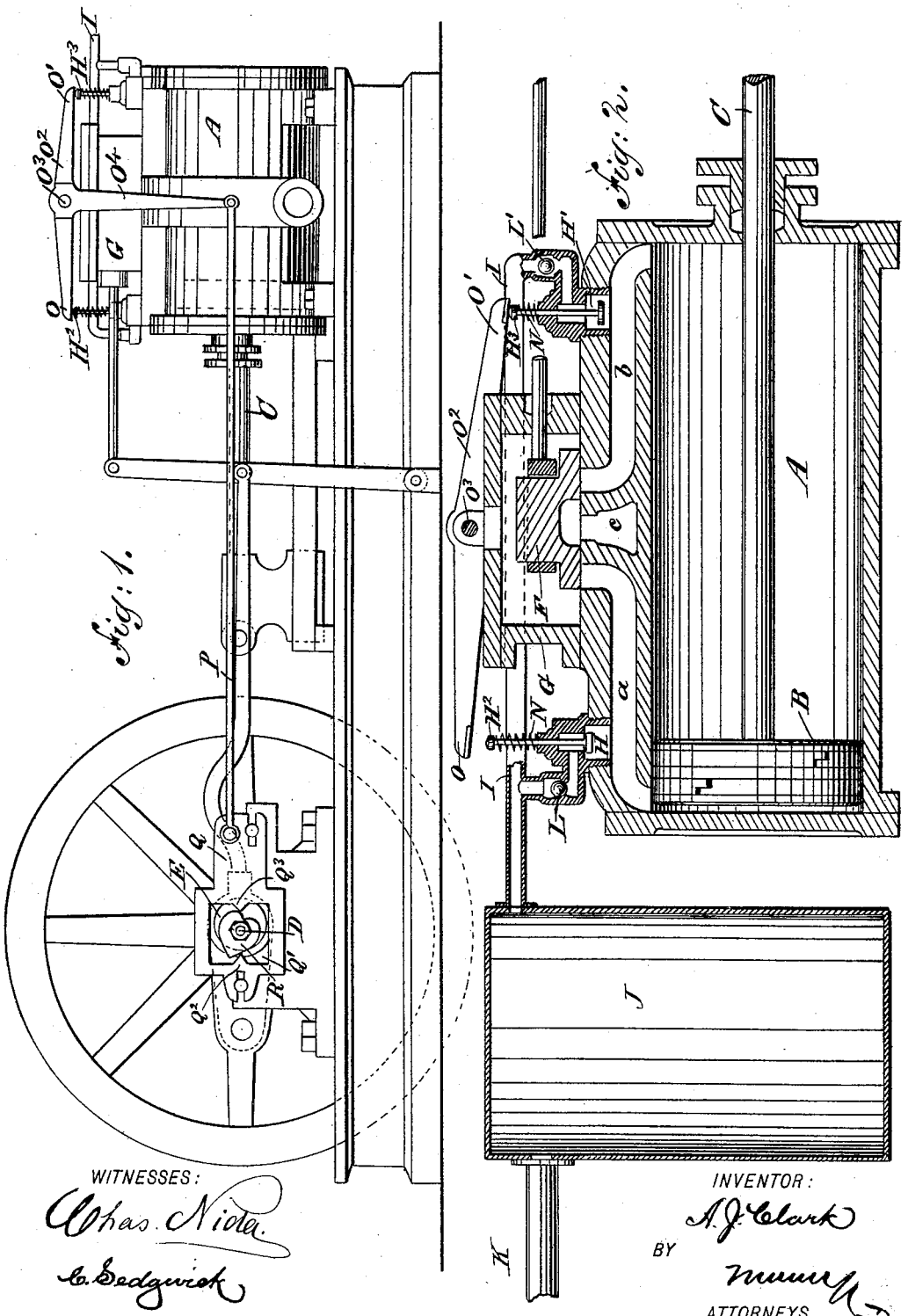
(No Model.)

A. J. CLARK.

ENGINE.

No. 453,901. Patented June 9, 1891.



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ANDREW J. CLARK, OF DAYTON, TENNESSEE.

ENGINE.

SPECIFICATION forming part of Letters Patent No. 453,901, dated June 9, 1891.

Application filed April 1, 1891. Serial No. 387,272. (No model.)

To all whom it may concern:

Be it known that I, ANDREW J. CLARK, of Dayton, in the county of Rhea and State of Tennessee, have invented a new and Improved Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved engine which is simple and durable in construction, utilizes the motive power to the fullest advantage, and saves a large amount of exhaust-steam without causing back-pressure on the piston in the cylinder, the exhaust-steam saved being stored in a suitable reservoir to be used for other purposes.

The invention consists of a valve arranged in each end of the cylinder and means for opening it at the time the piston is at or near the end of the stroke and previous to the opening of the ordinary exhaust.

The invention also consists of certain parts and details and combinations of the same, as will be hereinafter fully described, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in both the figures.

Figure 1 is a side elevation of the improvement, and Fig. 2 is an enlarged sectional side elevation of the cylinder and storage-vessel for the exhaust-steam.

The improved engine is provided with the usual cylinder A, in which is mounted to travel the piston B, held on the piston-rod C, connected in the usual manner with the main driving-shaft D, so that when the piston is reciprocated within the cylinder A a rotary motion is imparted to the main driving-shaft D. On the latter is arranged the usual eccentric E or other means for actuating the ordinary slide-valve F, arranged in the steam-chest G, and adapted to operate over the usual inlet-ports *a* and *b* and the exhaust-port *c*.

At the ends of the cylinder A are arranged the valves H and H′, adapted to open inwardly and serving to connect the ends of the cylinder with a pipe I, leading to a storage-vessel J, provided with an outlet-pipe K for carrying off the saved exhaust-steam to utilize the latter for other purposes. In the valve-bodies of the valves H and H′ are arranged check-valves L and L′, respectively, preventing a return flow of the said exhaust-steam from the vessel J to the cylinder A.

The valve-stems H^2 and H^3 of the valves H and H′ carry springs N for holding the valves to their seats until opened by the means presently to be described. The outer ends of the valve-stems H^2 and H^3 are adapted to be pressed on alternately by the ends O and O′, respectively, of a lever O^2, fulcrumed at O^3 to the top plate of the steam-chest G. The lever O^2 is provided with an arm O^4, (see Fig. 1,) pivotally connected by a link P with a plate Q, fitted to slide longitudinally on the frame of the engine near the main driving-shaft D, the said plate being provided with an aperture in which travels a heart-shaped cam R, secured on the main driving-shaft D and adapted to strike on V-shaped lugs Q^2 Q^3, secured on the plate and projecting into the opening Q′. By this arrangement a quick motion can be imparted by the heart-shaped cam R to the plate Q, so that the link P suddenly carries the lever O^2, whereby the valves H and H′ are alternately opened at the time the piston is at or near the end of its stroke and previous to the opening of the valve F for the exhaust.

The operation is as follows: The piston B is actuated by the motive agent entering the cylinder A through the alternately opening and closing ports *a* and *b*. When the piston B is at or near its outermost stroke, as is illustrated in Fig. 2, then the valve H′ is suddenly opened by the action of the heart-shaped cam R on the plate Q, as is previously described. At this time the steam has been cut off at the port *a* and the port *b* has not yet been connected with the exhaust-port. Steam in the cylinder A now escapes through the open valve H′ and past the check-valve L′ into the pipe I, from which the steam flows into the vessel J to be stored therein and utilized for other purposes whenever desired. As soon as the piston B begins the return-stroke the valve H′ suddenly closes by the action of its spring N, the lever O^2 permitting such movement, as the heart-shaped cam R has left the projection Q^3. At this time the valve F connects the port *b* with the exhaust-port *c*, so that the remainder of the steam in the cylinder A es-

capes through the said ports in the usual manner. When the piston B is at the inner end of its stroke, the valve H is opened by the action of the heart-shaped cam R on the projection Q^2 of the plate Q, so that steam from this end of the cylinder can escape through the valve into the pipe I to be stored in vessel J. As soon as the piston commences its forward stroke the valve F connects the port *a* with the exhaust-port *c*, so that the exhaust takes place through the said ports in the usual manner. It is understood that the valves H and H′ open a sufficient length of time to permit a large quantity of steam to escape from the respective end of the cylinder. It is further understood that the said valves open previously to the opening of the ordinary exhaust at the time when the piston is at or near the end of its stroke. As shown in the drawings, the valves H and H′ open into the exhaust-ports *a* and *b* of the cylinder; but it is evident that the valves may be arranged in the heads of the cylinder, if desired.

I do not limit myself to the peculiar construction of the means for actuating the valves H and H′ from the main driving-shaft, as other suitable devices may be employed. It will further be seen that the improvements may be readily applied to all kinds of engines now in use.

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

1. An engine provided with self-closing valves arranged in the ends of the cylinder, and means for opening the said self-closing valves at the time the piston of the engine is at or near the end of the stroke and previous to the opening of the exhaust, substantially as shown and described.

2. The combination, with an engine provided with a valve in each end of the cylinder and arranged to open at the time the piston is at or near the end of the stroke and previous to the opening of the exhaust, of a storage-vessel connected with the said valves to store the exhaust-steam passing through the said valves from the ends of the cylinder, and check-valves to prevent a return of the exhaust-steam from the said vessel to the ends of the cylinder, substantially as shown and described.

3. The combination, with an ordinary engine, of self-closing valves arranged in the ends of the cylinder of the said engine, means, substantially as described, for opening the said valves at the time the piston is at or near the end of the stroke and previous to the opening of the exhaust, a pipe connected with the said valve, and a storage-vessel connected with the said pipe to store the exhaust-steam passing through the said valves, substantially as shown and described.

4. The combination, with an ordinary engine, of self-closing valves arranged in the ends of the cylinder of the said engine, means, substantially as described, for opening the said valves at the time the piston is at or near the end of the stroke and previous to the opening of the exhaust, a pipe connected with the said valve, a storage-vessel connected with the said pipe to store the exhaust-steam passing through the said valves, and check-valves for preventing a return of the exhaust-steam to the cylinder, substantially as set forth.

5. In an engine, the combination, with a cylinder provided with the usual ports, of a piston held to reciprocate in the said cylinder, a valve operating over the said ports, and self-closing valves arranged in the ends of the said cylinder and adapted to open alternately at the time the piston is at or near the end of the stroke and previous to the opening of the exhaust by the said slide-valve, substantially as shown and described.

6. In an engine, the combination, with a cylinder provided with the usual ports, of a piston held to reciprocate in the said cylinder, a valve operating over the said ports, and self-closing valves arranged in the ends of the said cylinder and adapted to open alternately at the time the piston is at or near the end of the stroke and previous to the opening of the exhaust by the said slide-valve, means, substantially as described, for alternately opening and closing the said valves at the time specified and described, a pipe connected with the said valves, and a storage-vessel connected with the said pipe for storing the exhaust-steam, substantially as described.

7. In an engine, the combination, with a cylinder provided with the usual ports, of a piston held to reciprocate in the said cylinder, a valve operating over the said ports, and self-closing valves arranged in the ends of the said cylinder and adapted to open alternately at the time the piston is at or near the end of the stroke and previous to the opening of the exhaust by the said slide-valve, means, substantially as described, for alternately opening and closing the said valves at the time specified and described, a pipe connected with the said valves, a storage-vessel connected with the said pipe for storing the exhaust-steam, and check-valves to prevent a return of the steam from the said storage-vessel to the cylinder, substantially as shown and described.

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Witnesses:
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