

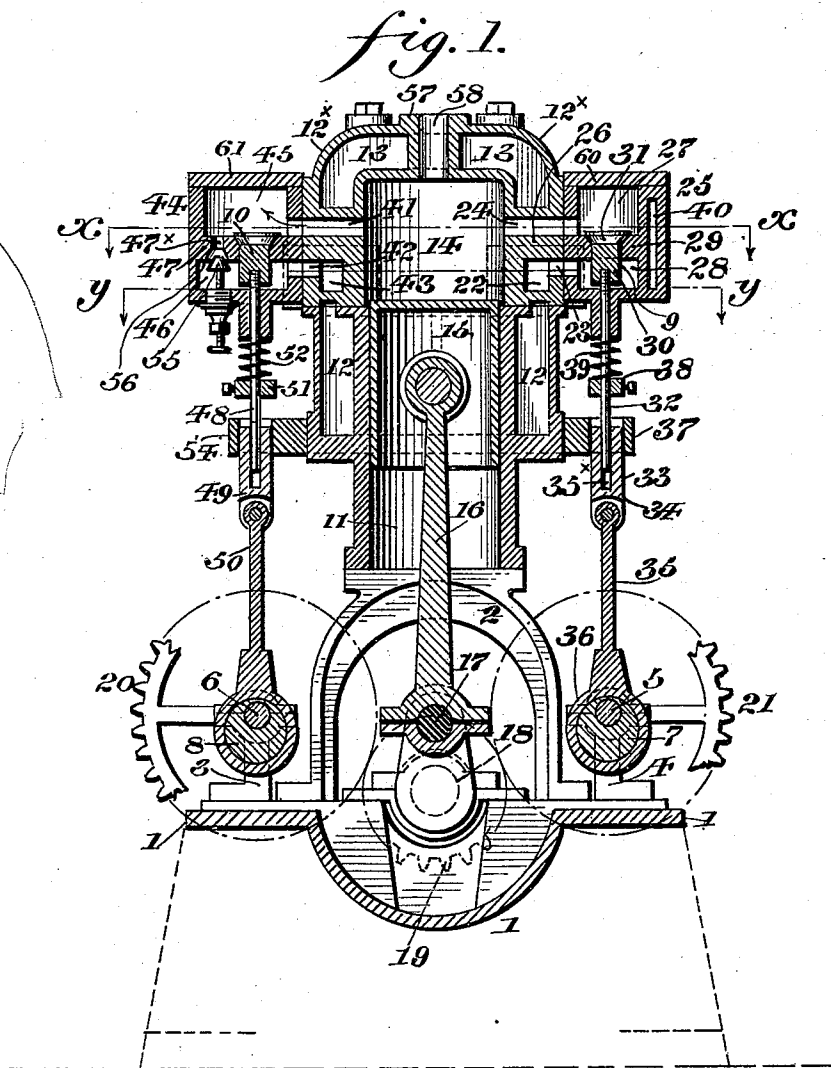
(No Model.)

2 Sheets—Sheet 1.

B. L. RINEHART & B. M. TURNER.
GAS ENGINE.

No. 552,332.

Patented Dec. 31, 1895.



Witnesses
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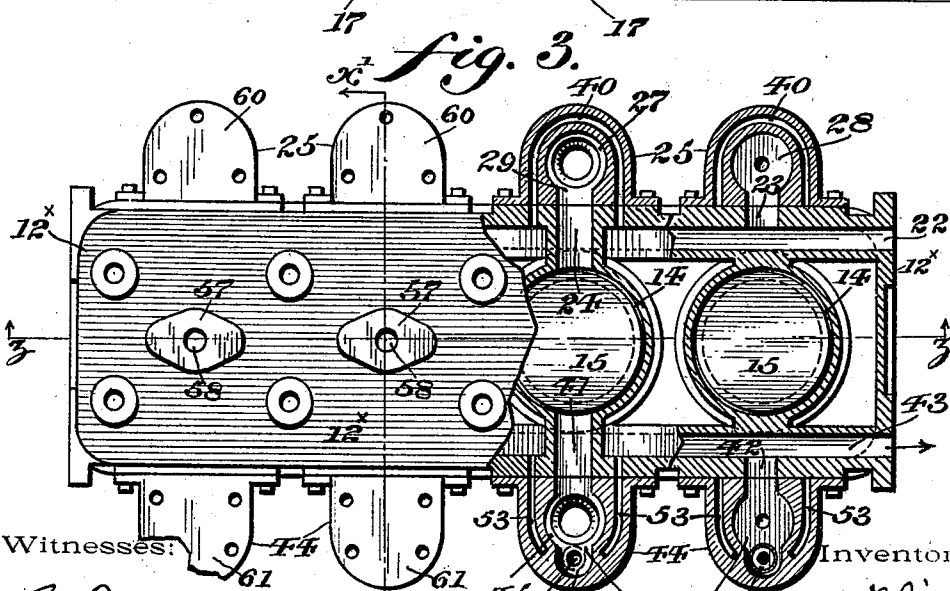
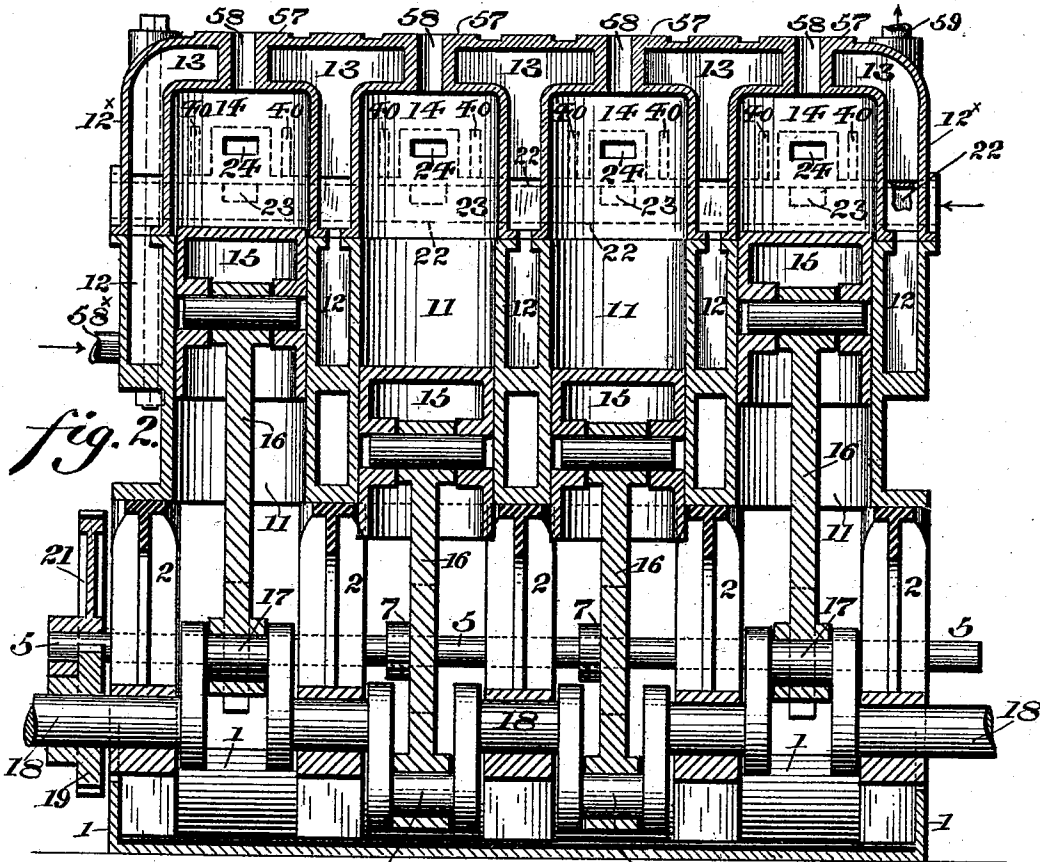
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2 Sheets—Sheet 2.

B. L. RINEHART & B. M. TURNER.
GAS ENGINE.

No. 552,332.

Patented Dec. 31, 1895.



Witnesses:

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UNITED STATES PATENT OFFICE.

BENTLEY L. RINEHART AND BRYSON M. TURNER, OF CAMDEN, NEW JERSEY,
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GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 552,332, dated December 31, 1895.

Application filed April 27, 1895. Serial No. 547,319. (No model.)

To all whom it may concern:

Be it known that we, BENTLEY L. RINEHART and BRYSON M. TURNER, citizens of the United States, residing in the city and county of Camden, State of New Jersey, have invented a new and useful Improvement in Gas-Engines, which improvement is fully set forth in the following specification and accompanying drawings.

Our invention consists of a novel construction of gas-engine in which the cost of the production and erection of the same is reduced to a minimum, provision being made for keeping the walls of the cylinders and valve-chests always cool and for simplifying the construction throughout.

It also consists of a novel arrangement of the inner and outer cranks relative to each other, whereby a steady and uniform reciprocation of the piston is attained and injurious vibrations and strains are prevented.

It also consists of a novel arrangement of the location of the inlet and exhaust ports relative to the cylinders and valve-chests, thereby dispensing with pipe fittings, connections, &c.

It also consists of a novel means of actuating and cushioning the valve-rods.

It further consists of novel details of construction, all as will be hereinafter set forth.

Figure 1 represents a vertical sectional view through one cylinder of a gas-engine embodying our invention, showing the inlet and exhaust ports and the valves controlling the same, the section being taken on line $x'x'$, Fig. 3. Fig. 2 represents a vertical sectional view of the same on line zz , Fig. 3. Fig. 3 represents a partial plan and sectional view of the same, the extreme right-hand end being a section on line yy , Fig. 1, while the intermediate portion represents a section on line xx , same figure.

Similar numerals of reference indicate corresponding parts in the several figures.

Referring to the drawings, 1 designates the base or bed of the engine, upon which are mounted the frames 2, and on each side of the latter the posts 3 and 4, the upper portions of which form bearings for the eccentric-shafts 5 and 6, upon which are mounted the eccentrics 7 and 8, which actuate the inlet and ex-

haust valves 9 and 10, respectively, as will be explained.

11 designates the engine-cylinders, which are suitably attached to the top of the frames 2, said cylinders having their upper portions provided with a jacket 12, which is to be supplied with water. The cylinders in the present instance are four in number, and since the construction of each cylinder and its adjuncts is substantially the same a description of one will suffice for all. The top of each cylinder 11 has suitably attached thereto the cap portion 12^x, which is provided with a water-jacket 13, which surrounds the explosion-chamber 14 within said cap, it being noticed that said explosion-chamber is of slightly larger diameter than the bore of the cylinder 11, in which the piston 15 reciprocates, so that no internal finishing or boring is required after said cap comes from the foundry. The said piston 15 has pivotally attached thereto one end of the connecting-rod 16, the other end of the latter being mounted on the crank 17 of the crank-shaft 18, which revolves in suitable bearings on the frame 1, it being noticed that the two outer cranks point in one direction, while the two inner cranks also point in one direction, but opposite to said outer cranks, at substantially an angle of one hundred and eighty degrees.

19 designates a pinion which is mounted on an end of the crank-shaft 18 and meshes with the gears 20 and 21, which are attached to the shafts 6 and 5, respectively. The said cap portion 12 is provided with the laterally-extending gas-inlet passage 22, which extends the length of the engine, and is in the present instance on substantially the same level as the exhaust-passage 43, to be hereinafter referred to, said passage 22 having the port 23 leading therefrom, and communicating with the lower portion of the adjacent inlet-valve chest or chamber 25.

24 designates an inlet-port which extends from the interior of the explosion-chamber 14 to the exterior thereof, and communicates with the upper portion 27 of the inlet-valve chamber 25, said ports 23 and 24 being separated by the partition 26. The said valve-chamber 25 is divided into the upper and lower chambers 27 and 28 by means of the

partition 29, through which passes the valve 9, the same consisting of the plug portion 30 and the valve proper 31, which is of inverted conical shape, and contacts with a similar-shaped seat in the top of said partition 29. The upper and lower chambers 27 and 28 communicate with the ports 23 and 24 by means of similar ports in alignment therewith, as stated. 32 designates the inlet-valve rod, which is attached to said valve 9 and passes through an elongated boss depending from said chest 25, a stuffing-box being dispensed with, the lower or free end of said rod entering the upper portion of a cavity 35^x which serves as a dash-pot, which is formed in the upper portion of the head 34, whose lower end is pivotally attached to the upper end of the eccentric-rod 35, which latter is attached to the eccentric-strap 36, which is actuated by the eccentric 7 mounted on the shaft 5. 37 designates a guide for said head 34. 38 designates a collar attached to said rod 32, which is normally held in contact with one end of a spring 39, the other end of the latter contacting with the under side of a suitable portion of the chest 25. 40 designates a water-jacket in said valve-chest 25.

The construction and location of the exhaust-valve 10, the exhaust-ports 41 and 42, the passage 43, the exhaust-valve chamber 44 having the upper and lower compartments 45 and 46, and the partition 47 are similar to the corresponding parts, passages, &c., of the inlet-valve chest 25, and will, it is thought, require no further description, the means for actuating the said exhaust-valve 10 consisting of the valve-rod 48, the dash-pot in the head 49, and the eccentric-rod 50, being also substantially the same as the similarly-arranged devices for actuating the valve 9, said valve-rod 48 having an adjustable collar 51, and a spring 52 intermediate said collar and valve-chamber, while the latter has a water-jacket 53 around it and a guide 54 for the head 49.

55 designates a suitable relief-valve, which has its seat 56 on the under side of the partition 47, said relief-valve being normally closed tight on its seat, but being adapted to be opened when it is desired to turn the engine over, in which case if the valves 9 and 10 should be closed, and the piston 15 depressed from the position seen in Fig. 1, and it should be desired to elevate said piston, by opening the valve 55, the gas above said piston can readily escape through the ports 47^x and 42 into the exhaust-passage 43, and the upward movement of the piston will be unobstructed, as is evident.

57 designates bosses on the top of the cap-section 12^x, to which a suitable igniting device is to be attached, the spark from the igniter being conducted into the explosion-chamber 14 by means of the passage 58, which extends up through the water-jacket 13.

58^x designates the inlet-pipe which conducts water to the jacket around the cylin-

ders, said water being conveyed therefrom by the pipe 59.

The inlet and exhaust valve chambers 25 and 44 are made separate from the engine-cylinders, and suitably attached thereto, as will be understood from Figs. 1 and 3, said chambers having covers 60 and 61.

It will be noticed that the main inlet and exhaust passages are cast within the cap-portion 12^x of the engine, the caps for the four cylinders being in the present instance cast together, as are also said four cylinders, the water-jackets of said cap and cylinder section being in communication, as are also the water-jackets of the inlet and exhaust valve chambers, as is evident from Figs. 2 and 3. The said cap-section is preferably secured to the cylinder-section by means of bolts. (Shown dotted at the left of Fig. 1.)

By casting the inlet and exhaust passages within the upper portion of the engine, and attaching the valve-chests thereto in the manner described, expensive pipe fittings, couplings, &c., are dispensed with, and the different parts of the engine can be assembled without necessitating the employment of skilled labor, it being noticed that the inlet or exhaust pipe can be attached to either end of the engine, as may be most convenient, the end not used being closed in any suitable manner.

By the employment of the dash-pots or cushioning devices shown in Fig. 1, the noise incident to the operation is minimized, and the parts are more readily assembled than heretofore, and it will also be seen that by arranging the inner and outer cranks relatively to each other, as shown, injurious strain will be prevented, and uniformity of movement assured.

The operation is as follows: Assuming the piston 15 and the valves 9 and 10 to be in the positions shown in Fig. 1, the valve 55 closed, and a suitable volume of gas above said piston, it will be evident that if said gas is ignited or caused to explode the piston 15 will be driven downwardly. At the termination of the downstroke the valve 10 opens and the exhaust takes place, while at the end of the upstroke the exhaust-valve 10 closes, and the inlet-valve 9 opens and remains open until the piston 15 has moved to the end of its downstroke, at which point the valve 9 closes. The piston 15 then moves up into position seen in Fig. 1, at which point the explosion takes place and the operation is repeated, the gas entering by the passage 22 and being conducted through the ports and chambers 23, 28, 27 and 24 to the explosion-chamber 14, and passing from the latter after the explosion through the ports and chambers 41, 45, 46 and 42 to the exhaust-passage 43, said exhaust-valve 10 being caused to open at the proper intervals, as stated.

Both the suction and discharge valves open once every other revolution, neither opening during the intermediate revolution, and said

valves being raised in the present instance by one-quarter of the throw of the eccentric.

The seating of the valves 9 and 10 is rendered positive by the employment of the springs 39 and 52 and their collars, the tension of said springs being adjusted by shifting said collars.

The upward movement of each of the valves is caused by the contact of the end of the valve-rods with the bottom of the dash-pot in the heads 34 and 49, while any excessive shock caused by their downward movement is prevented by said dash-pots, as is evident, the movement of said heads being caused by the engagement of the pinion 19 with the gears 20 and 21, which are mounted on the shafts 6 and 5, as is evident.

The function and operation of the valve 55 have already been explained.

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

1. In a gas engine, a cap section having an explosion chamber, inlet and exhaust passages therein, communicating therewith, a main inlet and main exhaust passage in said cap, adjacent said former passages, but out of direct communication therewith, and a cylinder supporting said cap, in combination with inlet and exhaust valve chambers divided into upper and lower compartments, in communication with said first mentioned and main passages respectively, and valves and pistons, substantially as described.

2. In a gas engine, a cap section having therein a plurality of explosion chambers, inlet and exhaust passages thereto, in communication with said explosion chambers, a main inlet and main exhaust passage in said cap adjacent to said former passages, but out of direct communication therewith, and cylinders supporting said cap section, in combination with inlet and exhaust valve chambers divided into upper and lower compartments in communication with said first mentioned and main passages respectively, and valves and pistons for said engine, said cylinder, cap section and valve chambers being provided with water jackets, substantially as described.

3. In a gas engine, a cap section, having therein an explosion chamber, a main inlet thereto, a water jacket surrounding the same, an inlet passage leading to said explosion chamber, an inlet valve chamber having a partition therein dividing the same into upper and lower compartments, the upper compartment being in communication with said inlet passage to the explosion chamber, said main

inlet being in communication with the lower compartment, a valve in said partition having a valve rod depending therefrom, a collar on said rod, a spring interposed between said collar and valve chamber, a head in which said valve is seated, means for actuating said head, an exhaust port on the opposite side of said explosion chamber, an exhaust valve chamber, an upper compartment therein communicating with said exhaust port, a lower compartment leading to the main exhaust outlet, a partition intermediate said compartments, an exhaust valve in said chamber seating in said partition, and means for actuating said valve, in combination with an engine cylinder suitably supported, said engine cylinder, and inlet and exhaust valve chambers, being provided with water jackets, substantially as described.

4. In a gas engine, a cap section having therein an explosion chamber, a water jacket surrounding the same, an inlet passage leading to said explosion chamber, an inlet valve chamber having a partition therein dividing the same into upper and lower compartments, the upper compartment being in communication with said inlet passage to the explosion chamber, a main inlet for the gas located in said cap, out of communication with the former inlet passage, and in communication with the lower compartment, a valve in said partition having a valve rod depending therefrom, a collar on said rod, a spring interposed between said collar and valve chamber, means for actuating said rod, an exhaust port on the opposite side of said explosion chamber, an exhaust valve chamber, an upper compartment therein communicating with said exhaust port, a lower compartment therein communicating with said exhaust port, said lower compartment leading to the main exhaust outlet, a partition intermediate said compartments, an exhaust valve in said chamber seating in said partition, a second valve adjacent said exhaust valve and adapted to be normally closed, but to be opened when it is desired to turn the engine over, and means for actuating said valve in combination with an engine cylinder suitably supported, said engine cylinder, and inlet and exhaust valve chambers being provided with water jackets, substantially as described.

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