

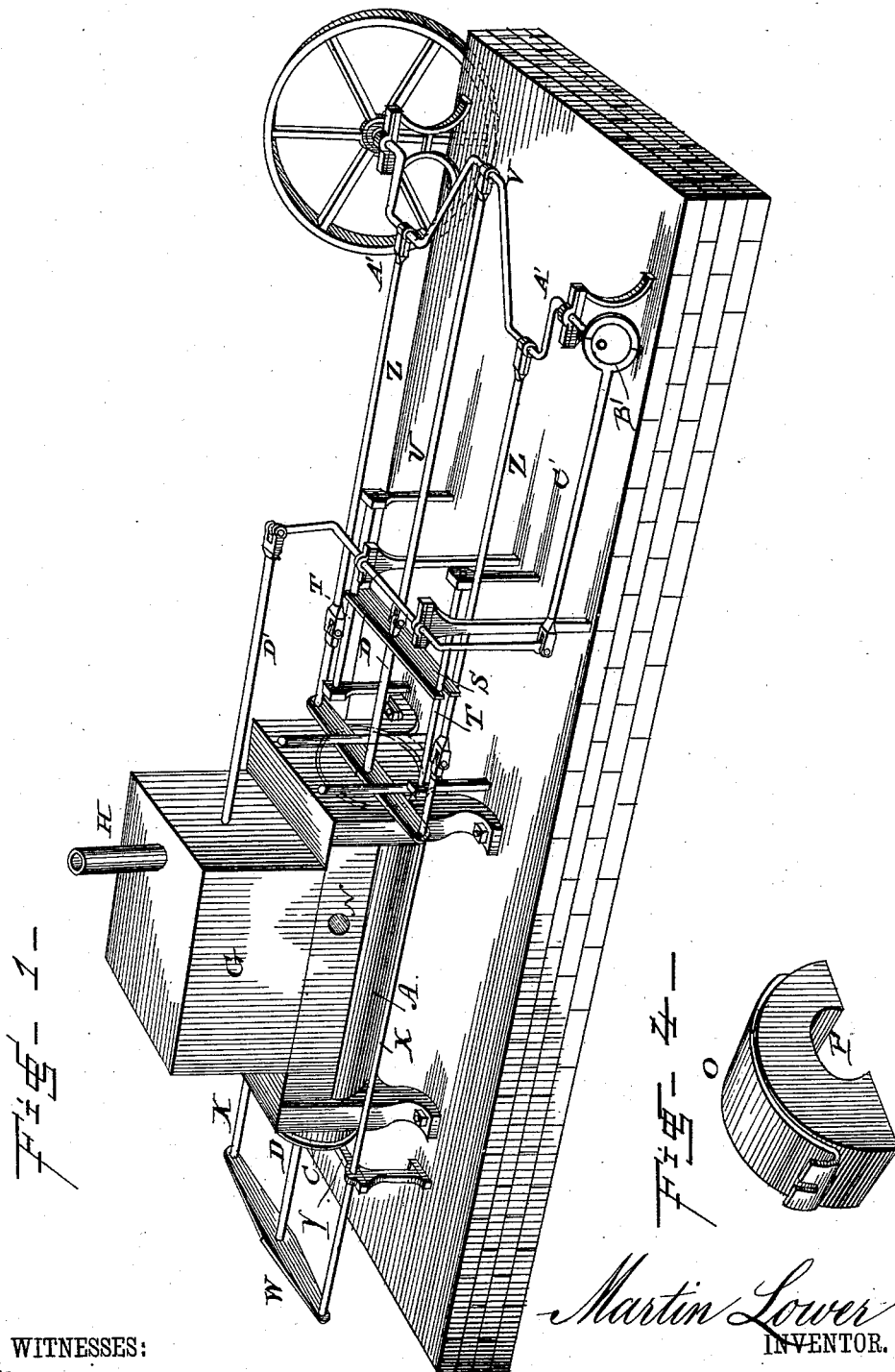
(No Model.)

2 Sheets—Sheet 1.

M. LOWER.
STEAM ENGINE.

No. 302,507.

Patented July 22, 1884.



WITNESSES:

Fred. G. Dieterich.
Epist. Secor

Martin Lower
INVENTOR.

By *Louis Baggett & Co.*
ATTORNEYS.

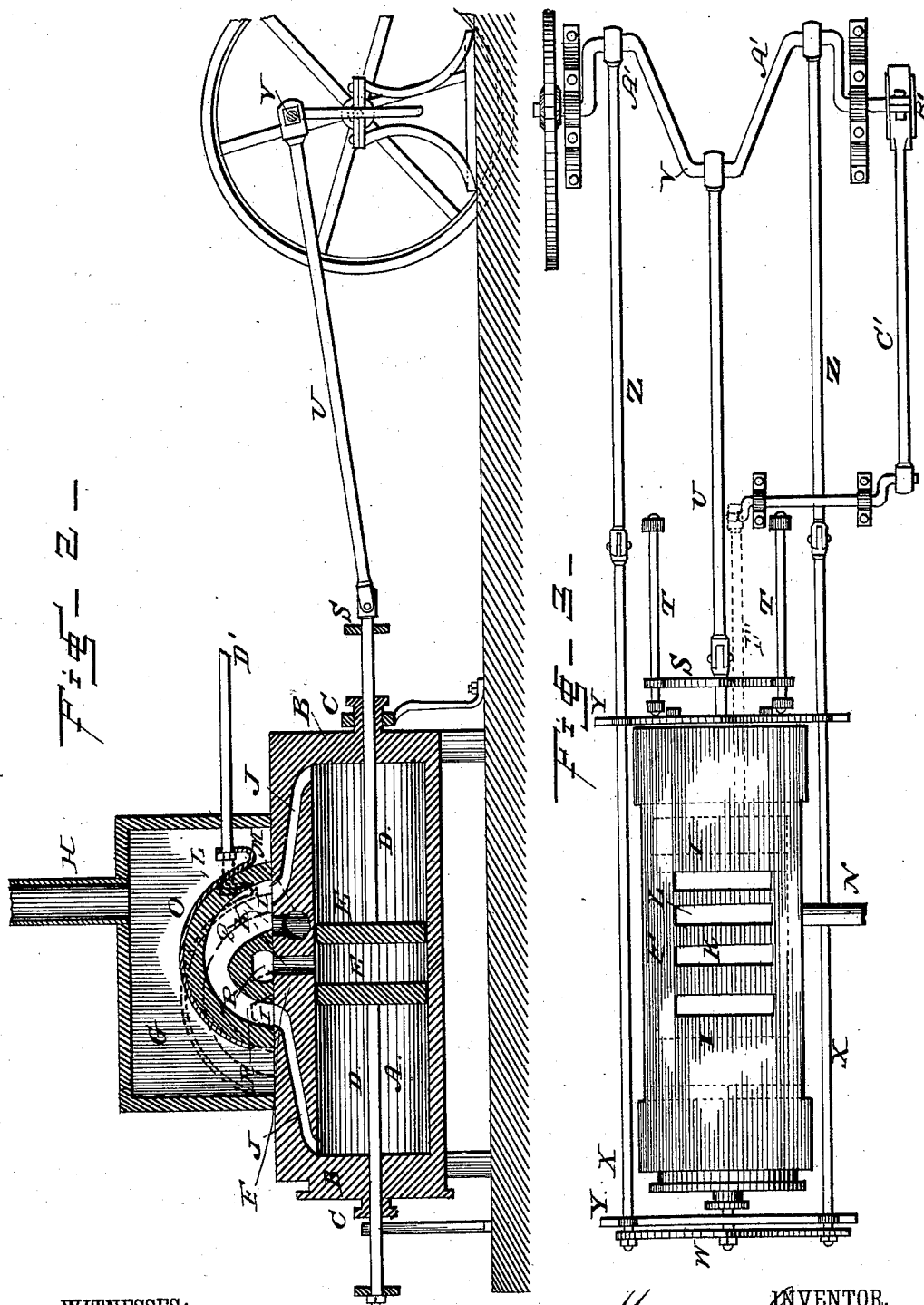
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Wm. S. Dietrich
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INVENTOR.

Martin Lower
Louis Bragger & Co.
ATTORNEYS.

UNITED STATES PATENT OFFICE.

MARTIN LOWER, OF MITCHELL'S MILLS, ASSIGNOR OF ONE-HALF TO WILLIAM E. TOZER, OF NEW WASHINGTON, PENNSYLVANIA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 302,507, dated July 22, 1884.

Application filed March 11, 1884. (No model.)

To all whom it may concern:

Be it known that I, MARTIN LOWER, a citizen of the United States, and a resident of Mitchell's Mills, in the county of Indiana and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a perspective view of my improved steam-engine. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is a top view of the same with the steam-chest removed, and Fig. 4 is a perspective detail view of the valve.

Similar letters of reference indicate corresponding parts in all the figures.

My invention has relation to steam-engines; and it consists in the improved construction and combination of parts of an engine having two pistons working in opposite directions in one cylinder, at the same time pulling and pushing upon the cranks upon the shaft by their piston-rods and their connections with the said cranks, as hereinafter more fully described and claimed.

In the accompanying drawings, the letter A indicates the cylinder, the heads B of which are provided with stuffing-boxes C, for the passage of the piston-rods D of the two pistons E, which slide each in one-half of the cylinder, the rods passing out at the opposite heads.

F is the valve-seat, which is provided with four ports, and is covered by the steam-chest G, which has the live-steam pipe H opening into it.

I I are the steam-ports, which open into steam-channels J, which open in the ends of the cylinder, and K is the central steam-port, which opens at the center of the cylinder between the two pistons.

L is the exhaust-port, which opens in the valve-seat between the central steam-port and one of the end steam-ports, and it is continued into an exhaust-channel, M, opening into the

exhaust-pipe N, which passes out at the side of the top of the cylinder below the valve-seat.

The slide-valve O has a longitudinal passage, *r*, through it, and a transverse chamber, P, between the ports of said longitudinal passage, which is open at the sides, allowing the steam to pass into it from the steam-chest around the valve, and the one end of the valve is of a sufficient width to allow its port Q to connect the exhaust-port with either the end port nearest to it or with the center port, while the other end is only of a sufficient width to allow its port R to open over the other end port. The piston-rod passing out of the cylinder at the end facing the crank-shaft has a cross-head, S, which slides in guides T, and is provided with a connecting-rod, U, which is pivoted to the central crank, V, upon the crank-shaft, the shaft having three cranks, two of which project diametrically opposite to the central crank. The other piston-rod has a cross-head, W, to the ends of which two sliding rods, X, are secured, which slide in suitable bearings, Y, parallel with the cylinder, and two connecting-rods, Z Z, are pivoted to the outer ends of these sliding rods and to the outer cranks, A'.

The crank-shaft may be provided with a suitable eccentric, B', which operates a connecting-rod, C', reciprocating the valve-rod D'.

It will be seen by reference to Fig. 2 of the drawings, and assuming the position of the several parts of the engine to be as shown in full lines in the same, that the live steam, entering the steam-chest through the live-steam pipe, will pass around the sides of the slide-valve and through the central recess or chamber of the same into the channel and port opening in the middle of the cylinder, where it will force the pistons apart, and the exhaust-steam will pass through the end ports and channels to the curved longitudinal passage in the valve, the wide port of which will also be in place over the exhaust-port, and the steam will thus pass from both ends of the cylinder out through the exhaust port and pipe. When the valve now is changed to its diametrically-opposite position, as shown in dotted lines in Fig. 2, the narrow port of the

passage in the valve will be closed by the valve-seat, while the wider port of the said passage connects the port and channel opening into the middle of the cylinder with the exhaust-port, and the central transverse chamber or recess in the valve will register with one of the ports having its channel opening in the end of the cylinder, and the other port of the cylinder will be entirely uncovered by the valve, thus causing the live steam to enter freely into the ends of the cylinder through the said ports and channels, and to force the pistons together. In this manner the two sliding arms and their connecting-rods will pull upon the cranks, while the single piston-rod and its connecting-rod will push the central crank when the valve is in its first-described position, whereupon, when the valve shifts to its other position, the single piston-rod will pull, and the sliding rods and their piston-rod will push the cranks, the wear of the crank-shaft upon its bearings being in this manner equalized, as also this construction of an engine will enable the engine to be run at a considerable speed without danger, as the push and pull of the two pistons and their connecting-rods will equalize the strain. It follows that the cylinder may be made oscillating, doing away with the connecting-rods and pivoting the sliding rods to their cross-head without departing from the spirit of my invention.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The combination of a cylinder having stuffing-boxes in both heads, and having a valve-seat provided with a central steam-port, two end steam-ports, and an exhaust-port between the central steam-port and one of the end steam-ports, two pistons having

rods passing out of the opposite heads of the cylinder, and a valve having a port in one end sufficiently wide to connect the exhaust-port with either of its adjoining ports, and having in its other end a port of sufficient width to cover the other end steam-port, both the ports being connected through the valve, and formed with a transverse recess or chamber at the middle of its under side, open at the sides connecting with the steam-chest, as and for the purpose shown and set forth.

2. In a steam-engine, the combination of a cylinder having stuffing-boxes in both heads, and having a port and channel opening at its middle, and two ports and channels opening at its ends, two pistons and piston-rods passing through the stuffing-boxes in the heads of the cylinder, a connecting-rod attached to the end of one piston-rod, a cross-head secured to the end of the other piston-rod, rods sliding parallel with the cylinder and secured at one end to the ends of the cross-head, connecting-rods attached to the ends of the sliding rods, a crank-shaft having one central crank and two outer cranks pointing in a direction diametrically opposite to the central crank, the said central crank having the connecting-rod from the piston-rod pivoted to it, and the outer cranks having the connecting-rods from the sliding rods pivoted to them, and means, substantially as described, for alternately admitting and exhausting steam into and from the central and end ports and channels of the cylinder, as and for the purpose shown and set forth.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

MARTIN LOWER.

Witnesses:

WILLIAM TOZER,
HUGH S. THOMPSON.