

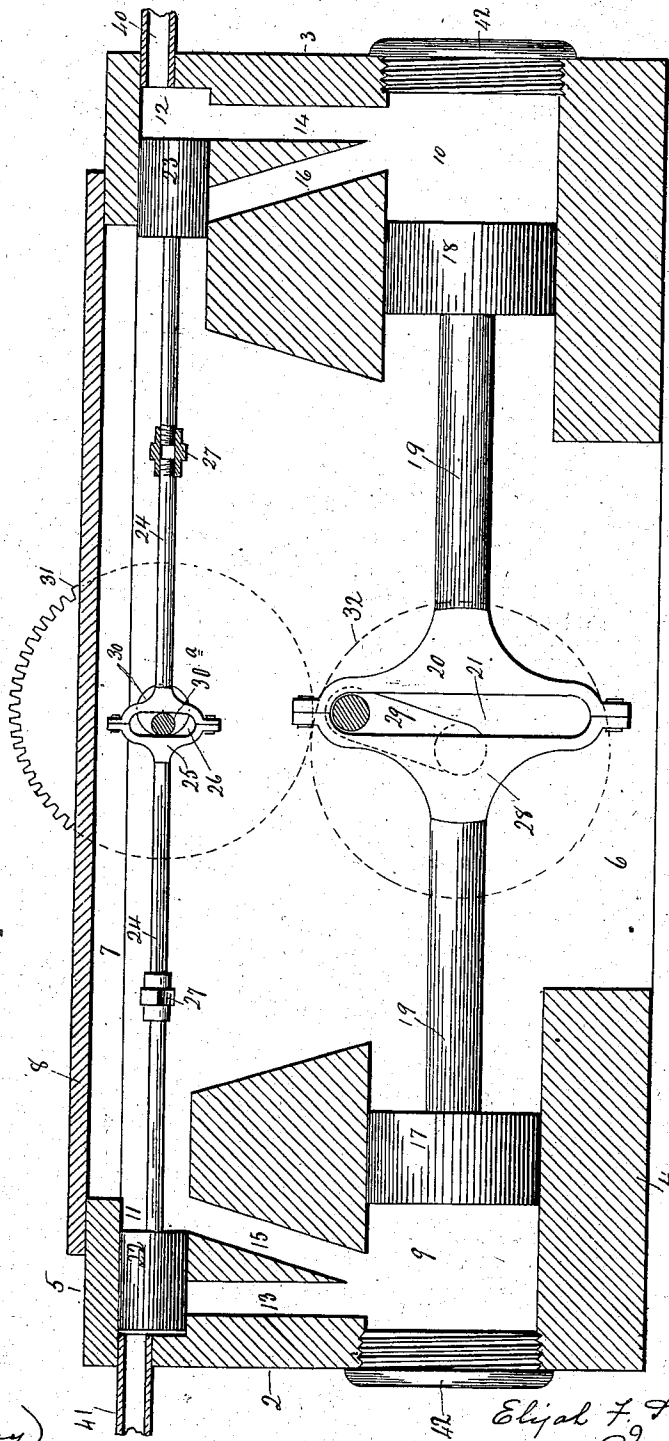
E. F. STEELE.
STEAM ENGINE.

APPLICATION FILED OCT. 21, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses
J. H. Hummer
Clara L. Steed.

Elijah F. Steele
 Inventor
 By *Atty Leonard & Co.*

E. F. STEELE.
STEAM ENGINE.

APPLICATION FILED OCT. 21, 1902.

NO MODEL.

2 SHEETS—SHEET 2.

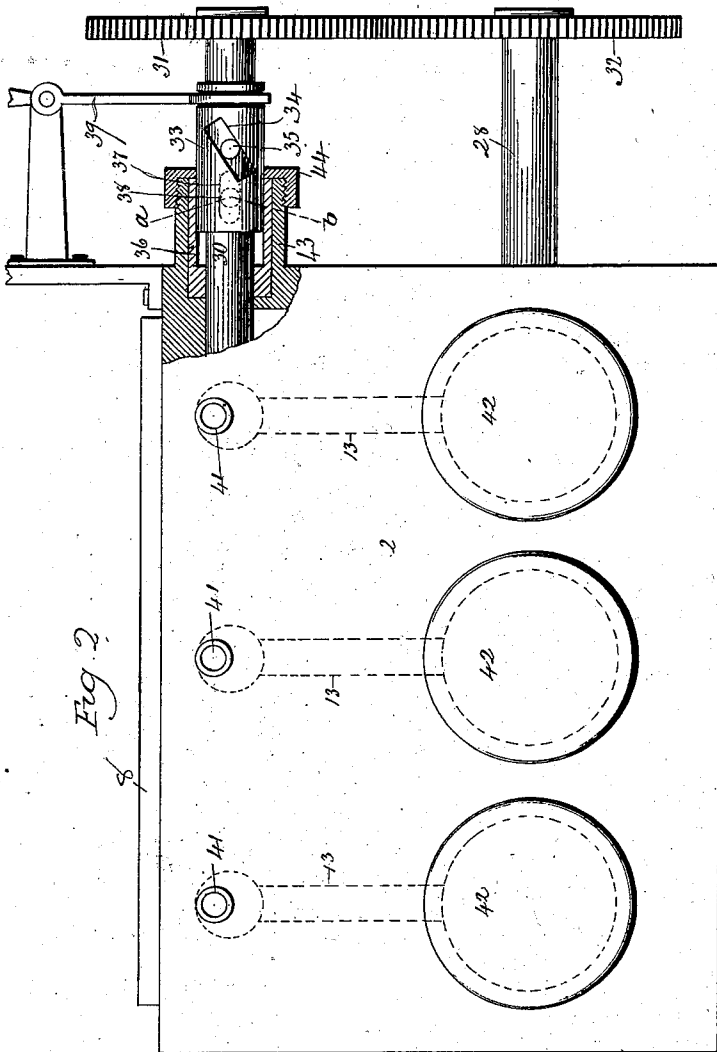


Fig. 2

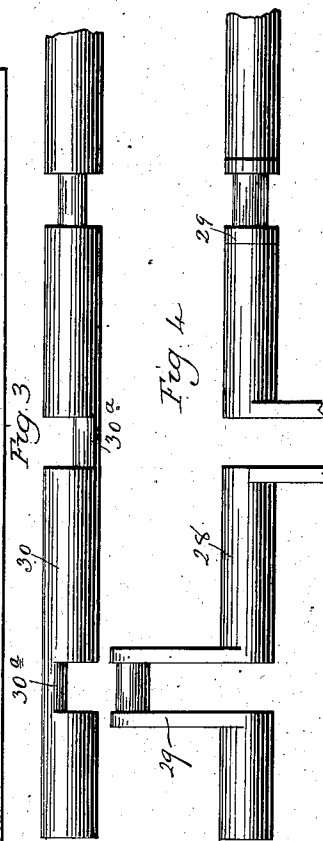


Fig. 3

Fig. 4

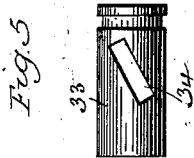


Fig. 5

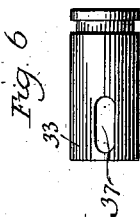


Fig. 6

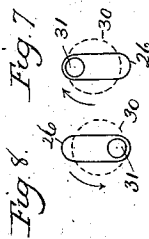


Fig. 7

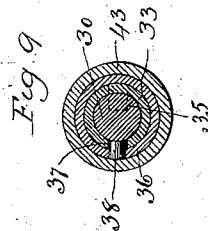


Fig. 9

Witnesses
J. H. Shumway
Clara L. Steele

Elijah F. Steele
 Inventor
 By *Atty. Seymour & Co.*

UNITED STATES PATENT OFFICE.

ELIJAH F. STEELE, OF WALLINGFORD, CONNECTICUT, ASSIGNOR OF TWO-THIRDS TO ROBERT H. COWLES AND GEORGE M. HALLENBECK, OF WALLINGFORD, CONNECTICUT.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 729,972, dated June 2, 1903.

Application filed October 21, 1902. Serial No. 128,138. (No model.)

To all whom it may concern:

Be it known that I, ELIJAH F. STEELE, of Wallingford, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Steam-Engines; and I do hereby declare the following, when taken in connection with the accompanying drawings and the numerals of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a longitudinal sectional view of an engine constructed in accordance with my invention; Fig. 2, an end view of the same, partially broken away to show the reverse mechanism; Fig. 3, a top or plan view of the cut-off-valve shaft; Fig. 4, a top or plan view of the main crank-shaft; Fig. 5, a side view of the reversing-cylinder; Fig. 6, a side view opposite that shown in Fig. 5; Fig. 7, a diagrammatical view showing one extreme position of the eccentric cut-off shaft; Fig. 8, a view of the same in the other extreme position; Fig. 9, a sectional view on the line *a b* of Fig. 2.

This invention relates to an improvement in steam-engines, the object being a simple, compact, and cheap construction of engine particularly applicable to motor-vehicles, dynamos, and other uses where economy of space is important; and the invention consists in the construction as hereinafter described, and particularly recited in the claims.

As herein shown, the case is rectangular, having ends or, as I will hereinafter call them, heads 2 3, bottom 4, and top 5. In the bottom 4 is a large opening 6, while in the top 5 is a large opening 7, adapted to be closed by a cover 8. In the head 2 are three openings forming cylinders 9, and in the head 3 are three openings forming cylinders 10, the cylinders in one end being in line with the cylinders at the opposite ends and all arranged in the same horizontal plane, their outer ends being closed by plugs 42. Above the cylinders 9 are cut-off cylinders 11, and above the cylinders 10 are cut-off cylinders 12, the cylinders also being formed in the heads 2 and

3 and those in one end in line with those in the opposite end and all in the same horizontal plane. Connecting the cylinders 9 and 11 and 10 and 12 are inlet-ports 13 and 14. From the cylinders 9 and 10 exhaust-ports 15 and 16 extend diagonally upward into the case. In the cylinders 9 is a piston 17, and in the cylinders 10 is a piston 18, each having piston-rods 19, which are connected by a yoke 20, forming a long slot 21. In the cut-off cylinders 11 and 12 are cut-off valves 22 and 23, connected by stems 24, the inner ends of which also form a yoke 25 with a slot 26 like the yoke and slot of the lower piston-rods. If desired and as herein shown, the valve-stems 24 may be divided and their ends connected by right and left hand threaded nipples 27, by which the length of the stems may be adjusted.

Transversely through the case is a driving-shaft 28, provided with three cranks 29, arranged at angles to each other and engaged by the yoke 20, while above the driving-shaft 28 and parallel therewith is a cut-off shaft 30, having eccentrics 30^a in the slots 26 of the yokes 25. The ends of the shafts 28 and 30 extend outward beyond the case and carry at their ends gear-wheels 31 32, which mesh with each other and so that the rotation of one shaft will impart rotation to the other shaft. Upon the shaft 30 is a sleeve 33, formed with a diagonal slot 34, into which a pin 35, mounted upon the shaft 30, extends, and this sleeve is mounted in a tube 36, also formed with a longitudinal slot 37, into which a pin 38, mounted in the tube 36, extends. This tube 36 is mounted in a bearing 43, in which it is free to revolve, but in which it is held against longitudinal movement by a collar 44, screwed on over the end of the bearing 43. In engagement with the outer end of the sleeve 33 is a shifting-lever 39, by which the sleeve may be moved back and forth, for the purpose as will hereinafter appear.

The main pistons and the cut-off pistons are so arranged and adjusted that steam being admitted through the pipes 40 41 will act upon the piston as follows: The steam ad-

mitted through the pipe 40 passes through the port 14 into the cylinder 10 and drives the piston 18 rearward, turning the crank 29 and moving the piston 17 forward in the cylinder 9, the exhaust-steam passing through the exhaust-port 15 into the case, from which it escapes through the opening 6 in the bottom thereof. This turning of the crank 29 and driving-shaft 28 turns the gear 31, and hence the gear 32, so as to revolve the cut-off shaft 30 and move the valves 22 23 accordingly. Upon the completion of the stroke the valves 22 23 will have been moved in the reverse direction, so as to close the port 14 and open the port 13, so that steam admitted through the pipe 41 may be passed through the port 13 in the cylinder 9 and drive the piston 17 therein rearward, the steam in the cylinder 10 passing through the exhaust-port 16 into the case, from which it escapes through the opening 6 in the bottom thereof. The pressure of the steam in the pipes 40 41 being equal the cut-off valves 22 23 are balanced. To reverse the movement of the engine, the shifting-lever 39 will be moved to move the sleeve longitudinally upon the shaft 30, and as it is permitted to move only in a longitudinal direction by the pin 38 in the bearing 36 it follows that the slot 34, acting upon the pin 35, will partially rotate the shaft 30 and so as to move the eccentrics 31 from the position shown in Fig. 7 to that shown in Fig. 8 or, in other words, to turn the eccentric 30^a from one end of the slot 26 to the opposite end and so that the movement of the valve-rods 24 will be reversed. This movement of the shaft through the gears 31 and 32 correspondingly rotates the shaft 28 and so turns the crank 29 in the slot 20 and moves the pistons 18 and 17 into proper relative positions.

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

1. In a steam-engine, the combination with a case having two or more cylinders at each end in line with each other and in the same plane, pistons in said cylinders with connected piston-rods, cut-off cylinders parallel with the main cylinders, valves arranged therein and closely fitting the same, means for admitting steam at equal pressure at the outer ends of both the cut-off cylinders, the said valves connected by stems, said stems and rods substantially parallel, inlet-ports between said cylinders, exhaust-ports from the main cylinders, and crank-shafts with which the stems and pistons are connected, said

shafts geared together, substantially as described.

2. In a steam-engine the combination with a case having two or more cylinders at each end in line with each other and in the same plane, pistons in said cylinders with connected piston-rods, cut-off cylinders parallel with the main cylinders, valves arranged therein, means for admitting steam at equal pressure at the outer ends of both of the cut-off cylinders, connected valve-stems for said valves, said stems and rods substantially parallel, inlet-ports between said cylinders, exhaust-ports from the main cylinders, crank-shafts with which said pistons and stems engage, said shafts geared together, a sleeve on the upper shaft, a diagonal slot in said sleeve into which the pin on the shaft extends, a tube extending over said sleeve, a pin in said tube extending into a horizontal slot in said sleeve, said tube mounted in a bearing in which it is free to revolve but in which it is held against longitudinal movement, and means for moving said sleeve whereby the said shaft may be partially turned, substantially as described.

3. In a steam-engine, the combination with a case having two or more cylinders at each end in line with each other and in the same plane, pistons in said cylinders, with piston-rods connected by slotted yokes, cut-off cylinders above the main cylinders, round valves arranged therein and closely fitting the same, means for admitting steam at the outer ends of the cut-off cylinders, valve-stems connected with slotted yokes, said stems and rods substantially parallel, inlet-ports between said cylinders, exhaust-ports from the main cylinders, crank-shafts with which said yokes engage, said shafts geared together, a sleeve on the upper shaft, a diagonal slot in said sleeve into which the pin on the shaft extends, a tube extending over said sleeve, a pin in said tube extending into a horizontal slot in said sleeve, said tube mounted in a bearing in which it is free to revolve but in which it is held against longitudinal movement, and means for moving said sleeve whereby the said shaft may be partially turned, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ELIJAH F. STEELE.

Witnesses:

CLIFTON D. ALLEN,
HENRY MARTIN.