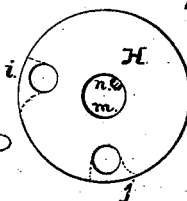


Patented Nov. 4, 1879.

Witnesses:
Edw. L. Osborn.
Louis H. Foster.



Anatole Ehret

By Wm Smith

Attorney:

UNITED STATES PATENT OFFICE.

ANATOLE EHRET, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO FRANK X. CICOTT, OF SAME PLACE.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. 221,224, dated November 4, 1879; application filed May 19, 1879.

To all whom it may concern:

Be it known that I, ANATOLE EHRET, of the city and county of San Francisco, in the State of California, have made and invented a certain new and useful Improvement in Steam-Engines, which invention is fully set forth and described in the following specification and the drawings therein referred to.

My invention relates to an improvement in reciprocating engines; and it has for its object to produce an engine which shall combine great simplicity of construction, ease and rapidity of action, and cheapness in cost of manufacture.

It consists in the combination together of double cylinders, a double-crank shaft, reciprocating pistons acting alternately, and a novel construction and mode of operating rotary reciprocating valves to control the induction and eduction ports, as will be more fully described hereinafter.

In the accompanying drawings, Figure 1 is a top view of my improved engine, with the cylinders partly in section to expose the interior parts. Fig. 2 is an end view taken from the left-hand side of Fig. 1, and with the heads of the cylinders removed to show the valves. Figs. 3 and 4 are views of the right and left cylinders, being longitudinal vertical sections through the lines *x x y y*, Fig. 2. Fig. 5 is an enlarged section taken vertically through the cylinder, the reciprocating valve, and the head that closes the cylinder. Fig. 6 is a detail view, showing the construction and operation of the valve.

A A' are the cylinders, placed side by side, with their axes parallel. B is a crank-shaft, held in bearings *b b*, and provided with double cranks *c c*, set in opposite directions. C is a fly-wheel, and C' is a pulley for transmitting power. D D' are two pistons, connected each with a crank on the shaft by means of a connecting-rod, E.

Steam is admitted into the cylinders upon one side of the pistons through the pipes *d d* and cylinder-ports *e e*, and it is exhausted from the same side through the ports *h h*. These ports are made through the side of the cylinder near the head, and are located in the same

vertical plane. Between these ports are placed circular valves H H', having a rotary reciprocating motion to connect the ports with and shut them off from the cylinder-space.

The valves H have supply and exhaust passages *i j* formed axially and radially through the face and out at the rim or periphery, and they are held in chambers *a a*, provided for them within the cylinders at the head, so that they shall have no longitudinal motion, but only a rotary movement in their seats.

I I are reciprocating rods carried by the pistons, and operating to produce the required rotary movements of the valves. These rods are secured to and project from the face of the pistons, and are carried back and forth in the center of the cylinder and through the central aperture, *m*, in the valves. Grooves or slots *k k l* are formed longitudinally in the rods along their length, which are caused to produce rotation of the valves forward and back by acting upon and against a roller-stud fixed within the central aperture, *m*, of each valve.

The straight portions *k k* of the grooves are connected at the front and rear ends by the curved or cam grooves *l l*, and during the reciprocations of the rods I these straight portions hold the valve stationary while its stud is traveling in them, and the curved portions, as they strike the stud at the termination of each stroke, produce the rotations of the valve to bring the supply and exhaust passages alternately into and out of line with their respective ports in the cylinder.

As the valves H occupy two different positions during the reciprocations of the rods I—one when the passage *i* is in line with the inlet *e*, and the other when the exhaust-passage *j* and port *h* are brought together—it becomes necessary to provide the two straight grooves *k* for the stud *n*, that the rod may pass through the valve at the principal portions of each forward-and-back stroke without moving the valve. Rotation of the valve takes place only when the curved portions *l* of the grooves come in contact with the roller-stud *n*.

G G' are the heads, closing one end of the

cylinders, and F F are extensions thereof, in which are formed the chambers or passages *ff*, to receive and guide the free ends of the rods I. These passages communicate with the atmosphere through the apertures *f'*, to prevent compression of air within the chamber and reduce resistance against the head of the rod.

This construction of valve and the manner of arranging and actuating it enable me to manufacture an engine at a low cost, from the great simplicity and the reduction in the parts of valve mechanism.

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

1. A steam-cylinder having induction and eduction ports located in the same plane, perpendicular to the cylinder-axis, a circular valve located within the cylinder and in line with the ports thereof, provided with induction and eduction passages formed longitudinally and radially through its face and rim, in combination with means, as described, for producing an intermittent rotary reciprocation of the valve during the play of the piston, consisting of the grooved rod I, fixed to and carried by the piston, and a roller-stud fixed in the central aperture of the valve, all constructed and arranged substantially as set forth.

2. In combination, the cylinder having the central longitudinal extension-chamber *f*, the reciprocating piston, the grooved rod I, carried by the piston, and the circular valve H, situated in line with the cylinder-ports, and having a central aperture to receive the reciprocating rod, and a roller-stud to play in the grooves thereof, all substantially as described.

3. The combination of the reciprocating rod I, having grooves *k k l l*, and the circular valve H, held in a circular seat, and having a central aperture to receive said rod, and a roller-stud to work in said grooves, constructed and arranged to operate substantially as described.

4. The combination together of the double cylinders A A', the double-crank shaft B, the pistons D, and connecting-rods E, the extension-chambers F on the head of said cylinders, the circular valves H H', situated as described, and the grooved reciprocating rods I I', all constructed and arranged to operate together substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 7th day of April, 1879.

ANATOLE EHRET.

Witnesses:

C. W. M. SMITH,
WM. S. CAMPBELL.