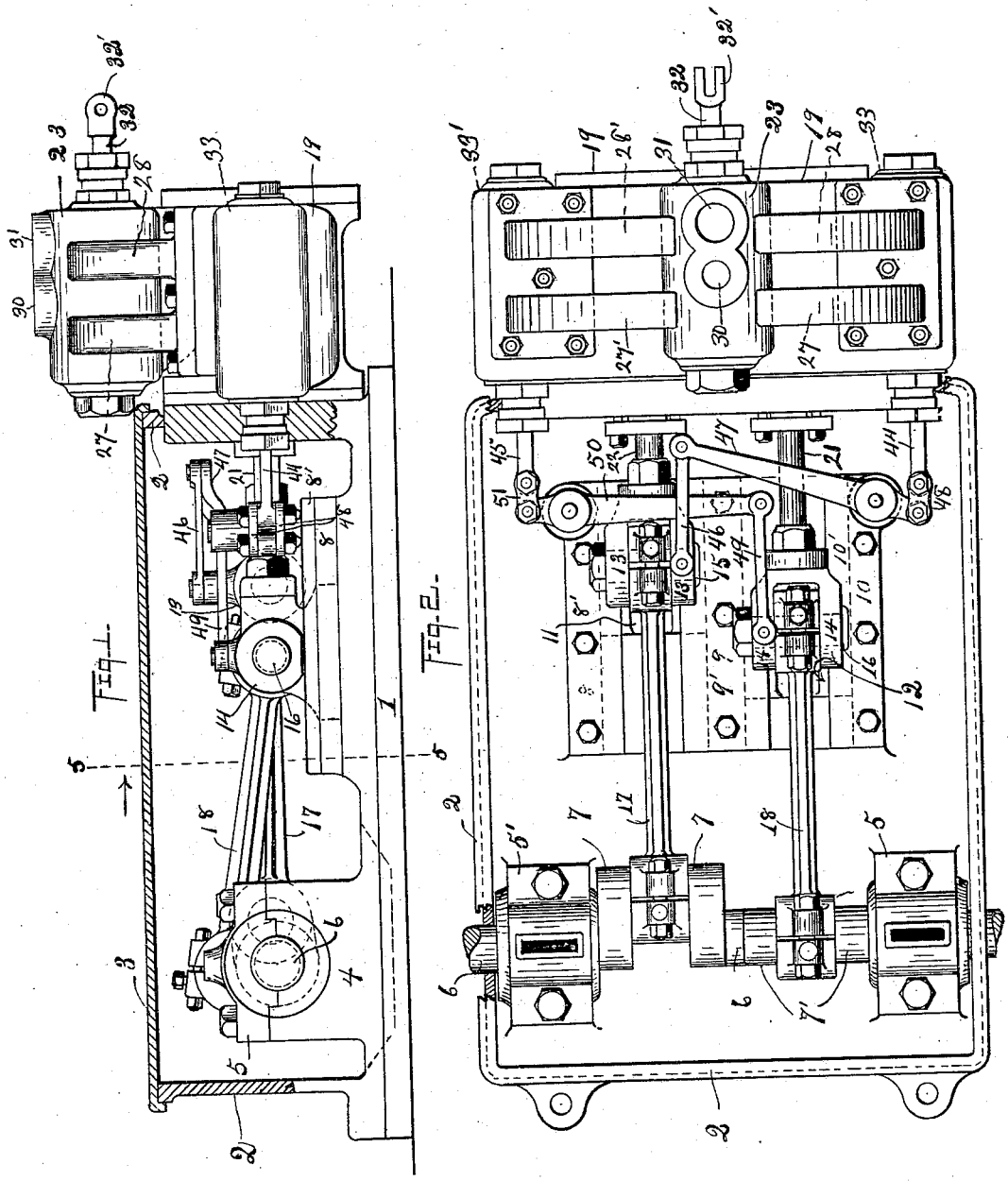
(No Model.) 2 Sheets—Sheet 1.

F. MURGATROYD.

STEAM ENGINE.

No. 553,419. Patented Jan. 21, 1896.



WITNESSES
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ATTORNEYS

(No Model.) 2 Sheets—Sheet 2.

F. MURGATROYD.

STEAM ENGINE.

No. 553,419. Patented Jan. 21, 1896.

Fig. 3.

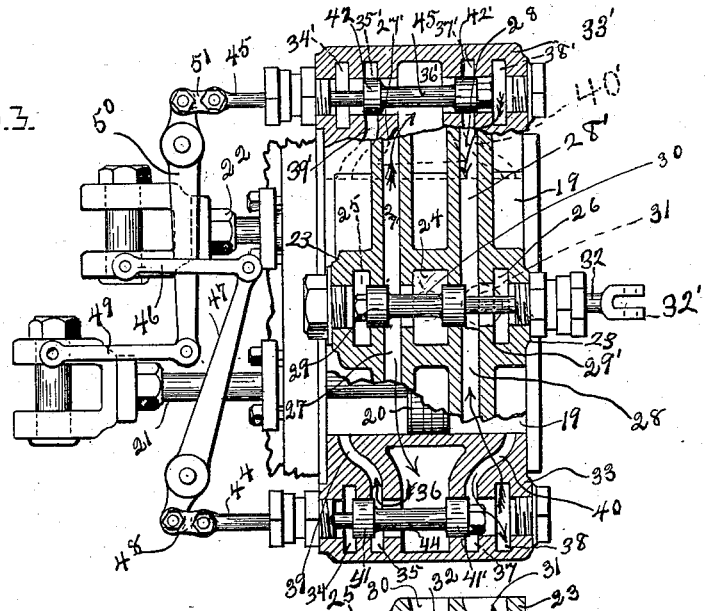


Fig. 4.

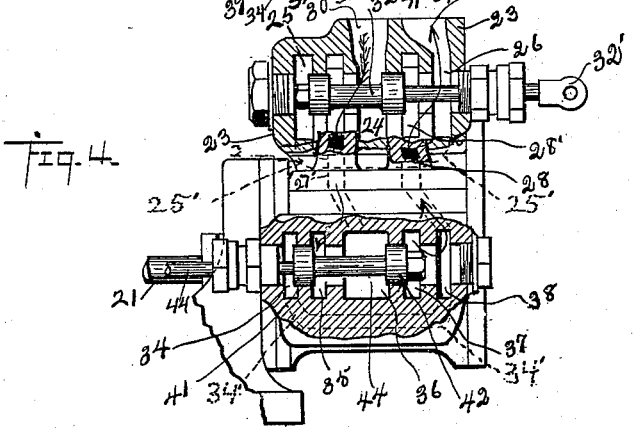
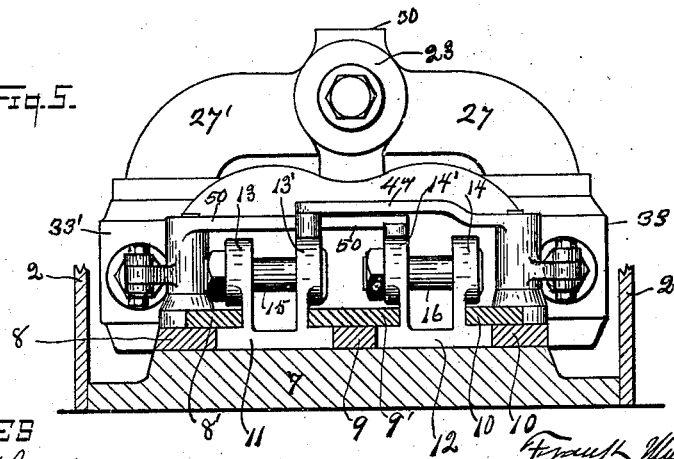


Fig. 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

FRANK MURGATROYD, OF CLEVELAND, OHIO.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 553,419, dated January 21, 1896.

Application filed October 11, 1894. Serial No. 525,550. (No model.)

To all whom it may concern:

Be it known that I, FRANK MURGATROYD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga, State of Ohio, have invented certain new and useful Improvements in Reversible Steam-Engines, of which the following, with the accompanying drawings, is a specification.

My invention relates generally to reversing steam-engines in which two ordinary steam-cylinders and pistons are employed, and more particularly to reversing-engines embodying two ordinary steam-cylinders and pistons and the combination therewith of the reversing-valve patented to me by United States Letters Patent No. 178,870, dated June 20, 1876.

The object of my invention is to avoid the use of eccentrics by employing instead thereof steam-operated levers, to increase the wearing-surfaces of the valve-operating parts, to secure compactness and economy of space, and to have the steam-operated valve-levers inclosed within a casing which will protect them against dust and other destructive matter.

My invention consists in the construction and combination of parts described herein and defined in the claim.

In the drawings, Figure 1 is a side elevation of my invention, one side of the casing being removed and a part of the ends and top of the casing being cut away. Fig. 2 is a plan of my invention, the top of the casing being removed. Fig. 3 shows the reversing-valve case and the steam-valve cases in central horizontal section. Fig. 4 is a vertical section through the center of the reversing-valve case and one of the steam-valve cases; and Fig. 5 is a section on the line 5 5 of Fig. 1, the connecting-rods being removed.

In the different figures of the drawings, 1 is the engine-bed.

2 is the outer wall of the casing which incloses the shaft and its bearings, the connecting-links, the cross-heads and their ways, and the valve-levers, and 3 is the top of the inclosing box or casing.

The bases 4 of the pillow-blocks are preferably made integral with the machine-bed, as illustrated, or they may be made separate and bolted thereto. The caps 5 and 5′ inclose the brasses which form the bearings for the shafts 6.

The slide-bars 8 8′, 9 9′, and 10 10′ are secured to the machine-bed to guide the slide-blocks 11 and 12. Upon the slide-blocks 11 and 12 are lugs 13 13′ and 14 14′, through which pass the bolts 15 and 16 to form a pivotal connection between the connecting-rods 17 and 18 and the piston-rod cross-heads. The opposite ends of the connecting-rods 17 and 18 are journaled upon the cranks 7 and 7′ of the shaft 6. Said cranks are at right angles with each other, so that while one piston is at half-stroke the other is at full-stroke.

There are two cylinders 19 19, having therein pistons 20 20, which are provided with piston-rods 21 22 of the usual construction.

Above the cylinders 19 is mounted the valve-case 23 which contains the reversing-valve. (The reversing-valve was patented to me by United States Letters Patent No. 178,870, dated June 20, 1876.) Said reversing-valve consists of the valve-case 23, having therein the chambers 24, 25, and 26, the double pipes 27 27′ and 28 28′, which connect with the steam-valves, and the valves 29 29′.

30 is the steam connection and 31 is the exhaust connection.

32 is the valve-stem through which the valves 29 and 29′ are operated by means of a lever (not shown) at the outer end 32′ of the valve-stem.

To the outside of the cylinders 19 are steam valve-cases 33 and 33′, having therein the chambers 34, 35, 36, 37 and 38 and 34′, 35′, 36′, 37′ and 38′, and the ports 39 and 40 and 39′ and 40′, leading respectively from the chambers 35 and 37 and 35′ and 37′ to the steam-cylinders 19. The pipes 27 and 28 and 27′ and 28′ lead from the reversing-valve to the chambers 36 and 38 and 36′ and 38′ of the steam-valves. Within the casings 33 and 33′ are valves 41 and 41′ and 42 and 42′, which are operated through the valve-stems 44 and 45 that project through the inner ends of the valve-cases 33 and 33′.

The valve-stem 44 is operated by the cross-head of the piston-rod 22 through the link 46, lever 47 pivoted upon the machine-bed, and the link 48, as illustrated, and the valve-stem 45 is operated by the cross-head of the piston-

rod 21 through the link 49, lever 50 pivoted upon the machine-bed, and the link 51, as illustrated.

The arrows in the drawings indicate the course of the steam when the pistons and valves are in the position shown. The movement of the steam when the position of the pistons and valves change will be understood by engineers and machinists. When the parts are reversed from the positions illustrated, steam escapes from the chamber 25 to the chamber 26 through the passage 25′, (shown by dotted lines in Fig. 4,) and steam passes from the chamber 34 to the chamber 38 through the passage 34′. (Shown by dotted lines in Fig. 4.)

It will be seen that the steam-valves within the valve-cases 33 and 33′, being operated by the opposite pistons of the cylinders 19, control with absolute certainty the admission of steam to the cylinders and the exhaust of steam therefrom, that no cams are employed, that the wearing-surfaces are reduced to a minimum, that the combination of the steam-valves and operating-levers with the cylinders and my reversing-valve makes a very compact double-reversible engine, that the inclosing of the parts within a casing protects them against dust and foreign substances that would cut the wearing surfaces and cause damage to the engine, and that by the construction described all the objects of my invention are accomplished.

My invention may take on various changes in mechanical details and arrangement of parts, and I do not, therefore, limit myself to the exact arrangement described.

What I claim as my invention is—

The combination of two steam cylinders having therein pistons connected with piston rods, a shaft having cranks off-set therefrom, cross heads and connecting rods through which the piston rods are connected with said cranks, two steam valves each of which is connected with one of the cylinders, pivoted levers and connecting links by which the steam valve of each cylinder is operated by the travel of the piston of the opposite cylinder, and a reversible valve having a steam connection and an exhaust opening, said reversible valve consisting of the valves 29 and 29′ operating in the chambers 24, 25 and 26, with the two systems of ports 27, 27′ and 28, 28′, by means of which and through which steam is admitted to the steam valves at either end thereof as desired, substantially as described.

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

FRANK MURGATROYD.

Witnesses:
J. A. OSBORNE,
E. E. OSBORNE.