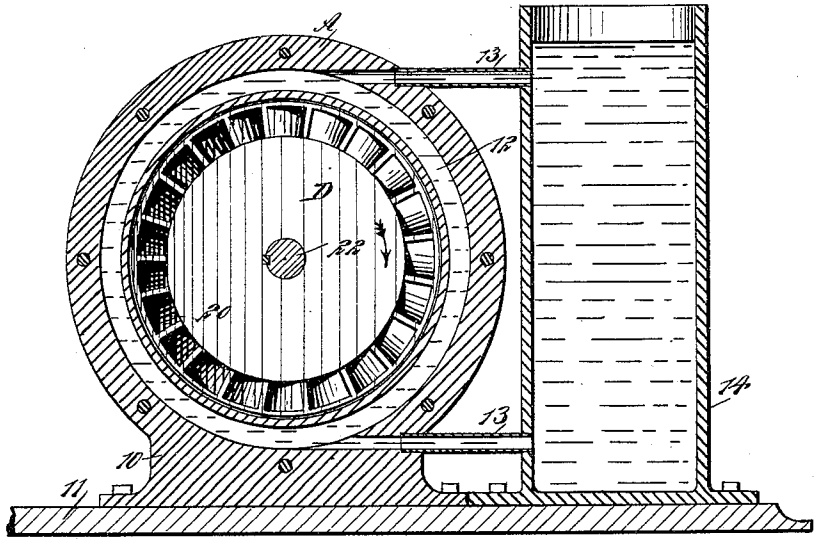

Fig. 3

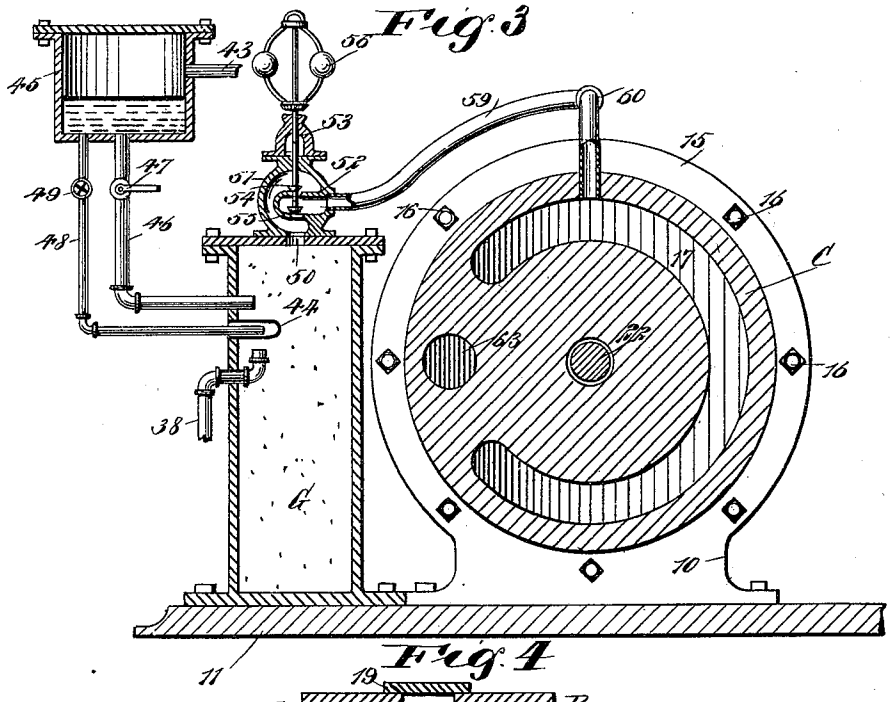

Fig. 4

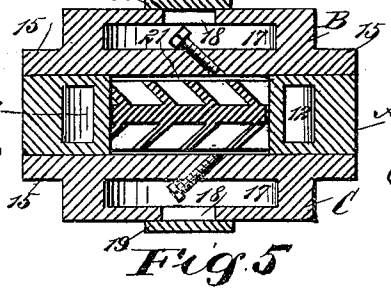

Fig. 5

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No. 642,949. Patented Feb. 6, 1900.

J. L. BAILLIE & P. B. VERITY.

COMBUSTION ENGINE.

(Application filed Aug. 5, 1898.)

(No Model.) 3 Sheets—Sheet 3.

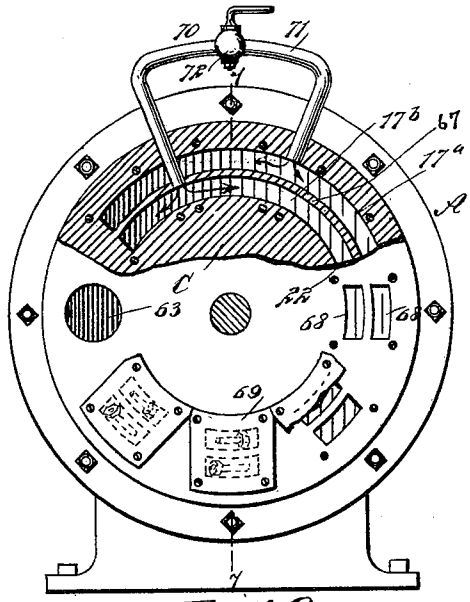

Fig. 6

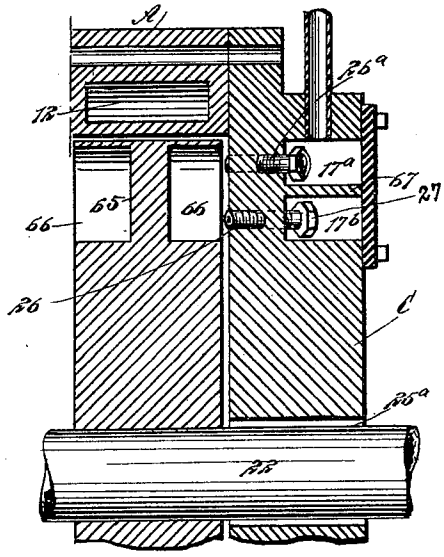

Fig. 7

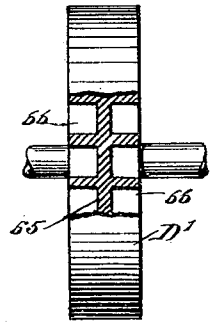

Fig. 9

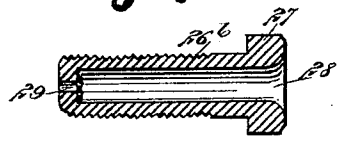

Fig. 8

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UNITED STATES PATENT OFFICE.

JAMES L. BAILLIE AND PERLEY B. VERITY, OF SHAWNEE, OHIO.

COMBUSTION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 642,949, dated February 6, 1900.

Application filed August 5, 1898. Serial No. 687,855. (No model.)

To all whom it may concern:

Be it known that we, JAMES L. BAILLIE and PERLEY B. VERITY, of Shawnee, in the county of Perry and State of Ohio, have invented a new and Improved Combustion-Engine, of which the following is a full, clear, and exact description.

The object of the invention is to construct a simple, durable, and economic form of combustion-engine, and one capable of considerable power, in which a driving-wheel of the turbine type is employed.

A further object of the invention is to provide a combustion-engine in which gas, oil, air, or steam may be employed, or a mixture of any such elements, and, furthermore, to provide a means whereby the gas, oil, or other elements will be used expansively, being ignited or exploded in a separate vessel, the resulting gases being conducted to the driving-wheel of the engine, thus providing a more steady and uniform pressure than when the elements are exploded directly within the engine.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the 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 figures.

Figure 1 is a side elevation of the improved engine. Fig. 2 is a vertical transverse section taken on the line 2 2 in Fig. 1, the driving-wheel, which is of the single type, being adapted to revolve in one direction only. Fig. 3 is a central longitudinal section on the line 3 3 in Fig. 2 through the body of the engine, the driving-wheel, and the water-tank connected with the frame or casing of the engine. Fig. 4 is a vertical section on the line 4 4 in Fig. 2. Fig. 5 is a sectional plan view on the line 5 5 in Fig. 1. Fig. 6 is a side elevation of the body portion of the engine, a portion of the side being broken away, the driving-wheel employed being of a double or reversible type. Fig. 7 is a section taken substantially on the line 7 7 in Fig. 6. Fig. 8 is a detail sectional view of one of the supply-nozzles for the driving-wheel; and Fig. 9 is an edge view of the reversible driving-wheel, a portion of the rim being broken away.

A represents the frame or casing of the engine, the said frame or casing being of circular or ring-like construction, and the frame is provided with a base 10, adapted to be secured to a bed 11 in any suitable or approved manner. The frame A is further provided with an annular water-chamber 12, which is connected at the top and at the bottom by pipes 13 with a water-tank 14, the object of the water-supply to the chamber 12 being to prevent overheating of the engine.

At each side of the frame A plates are firmly secured in an air and steam tight manner. These plates are designated, respectively, as B and C and are provided with flanges 15, that are bolted to the frame outside of the water-chamber 12. A segmental chamber 17 is formed in each of the plates B and C near their outer faces, the said chambers being adapted for receiving and delivering the explosive gases to the driving-wheel D of the engine, which driving-wheel is mounted to rotate within the frame A between the plates B and C, as shown in Fig. 2.

At various points in the outer face of each plate B and C hand-holes 18 are produced leading into the said chambers, and the hand-holes are normally closed by cover-plates 19. (Shown in Figs. 1 and 4.) The single form of driving-wheel D is provided upon each side of its periphery with a series of pockets 20, the pockets being oppositely disposed and given an inclination in direction of the axis of the wheel, as illustrated in Fig. 5, and the sets of pockets are separated from one another by a web 21. The driving-wheel D is secured upon a driving-shaft 22, which shaft is journaled upon pillars 23, attached to the bed 11, and the said shaft 22 is provided at one end with a driving-pulley 24 and also with a smaller pulley 25, adapted to drive a governor, to be hereinafter described. The shaft 22 is made to pass loosely through openings 25^a, made in the plates B and C.

Nozzles 26 are located within the gas-receiving chambers 17 of the side plates B and C. These nozzles are located opposite the hand-holes 18 and are given an inclination corresponding to the inclination of the pockets

in the driving-wheel D. These nozzles are exteriorly threaded and are provided at their outer ends with polygonal heads 27 in order that they may be readily removed, if desired. The nozzles 26, as shown in Fig. 8, are provided with an outer or inlet end 28, of greater diameter than the inner or outlet end 29, and this reduction in the passage-ways of the nozzles may be brought about by tapering the said passage-ways or by suddenly reducing the width of the passage-ways at their inner ends, as shown in the said Fig. 8.

A crank-disk 30 is secured at the end of the shaft 22 opposite that at which the pulley 24 is placed, and a double crank is eccentrically attached to the said disk, the two cranks being designated as 32 and 31. An air-pump E is located below the inner crank 31, and the piston-rod 33 of the air-pump is connected with the said crank 31, as shown in Fig. 2. Air is admitted into the pump E through the medium of an auxiliary chamber 34, provided with a valve 35, opening inward, and above the air-inlet chamber 34 an air-outlet chamber 36 is located, having a valve 37, which opens upward. The air outlet or discharge chamber 36 is provided with a pipe 38, which receives the air forced from the pump E. An oil or gas pump F is located, preferably, on the air-pump E, the said pump consisting of a cylinder 39, having a piston the rod 40 whereof is connected with the crank 32, and a supply-cylinder 41, having an inlet-pipe 42 and an outlet-pipe 43.

An exploding-chamber G in the form of a cylinder is attached to the bed 11, adjacent to the engine, and the air-discharge pipe 38 enters the said chamber preferably below a pipe 44, which extends horizontally within the chamber, as shown in Fig. 4, communicating with the atmosphere, the inner end of the pipe 44 being closed. The oil or gas from the pump F is delivered through the discharge-pipe 43 into a tank 45, and a discharge-pipe 46, provided with a suitable valve 47, is carried from the bottom of the tank 45 into the exploding-chamber G or the chamber where the explosion is to take place, the pipe 46 being immediately over the closed pipe 44. The pipe 46 is adapted to deliver the oil or gas into the said chamber G, and a second and similar discharge-pipe 48 is carried from the tank into the pipe 44, forming a portion of the casing of the explosion-chamber. The pipe 48 is provided with a valve 49, and the said pipe 48 is adapted to supply sufficient gas and oil to the pipe 44 to enable a flame to be obtained sufficient to heat the said pipe 44, and thus facilitate the explosion of the elements fed into the explosion-chamber.

The gases resulting from the explosion of the elements in the chamber G pass out through an opening 50 in the top of the said chamber into a governor-casing 51, which is provided with a hollow partition 52, extending from one side nearly to the other, the said partition connecting with an opening in one side of the casing. The governor-rod 53 is provided with two valves 54 and 55, one of the valves being arranged to be seated in an opening in the upper portion of the partition. The governor-rod is provided with the usual ball-governors 56, and the governor-balls are controlled by a shaft connected by suitable gearing with the balls, the shaft being provided with a pulley 57, connected by a belt 58 with the smaller pulley 25 on the shaft 22. When the engine is traveling at too great speed, the governor will act to cut off the supply of gases to the engine, the said supply being through the medium of a pipe 59, connected with the governor-casing at the opening leading into the hollow partition, and the said pipe 59 is connected with the cross-pipe 60, from each end of which a branch is projected downward, one into the gas-receiving chamber 17 of each side plate B and C, as is also shown in Fig. 2, the branch pipes being designated, respectively, as 61 and 62. Between the ends of the gas-receiving chambers of the sides B and C exhaust-ports 63 are formed in the said side pieces, connected with suitable pipes 64, the exhaust-ports receiving the spent gases from the pockets of the driving-wheel. The gases supplied to the chamber 17 pass through the nozzles 26 and strike the vanes of the driving-wheel, causing it to rapidly revolve.

In Figs. 6, 7, and 9 we have illustrated a slight modification of the engine, in that the engine is arranged to rotate a reversible wheel. Under such a construction of engine two gas-receiving chambers 17^a and 17^b are produced in each side piece B and C, separated by partitions 67, and hand-holes are provided for each chamber, as shown in Fig. 6, covered by plates 69. The driving-wheel D′ is provided with pockets 66 at each side of a central web 65; but the pockets are arranged transversely of the wheel instead of diagonally thereof, and at various intervals in each of the gas-receiving chambers 17^a and 17^b nozzles 26^a and 26^b are located, the nozzles in one chamber of each side piece having an inclination in an opposite direction to the nozzles in the other chamber. Under this form of construction of the engine two branch pipes 70 and 71 are carried down from each end of the cross-pipe 60, one of the branch pipes being longer than the other, since one pipe is made to enter the chamber 17^b and the other pipe the chamber 17^a of a side piece, as shown in Fig. 6. Where these branch pipes connect with the cross-pipe 60, a three-way valve 72 is located, so that the gases may be supplied to either the one or the other of the chambers in the side pieces and the driving-wheel be driven in one or the other direction.

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

1. In a combustion-engine, the combination with a combustion-chamber, and oil and air supply pipes projecting into the same, of a

pipe projecting into the chamber between the air and oil pipes, said pipe having a closed inner end and an open outer end, and an oil-pipe projecting into the said pipe, substantially as described.

2. In a combustion-engine, the combination of a combustion-chamber, a horizontally-extending pipe in the chamber, the inner end of the pipe being closed and its outer end open, an air-pipe leading into the chamber below the horizontally-extending pipe, a gas or oil tank, a pipe leading from said tank into the chamber above the horizontally-extending pipe, and a second pipe leading from the tank into the said horizontally-extending pipe, substantially as described.

3. In a combustion-engine, the combination of a casing having chambers in its sides, a turbine driving-wheel mounted in the casing and provided with pockets in its sides, nozzles in the chambers of the casing and discharging into the pockets of the turbine wheel, a combustion-chamber, a governor-casing on the combustion-chamber and communicating therewith, a hollow partition in said casing and provided with valve-seats, a pipe leading from the hollow partition and connected with each chamber of the driving-wheel casing, valves adapted to be seated on the seats of said partition and a governor driven from the driving-wheel and having the said valves secured to its rod, substantially as described.

4. In a combustion-engine, the combination with a combustion-chamber, a casing, a connection between the casing and chamber and a wheel in the casing driven by the products of combustion from said chamber, of a disk on the shaft of the said wheel, two cranks eccentrically secured to the disks, an air-pump having its piston connected with one crank, an oil-pump on the upper part of the air-pump and having its piston connected with the other crank, and connections between the said pumps and combustion-chamber, substantially as described.

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PERLEY B. VERITY.

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JOHN O. THOMSON.