

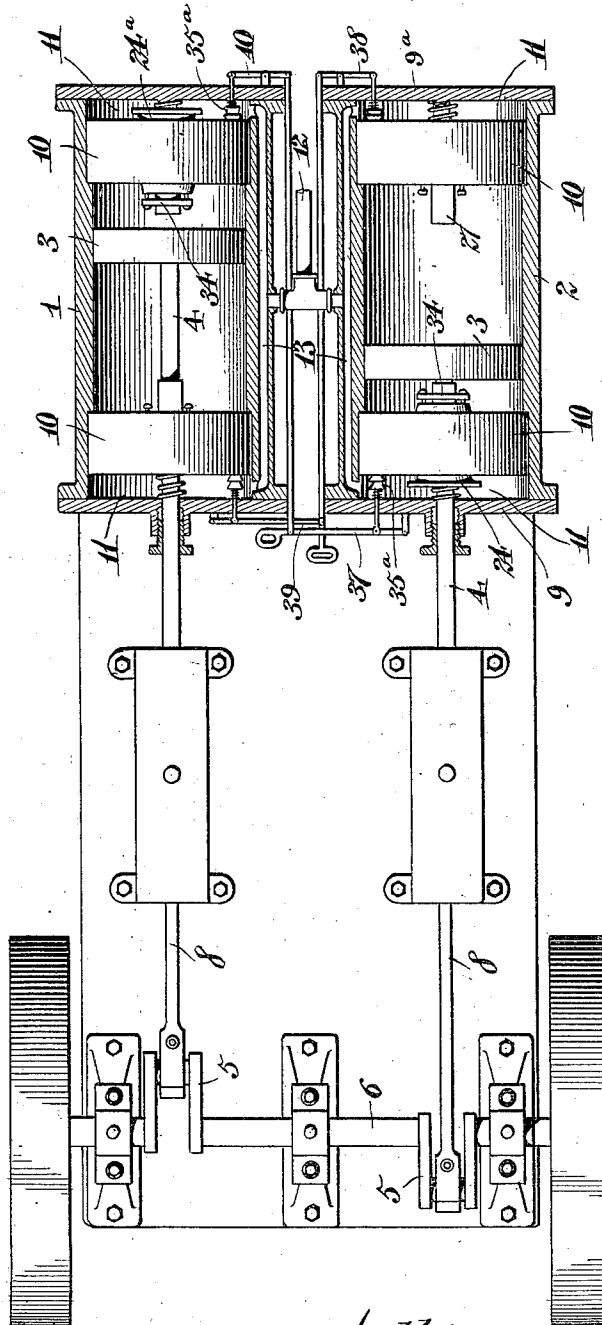
W. HUNTER, JR.
STEAM ENGINE.
APPLICATION FILED NOV. 19, 1912.

1,065,809.

Patented June 24, 1913.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses :
Christ Feinle, Jr.,
J. Warner

Inventor,
William Hunter, Jr.
By Victor J. Evans,
Attorney.

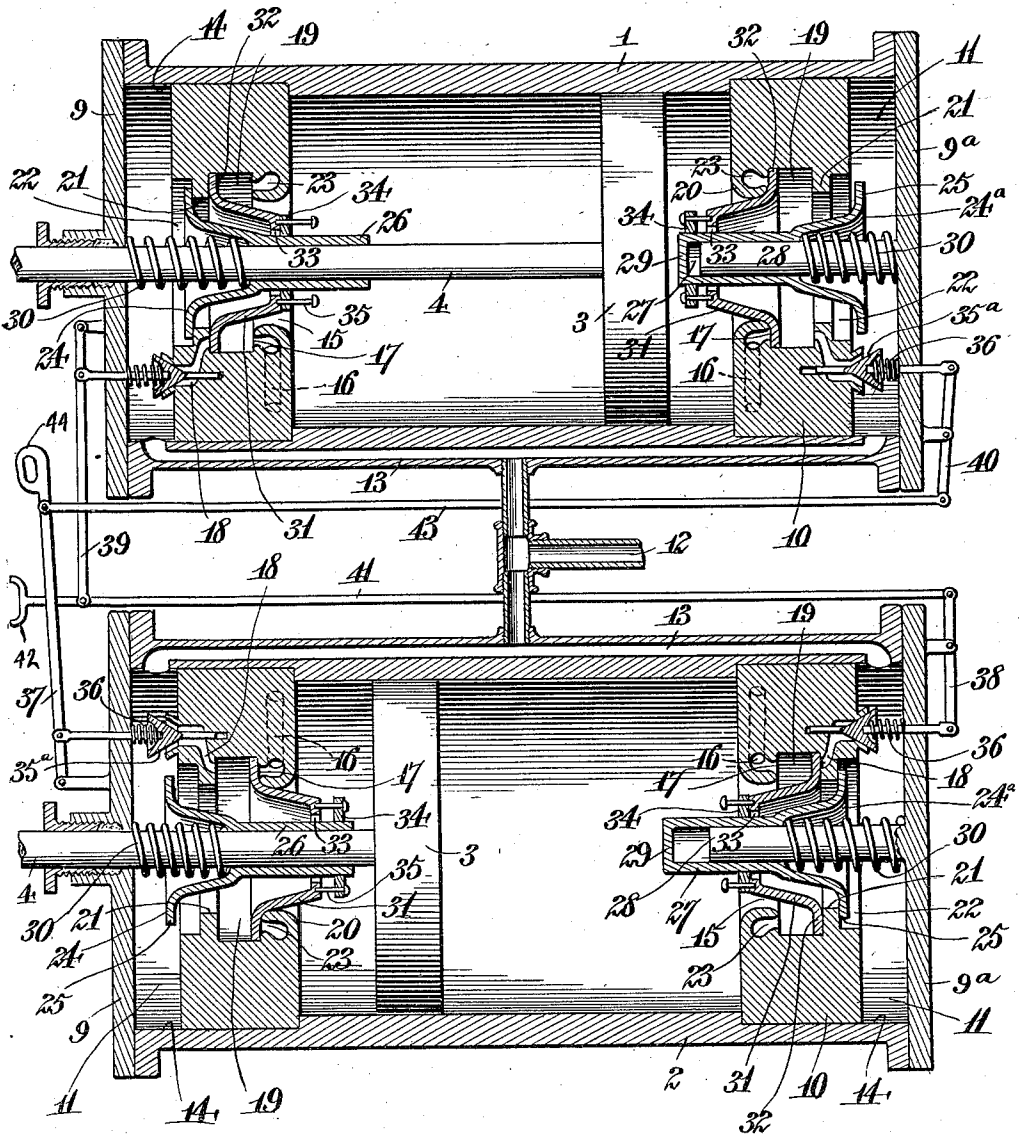
W. HUNTER, JR.
STEAM ENGINE.
APPLICATION FILED NOV. 19, 1912.

1,065,809.

Patented June 24, 1913.

2 SHEETS-SHEET 2.

Fig. 2.



Witnesses:
Christ Heinle, Jr.,
J. W. Garner

Inventor,
William Hunter, Jr.
By Victor J. Evans,
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM HUNTER, JR., OF SPARTANBURG, SOUTH CAROLINA.

STEAM-ENGINE.

1,065,809.

Specification of Letters Patent.

Patented June 24, 1913.

Application filed November 19, 1912. Serial No. 732,260.

To all whom it may concern:

Be it known that I, WILLIAM HUNTER, JR., a citizen of the United States, residing at Spartanburg, in the county of Spartanburg and State of South Carolina, have invented new and useful Improvements in Steam-Engines, of which the following is a specification.

This invention relates to improvements in steam engines and especially with reference to the construction of the cylinder and valves located in the cylinder for admitting and exhausting steam and thereby determining and controlling the action of the piston, the object of the invention being to provide an improved engine in which the usual link motion for reversing the engine and the usual valves located exteriorly of the cylinder are dispensed with, the invention consisting in the construction, combination and arrangement of devices hereinafter described and claimed.

In the accompanying drawings: Figure 1 is a plan, partly in horizontal section, of a two cylinder engine constructed in accordance with my invention. Fig. 2 is a horizontal sectional view, on a larger scale, of the cylinders and their interiorly located valves, the pistons and piston rods being shown in plan.

For the purposes of this specification, the engine here shown is provided with a pair of cylinders 1—2, in each of which operates a piston 3, each piston having a rod 4, the cranks 5 of the double crank shaft 6 being connected to the piston rods by the usual pitmen 8.

The cylinders and their interiorly located valves are identical in construction and I will, therefore, only describe one of them. Each cylinder has heads 9 and 9^a at opposite ends and is also provided with partition heads 10 which are spaced from the heads 9 so that live steam chambers 11 are formed between the heads and the partition heads. A steam feed pipe 12 is connected to the live steam chambers of the cylinders by means of steam ducts 13 which discharge into the said live steam chambers. Each cylinder is here shown as having an enlarged counterbore 14 in each end, the partition heads being shown as arranged in the said counterbores. The partition heads are fixed in place but are adapted to be removed from the cylinder, when desired. Each partition head has a centrally located working

opening 15, an exhaust passage 16 leading from the working opening and communicating therewith through a port 17, each partition head being also provided with a starting passage 18 which leads from the live steam chamber 11 and discharges into the diametrically enlarged central portion 19 of the working opening and preferably, as here shown, at a point opposite but spaced from the exhaust port 17. An annular shoulder 20 is formed around the inner side of the enlarged central portion 19 of the working opening, an annular shoulder 21 is formed around the outer side of the said enlarged portion of the working opening and at the extreme outer side of the working opening there is an annular counterbore or recess 22 formed in the outer side of the partition head. The shoulder 20 is provided with an annular channel 23 on its inner face, which channel communicates with the exhaust passage or duct.

In opposite ends of each cylinder are working valves 24—24^a which are similar in size and shape and are here shown as substantially bell-shaped and provided each at its outer end with a base flange 25 to move into and from the recess 22 of the partition head with which it is associated. The working valve 24 also has a tubular extension 26 at its inner end which operates on the piston rod and the valve 24^a has a similar extension 27 which operates on a guide 28 with which the head 9^a is provided, the inner end of the said extension 27 being closed as at 29. A pair of coiled extensible springs 30 are provided which are arranged in the live steam chambers 11 and bear between the heads and the working valves to keep the latter normally closed, one of these springs being on the piston rod and the other on the guide 28. Associated with each working valve and each partition head is an exhaust valve 31. The said exhaust valves are similar in shape to but are of less depth than the working valves and each exhaust valve has a base flange 32 which operates in the enlarged portion 19 of the working opening 15 and between the shoulders 20 and 21 and also has a central opening 33 at its smaller inner end through which the tubular extension of the associated working valve extends, the diameter of the said opening being greater than that of said tubular extension of the working valve.

Associated with each working valve and

exhaust valve is a cut off valve 34 which is here shown as annular in form and fitted snugly on the tubular extension of the working valve, to reciprocate thereon, each cut off valve being connected to the exhaust valve for reciprocating movement therewith and also independently thereof, by means of link bolts 35, each link bolt being secured to the exhaust valve and passing through and working in an opening in the cut off valve and being provided at its inner end or that end which extends into the cylinder toward the piston with a head, the said heads forming stops to limit the movement of the cut off valve in one direction. A starting valve 35^a is provided for each passage 18 to open the inlet or outer end thereof, and each starting valve is normally kept in closed position by means of a spring 36.

The operation of the engine is as follows: In order to start the engine, the starting valve 35^a at one end of the cylinder is momentarily opened thus causing steam to enter the space between the working valve and exhaust valve at that end of the cylinder and, hence, to pass through the opening 33 of the exhaust valve into the cylinder, to act against the piston and move the latter in one direction until it engages the tubular extension or tappet member of the working valve at the other end of the cylinder, thereby causing the last-named working valve to open from the recess 22 and to admit steam through the opening 33 in its associated exhaust valve into the corresponding end of the cylinder, thus reversing the stroke of the piston. At each stroke of the piston the dead steam is driven thereby against the inner side of the exhaust valve which the piston approaches, thus causing the exhaust valve to open the exhaust port and, hence, the dead steam is forced out through the exhaust port. The pressure of the dead steam which opens the exhaust port also closes the cut off valve 34 associated with said exhaust valve against the inner end of the latter. But, on the ensuing stroke of the piston, as soon as the working valve is opened against the tension of its spring, by the engagement of the piston therewith, the live steam which is admitted by the working valve operates to open the cut off valve, as will be understood.

The engine may be started in either direction by opening the appropriate starting valve at one or the other of its cylinders. Where, as in the form of the invention here shown, the engine is provided with two cylinders, the starting valves of the cylinder are, respectively, connected to levers 37—38 and those of the cylinder 2 are, respectively, connected to levers 39—40, the lever 38 being provided with an operating rod 41 which has a handle 42 at the same end with

the lever 37 and the lever 40 being connected by a rod 43 and the lever 40 being connected by a handle 44 to the lever 37. Hence, by pulling upon the lever 37 or the rod 41, the engine may be started in either direction.

I claim:—

1. In an engine of the class described, the combination of a cylinder having closed ends and partition heads spaced from the ends and forming live chambers between the ends and partition heads, the cylinder having ports leading to the live steam chambers and the partition heads being each provided with an exhaust port and also with a working opening, a piston arranged to reciprocate in the cylinder between the partition heads, a pressure operated exhaust valve mounted for reciprocating movement in each partition head in the working opening thereof and provided with a port, a piston operated working valve also mounted for reciprocating movement in the working opening of each partition head, toward and from the exhaust valve, a spring acting on each working valve to cause the latter to normally close the intake end of the working opening, and a cut off valve for each working valve and exhaust valve to close the port of the latter when the exhaust valve is in open position.

2. In an engine of the class described, a cylinder having a head and also having a partition head spaced from the head and provided with a working opening and also with an exhaust port, a piston arranged to reciprocate in the cylinder, a working valve, and an exhaust valve arranged for operation in the said working opening, the said exhaust valve having a port through which live steam passes when the working valve is open, and a cut off valve to close said port of the exhaust valve when the latter is opened by the pressure of the exhaust steam.

3. In an engine of the class described, the combination with a cylinder having a head and also having a partition head spaced from the head, the said cylinder having a live steam port discharging into the space between the head and the partition head and the said partition head having a working opening provided with an enlarged intermediate portion and being also provided with an exhaust passage leading from the enlarged portion of the working opening, a piston arranged to reciprocate in the cylinder, a working valve to open and close the intake end of the working opening, said working valve being provided with means to cause the same to be opened by the piston when the latter nears the partition head, a spring to close the working valve when the piston moves from the working head, an exhaust valve arranged to operate in the enlarged portion of the working opening and

to be closed by live steam pressure, when the working valve is open, the said exhaust valve having a port through which live steam passes when the working valve is open, and a cut off valve operated by the pressure of dead steam in the cylinder to close the said port of the exhaust valve when the working valve is in closed position and the exhaust valve is in open position.

4. In an engine of the class described, the combination with a cylinder having a head and also having a partition head spaced from the head, the said cylinder having a live steam port discharging into the space between the head and the partition head and the said partition head having a working opening provided with an enlarged intermediate portion and being also provided with an exhaust passage leading from the enlarged portion of the working opening, a piston arranged to reciprocate in the cylinder, a working valve to open and close the intake end of the working opening, said working valve being provided with means to cause the same to be opened by the piston when the latter nears the partition head, a

spring to close the working valve when the piston moves from the working head, an exhaust valve arranged to operate in the enlarged portion of the working opening and to be closed by live steam pressure, when the working valve is open, the said exhaust valve having a port through which live steam passes when the working valve is open, and a cut off valve operated by the pressure of dead steam in the cylinder to close the said port of the exhaust valve when the working valve is in closed position and the exhaust valve is in open position, the said partition head being also provided with a starting duct leading from the live steam space to the enlarged portion of the partition head working opening between the working valve and exhaust valve, and a starting valve to open and close the said starting duct.

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

WILLIAM HUNTER, JR.

Witnesses:

ALICE HUNTER,
MINNIE HUNTER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."