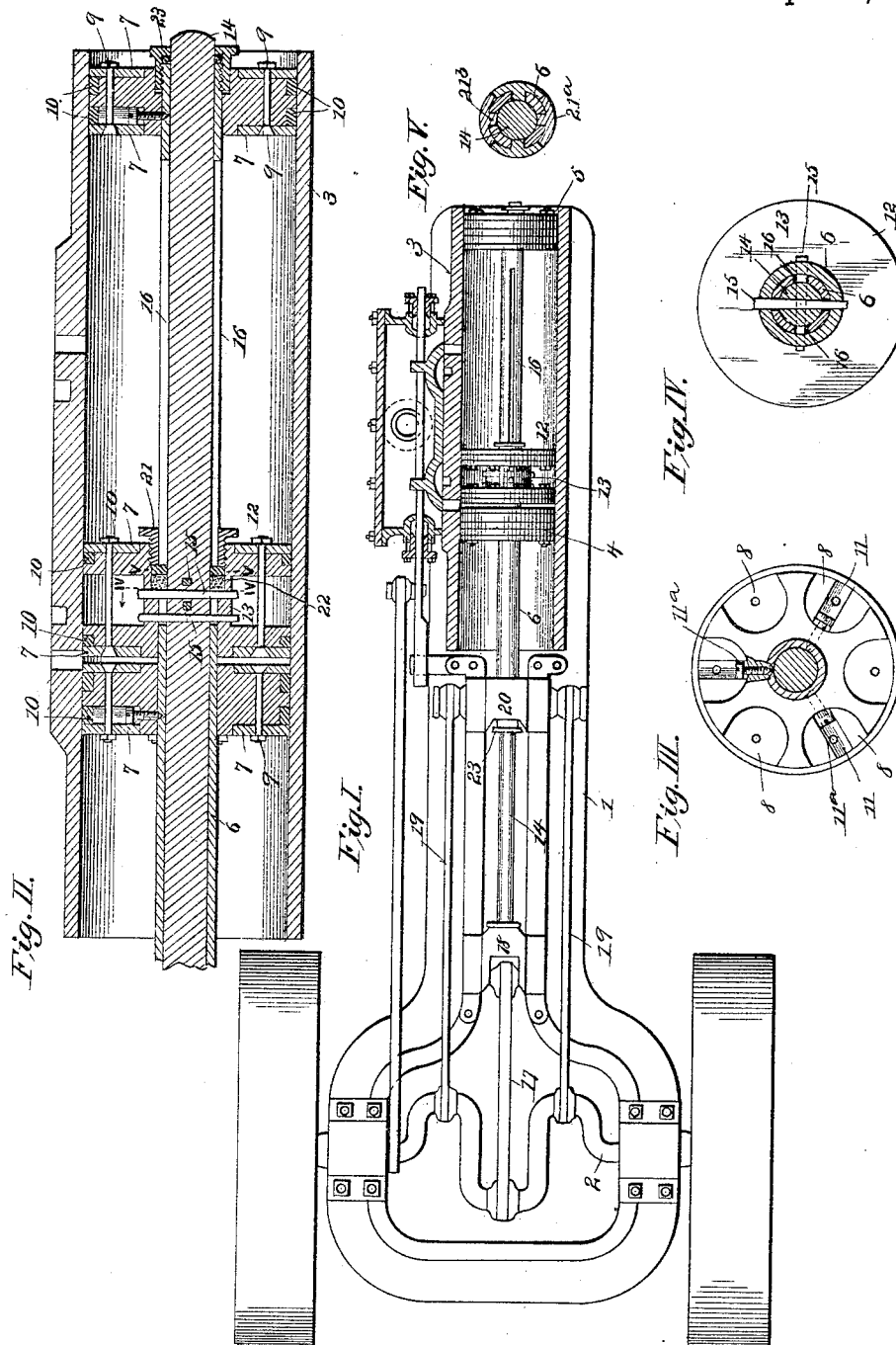


(No Model.)

H. CHRISTOFFERSON.
STEAM ENGINE.

No. 458,943.

Patented Sept. 1, 1891.



Witnesses:

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UNITED STATES PATENT OFFICE.

HANS CHRISTOFFERSON, OF HUDSON, WISCONSIN, ASSIGNOR OF FIFTY-ONE ONE-HUNDREDTHS TO HARRY L. NORTH AND CLINTON FULTON, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 458,943, dated September 1, 1891.

Application filed February 7, 1891. Serial No. 380,641. (No model.)

To all whom it may concern:

Be it known that I, HANS CHRISTOFFERSON, a citizen of the United States, residing at Hudson, in the county of St. Croix and State of Wisconsin, have invented certain new and useful Improvements in Steam-Engines, of which the following is a full, clear, and exact specification, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to means for relieving the bed of the engine from the back-pressure occasioned by the force exerted between the cylinder and crank-shaft in ordinary engines and applying such pressure directly to the crank-shaft, whereby the damage usually entailed by the excessive strain exerted on the bed and other connecting parts will be entirely avoided; and my invention consists in certain features of novelty hereinafter fully described in connection with the drawings, and particularly pointed out in the claims.

Referring now to the said drawings, in which like signs of reference indicate like parts throughout the several views, Figure I is a plan view of my improved engine partly in section. Fig. II is an enlarged longitudinal section of the cylinder-pistons and their rods. Fig. III is a detail view of one of the outer piston-heads, showing the manner of securing the same to its rod. Fig. IV is a detail sectional view taken on the line IV IV, Fig. II. Fig. V is a transverse sectional view of the piston-rods and packing-ring herein-after described, taken on the line V V, Fig. II.

In carrying out my invention I employ a bed 1, of any suitable construction, in one end of which the crank-shaft 2 is suitably journaled and upon the other end of which the open-ended cylinder 3 is mounted. The cylinder 3, instead of being provided with the usual fixed heads, is provided with two movable piston-heads 4 5, secured to a hollow piston-rod 6 and having a fixed relation to each other. These piston-heads are each provided with removable plates 7, seated in sockets 8 and secured therein by means of bolts 9 for the purpose of holding the piston packing-rings 10 in place. The sockets 8 or any suitable number of them are provided with coun-

tersinks or channels 11 for the insertion of set screws or bolts 11^a, which are threaded in the piston-head and impinge the hollow piston-rod 6 at their inner ends, thus securing the said rod and pistons firmly together. Located between these outer piston-heads 4 5 is another piston-head 12, having, like the former, packing-rings 10, held in place by means of removable plates 7, as before described with reference to the heads 4 5. This inner piston-head is provided with a neck or hub 13, through which the hollow piston-rod 6 reciprocates. Fitted snugly within the hollow piston-rod 6 is another, but preferably solid, piston-rod 14, and to this inner rod the piston-head 12 is secured by means of a number of (preferably four) keys 15. These keys are driven through tapering holes in the hub 13 and enter corresponding holes in the rod 14 and preferably pass entirely through the said rod and also through the other side of the hub. Inasmuch as the head 12 moves independently of the heads 4 5, it is necessary to provide the hollow rod 6 with longitudinal slots 16, through which the ends of the keys pass and along which said keys slide as the piston 12 and rod 6 move relatively to each other, the length of the slots 16 being of course equal to the extent of the travel of the head 12 relatively to the rod 6.

The crank-shaft 2, it will be seen, is provided with preferably three cranks, one of which stands in an opposite direction to the others; but it will of course be understood that but two cranks would answer the same purpose. I prefer to use three, however, as by so doing the strain on the inner cross-head is balanced and the tendency to bind in its guideway and bend the piston-rod is avoided. The inner crank is connected by means of pitman 17 to a cross-head 18, and this cross-head is secured to the inner piston-rod 14. The two outer cranks are connected by means of pitmen 19 to the outer ends of a cross-head 20, which latter is suitably secured to the hollow piston-rod 6.

The inner piston-head 12 may be provided on one or both sides with a suitable pack-nut 21 for forcing the packing 22 against the keys 15 and into the grooves 16, so as to avoid the

escape of steam between the head and rod. Interposed between the nut 21 and packing 22 is a ring 21^a, having lugs 21^b projecting into the grooves 16 for holding the packing 5 in said grooves, the said ring being divided into four sections, as shown in Fig. V, to facilitate its insertion. Both ends of the hollow rod may also be provided with stuffing-boxes 23, of any suitable construction, for guarding 10 against the escape of steam between the two rods.

From the foregoing description it will be seen that steam entering the cylinder between the inner piston-head and one of the outer 15 heads 4 5 will force the two heads in opposite directions, causing the piston-rods to reciprocate in opposite directions, and thus applying the back-pressure which would otherwise be sustained by the steam-cylinder directly 20 to the crank-shaft.

Having thus described my invention, what I desire to secure by Letters Patent is—

1. In an engine, the combination, with the cylinder, of the outer piston-heads, the inner 25 piston-head located between said outer heads, a hollow piston-rod passing through said inner head and being secured to said outer heads, the inner piston-rod located in said hollow rod and being secured to the inner piston-head, the packing, and the packing-ring 30

having lugs holding said packing in the slots of the said hollow rod, substantially as set forth.

2. In an engine, the combination, with the cylinder, of the pistons 4 5, a hollow slotted 35 rod 6, to which said pistons are secured, the rod 14 within said hollow rod, the piston 12 between the pistons 4 5, keys passing through the slots of the rods 6 and securing the piston 12 to the rod 14, the packing located in 40 the slots of the said rod 6, and the packing-ring held against said packing, substantially as set forth.

3. In an engine, the combination, with the cylinder, of the pistons 4 5, a hollow slotted 45 rod 6, to which said pistons are secured, the rod 14, fitting in the rod 6, the piston 12, located between the pistons 4 5, loose on the rod 6, and having a hub, keys passing through said hub and slots of the rod 6 and securing 50 said piston 12 and rod 14 together, packing arranged in the slots of said rod 6 against said keys, the lugs 21^b, arranged against said packing, and a pack-nut impinging said lugs, substantially as set forth.

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Witnesses:

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