

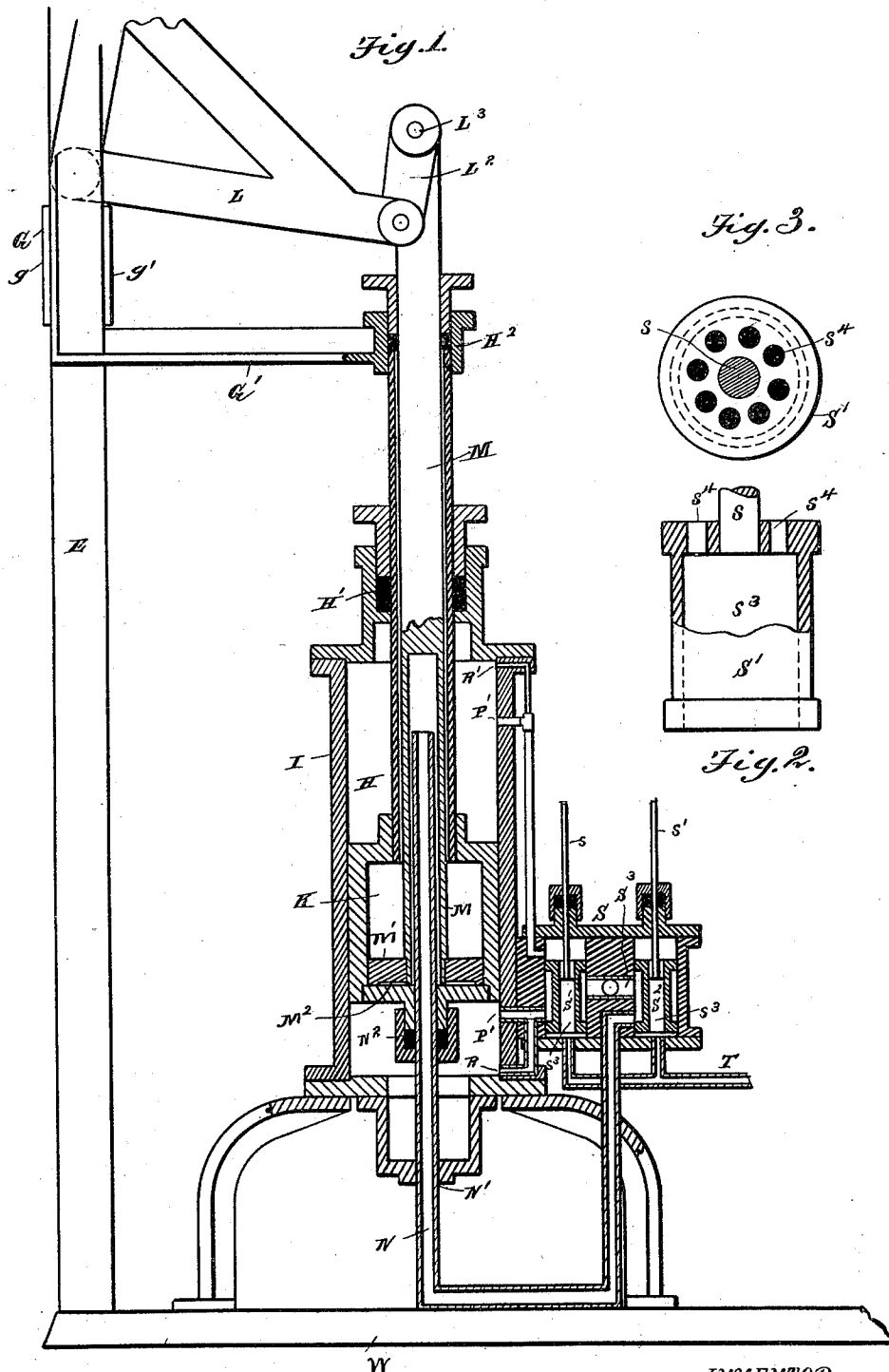
(No Model.)

2 Sheets—Sheet 1.

J. EVERED.  
STEAM ENGINE.

No. 513,493.

Patented Jan. 30, 1894.



WITNESSES  
*G. Clough*  
*W. S. Bradford*

INVENTOR  
*Joshua Evered*  
*by Parker & Benton*  
Attorneys.

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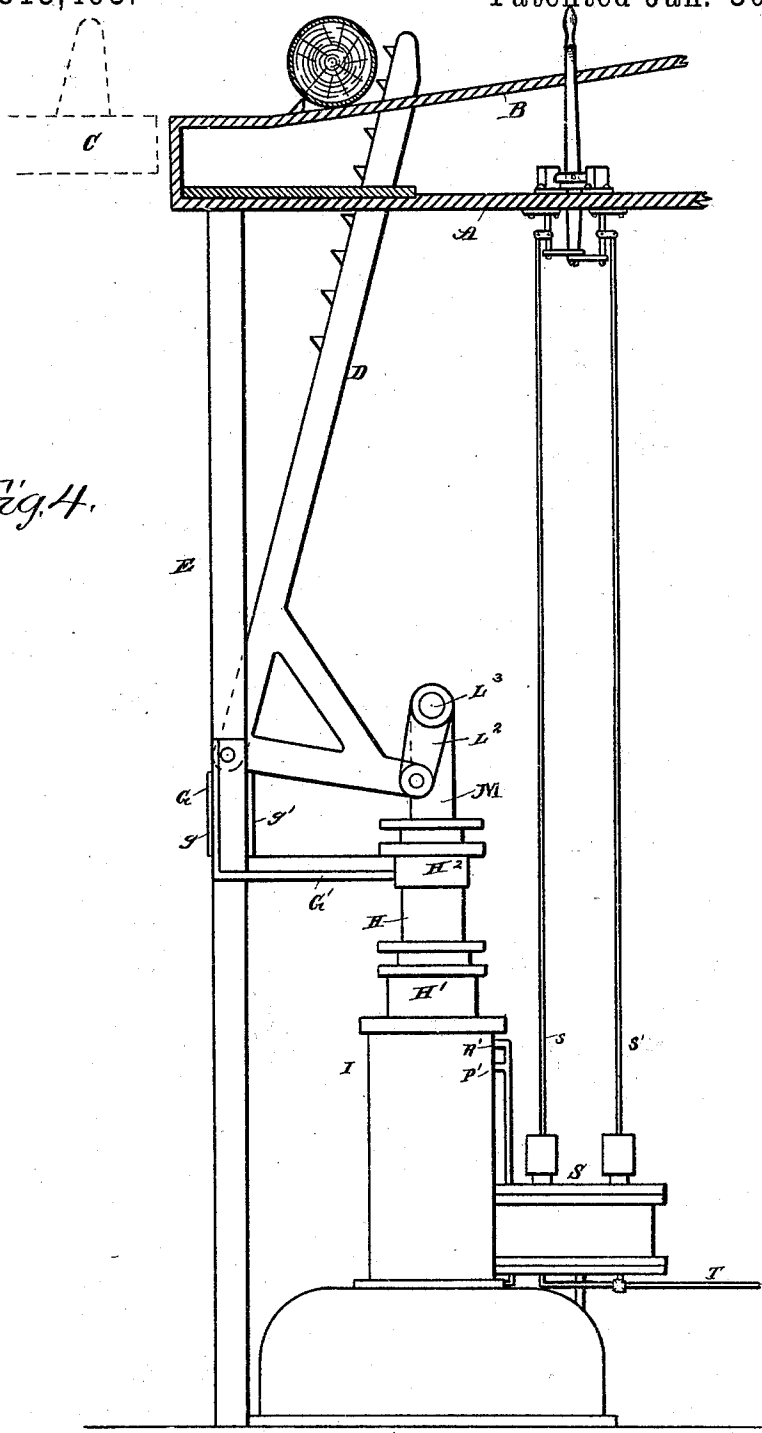
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*Fig. 4.*



WITNESSES  
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# UNITED STATES PATENT OFFICE.

JOSHUA EVERED, OF DULUTH, MINNESOTA, ASSIGNOR OF TWO-THIRDS  
TO LOUIS G. LANGE, OF SAME PLACE, AND ALBERT C. LANGE, OF  
MUSKEGON, MICHIGAN.

## STEAM-ENGINE.

**SPECIFICATION** forming part of Letters Patent No. 513,493, dated January 30, 1894.

Application filed April 17, 1893. Serial No. 470,778. (No model.)

*To all whom it may concern:*

Be it known that I, JOSHUA EVERED, a citizen of the United States, residing at Duluth, county of St. Louis, State of Minnesota, have  
5 invented a certain new and useful Improvement in Steam-Engines; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make  
10 and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to improvements in steam engines, and it consists broadly in combining an internal cylinder with what may  
15 be considered relatively an external cylinder, the internal cylinder being movable and serving as the piston of the external cylinder; also, in certain valve motions and combinations which permit the introduction of steam  
20 to the internal cylinder, all of which is more fully set forth in this specification.

In the drawings, Figure 1 represents a sectional elevation of my improvement. Fig. 2  
25 represents, partially in section, one of the valves. Fig. 3 is a plan view of the top thereof. Fig. 4 is an elevation of my improvement attached to the foot and cross head of a toothed bar for turning logs, for the purpose of showing  
30 the mode of operation of the two cylinders relatively to each other.

Similar letters refer to similar parts.

In carrying out my invention, A represents the flooring.

35 B represents a log deck; C, an outline of a log carriage; D, a toothed bar; all as used in saw-mills, and all of which are old and well known, and need no description.

E represents a post or guide, which, as  
40 shown in the drawings, is perpendicular.

G represents a cross head.  $g, g'$ , are flanges thereon, which inclose the post E, and serve as guides thereon.

45  $G'$  is an arm extending from the cross head G, and engaging with the upper end of a hollow piston rod hereinafter described.

L is an arm extending from the bottom end of the toothed bar D, which is pivoted at  $L^1$  to the cross head G, and which, by means of

the link  $L^2$ , is connected with the upper end  
50 of an interior piston rod by a pivot at  $L^3$ .

The engine is shown erected upon a suitable base W, although it is obvious that the engine might be used horizontally, which  
55 would require a different adjustment of its supporting parts. I is a cylinder erected thereon, and having appropriate heads at either end, each of these heads having projections cast within the surfaces for the purpose of receiving various parts shown on the  
60 interior of the cylinder. The cylinder I carries as a piston another and shorter cylinder K, the cylinder K being adjusted to fit the bore of the cylinder I accurately, and it may carry approved means of packing, as may be  
65 desired. Rigidly attached to the cylinder K at its upper end is a hollow piston rod H, which projects through the upper head of the cylinder I through a stuffing box  $H'$ . All of this is of the ordinary construction, and would  
70 in nowise be varied therefrom, except the relative size of the parts.

The upper end of the piston rod H is shown in the drawings rigidly attached to the projection  $G'$  of the cross head G. It is obvious  
75 that the movement of the interior piston cylinder K within the cylinder I, would compel a corresponding movement of the cross head G upon the posts E as a guide.

The interior piston cylinder K carries with-  
80 in it a piston head  $M'$  of the usual form, and firmly attached thereto is a piston rod M. The lower end of this piston rod is hollow, which hollow extends through the piston for a purpose which is hereinafter described.  
85 The upper portion, however, may be solid, and extends through the hollow piston rod H, and through a stuffing box of the ordinary construction upon the upper end thereof,  $H^2$ . As shown in the drawings, the upper end of  
90 the piston rod M is connected at  $L^3$  to the bracket L, attached to the lower end of the toothed bar. It is obvious that it might be attached to any other machinery in which the improvement may be desired to be used.  
95

Steam is admitted to the cylinder I through the ports,  $P, P'$ , upon either side of the piston cylinder K. It is obvious that the ad-

mission of such steam might be from the steam chest carrying an ordinary D valve, as the cylinder I, in its relation to the piston cylinder, is a simple double acting engine. 5 For especial purposes, however, at either end of the cylinder, small ports R R' open from the steam chest near the extreme end of the cylinder I, and the ports P', P', are withdrawn from the end a short distance so as to 10 be covered by the movement of the cylinder piston K. As the ports R R' are small, they permit steam to escape or enter slowly. The result is a covering at each end of the stroke, which is extremely desirable, whenever the 15 engine is not attached to a crank or other means for limiting the throw of the piston. This feature is not new, but it has been long employed in this class of engines. For the purpose of manipulating this class of engines, 20 however, I have devised improvements in valves which operate them, especially when operated as in the engines described, by hand, instead of the valve motion being automatic; it being intended that, when the engine is 25 used for ordinary purposes connected with cranks, &c., automatic valve motions will be used among any of the various number that are in common use.

In the drawings, S represents the steam 30 chest, which contains two valves, S' and S<sup>2</sup>, one for each of the cylinders. The seats for these valves are cylindrical, and the valves are turned to correspond therewith. As shown in Fig. 2, which is a partially sectional 35 view of one of the valves, the valve has two bearing points upon its seat, one at either end, the central portion being turned away to form a circumferential steam passage. The valve is hollow, and open at its lower end, at 40 s<sup>3</sup>. The upper end is cast with several holes, as shown at s<sup>4</sup> s<sup>4</sup>, which perforate the head and insure communication between the interior of the steam chest and the interior of the valve. The valve therefore is substantially 45 hollow throughout its longitudinal extent, the form of the construction at the upper end, as described, being merely for the convenience of attaching the valve stem centrally, a cross section of which valve stem is marked s. The other valve stem is marked 50 s'. As these valves are similar in construction, the description of one will suffice for both. This construction of valve I design to claim in a separate application.

55 Intermediately between the valve seats is an induction passage, communicating between either one and marked S<sup>3</sup>, into which a steam pipe enters, preferably centrally, and communicating with any source of steam supply. 60 As this passage is perpendicularly centrally located, it always communicates with both of the valve seats, and with the space surrounding the valve, and not with the interior of the valve, nor with the spaces at 65 either end, it being supposed that the two ends of the valve are steam tight in the seat,

so that no passage of steam can carry past the heads. It is obvious that with the valve S' in the position shown, steam will pass from the eduction pipe S<sup>3</sup> into the space surrounding 70 the valve S'; from thence through the lower port P', and underneath the piston cylinder in the cylinder I. Conversely, what steam may be above the piston cylinder in the cylinder I, will pass through the piston 75 port P' into the space in the steam chest above the valve S', centrally through the holes in the head of the valve and the aperture in its center heretofore described. An eduction pipe is provided, marked T, which 80 communicates with the lower ends of each valve seat, and it is evident that the steam escaping through the central portion of the valve will pass into this eduction pipe, and thus be exhausted. Upon raising the valve, 85 its upper head and bearing surface will pass to the opposite side of the upper port P', and thereby open communication between the induction pipe around the valve, through the port, and into the upper end of the cylinder 90 I. Simultaneously with this, the lower head of the valve is raised beyond the lower port P', and opens communication between it and the eduction pipe T through the lower portion of the valve seat, and therefore steam 95 would be exhausted from the lower end of the cylinder I.

Obviously, it is difficult to introduce steam into the piston cylinder K. This, however, I 100 accomplish by the following means: The lower head N<sup>2</sup> of the piston cylinder K, has a central opening, and has thereon a stuffing box and gland. The lower head of the cylinder I is also perforated, and a tube N passes 105 through it at N', and is of sufficient length, and is so adjusted, that it passes through the stuffing box N<sup>2</sup>. In its rectilinear movement, the piston cylinder K therefore moves upon the pipe N, forming a steam tight joint at the packing and head N<sup>2</sup>. The piston head M' 110 being hollow at its lower end at M<sup>2</sup>, and being of sufficient diameter, not only receives the upper end of the pipe N, but is large enough so that a considerable relative space exists 115 outside of the pipe N, and between it and the walls of the lower end of the piston rod M. The hollow portion also is long enough so that the upper end thereof never comes in contact with the upper end of the pipe N. 120 It is obvious that, by the admission of steam through the pipe N into the interior M<sup>2</sup> of the piston rod M, it will flow over the top of the pipe N downward and around the pipe N, filling the space between it and the piston rod, thence outwardly underneath the piston 125 M', until the pressure is sufficient to cause it to rise. It is obvious that, by permitting the steam to exhaust, the piston will descend, as shown by the device in question, by its own weight and by the weight of the piston rod 130 and attachments above it. This motion, as shown in Fig. 4, would compel the upper end

of the toothed bar to oscillate in a rectilinear movement, assuming that its pivotal point upon the cross head G was immovable. If not immovable, the movement of the upper end of the tooth bar would be compound, and be a resultant of the movement of the two pistons.

In order to permit steam to enter into the pipe N, and to operate the piston inside of the piston cylinder K, I use the same sort of valve as that already described, but it is only necessary to uncover one port. Steam is taken from the eduction pipe S<sup>3</sup> into the space surrounding the central portion of the valve, and with the valve shown in the position in Figs. 1 and 4. It passes from thence directly to the pipe N. On raising the valve, the steam is shut off from the pipe N, and by continuing to raise it, the orifice of the pipe N in the valve seat is opened and communicates with the space below the valve, and instantly exhausts into the eduction pipe T.

As hereinbefore stated, the valve stems s s' may operate by hand. I have devised such means, although there are a number by which they may be operated by a lever. Such means are described in various Letters Patent, one to William E. Hill, No. 245,496, dated August 9, 1881; one also to William E. Hill, No. 413,721, of October 29, 1889; or it may be such as I have devised and shown in an application of this device to a log turner of even date herewith. No one of these, however, is new with me, and I lay no claim thereto, and, as they are fully described in other patents, and as other valve motions would be required when the device is applied to other purposes,

I do not deem it necessary to describe them here.

What I claim is—

1. In a steam engine, the combination of a fixed cylinder having a hollow piston and rod forming an internal cylinder, and an interior piston with a hollow rod, the hollow being carried through the piston, and steam connections whereby the same may be operated substantially as described.

2. In a steam engine, the combination of a fixed cylinder carrying a piston rod and a hollow piston, a piston head in said hollow piston, and a piston rod attached to said head and adapted to move therewith and extending through the hollow piston rod first mentioned, a rigid steam passage consisting of a pipe fixed within the head of the fixed cylinder and extending through a stuffing box into the interior of the piston cylinder and into a concavity of the piston rod of said piston cylinder, substantially as described.

3. The combination of the cylinder I, piston rod H, piston cylinder K carrying piston rod M, the inlet and outlet pipe N, the cylinder head and stuffing box N<sup>2</sup>, the stuffing box H', and means for causing steam to be admitted and exhausted simultaneously or successively, as desired, from the steam spaces in the interior of said steam cylinders respectively, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

JOSHUA EVERED.

Witnesses:

WILSON G. CROSBY,  
ALFRED E. MCCORDIC.