(No Model.)

J. W. DENNIS & F. A. SHOEMAKER.

REVERSING VALVE FOR STEAM ENGINES.

No. 424,183. Patented Mar. 25, 1890.

Fig. 1.

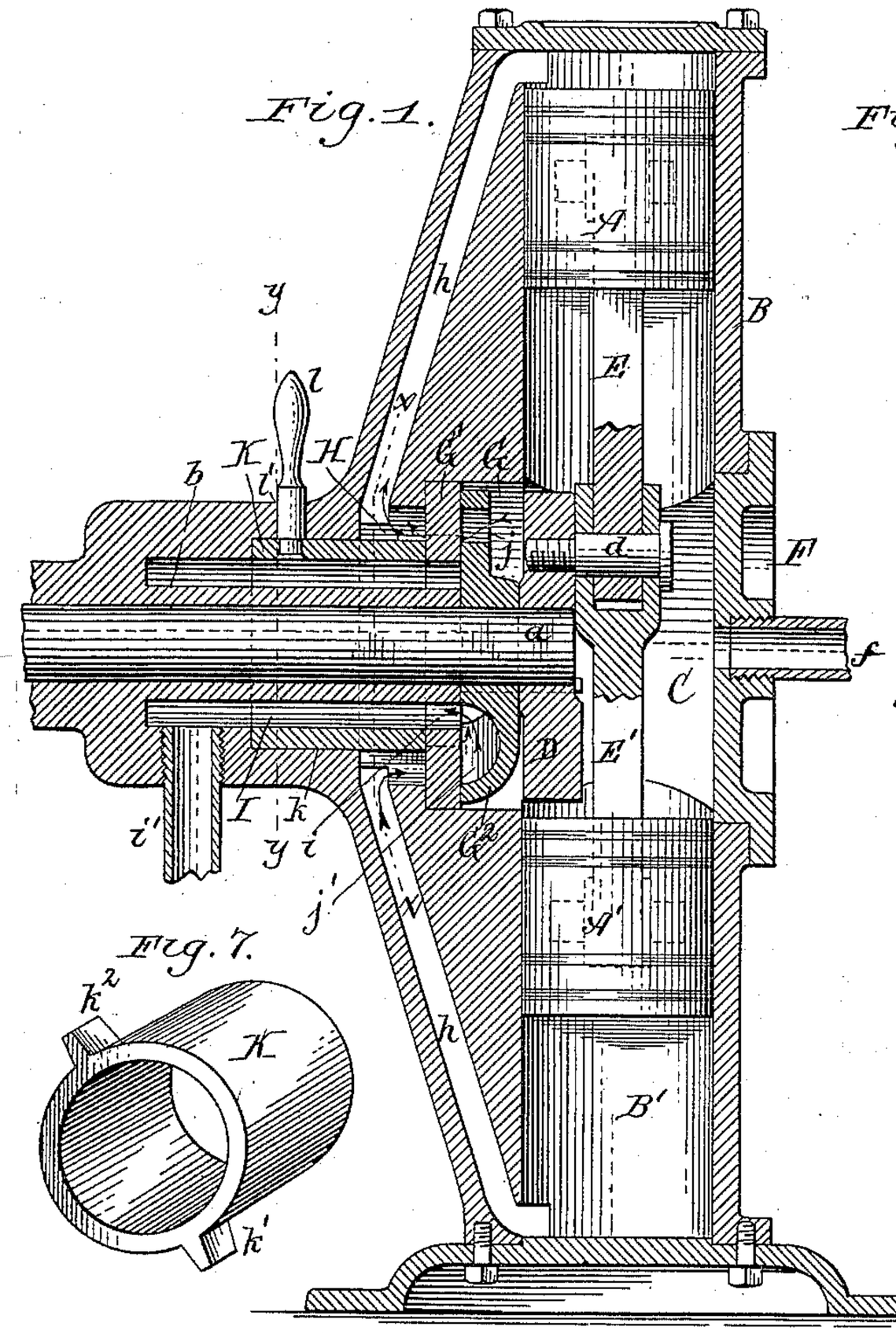


Fig. 2.

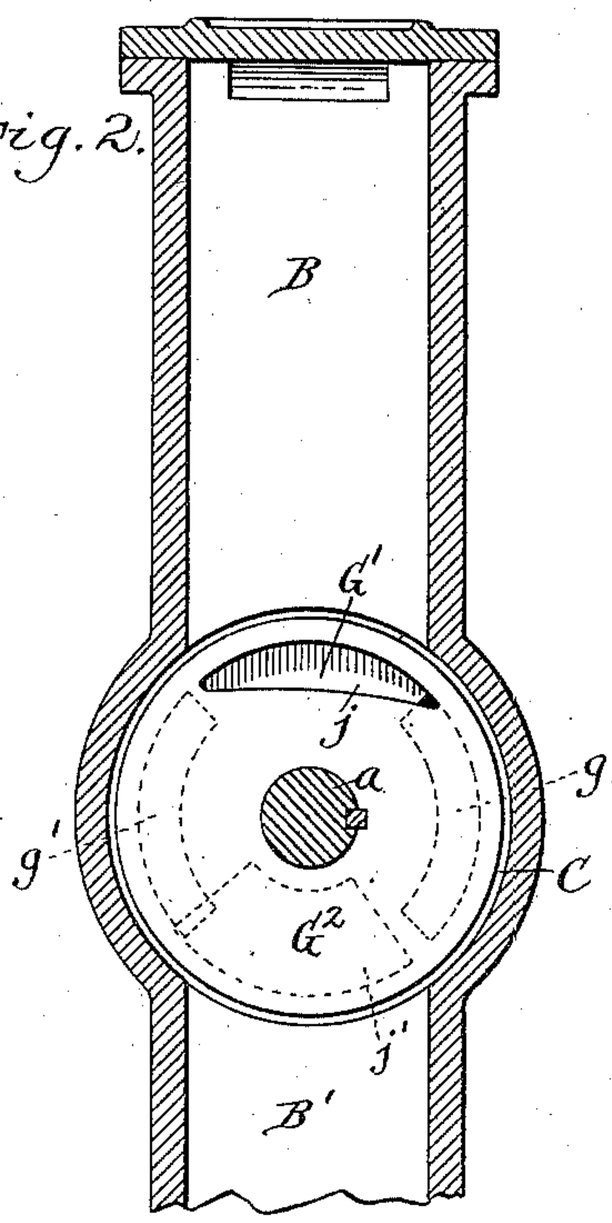


Fig. 7.

Fig. 4.

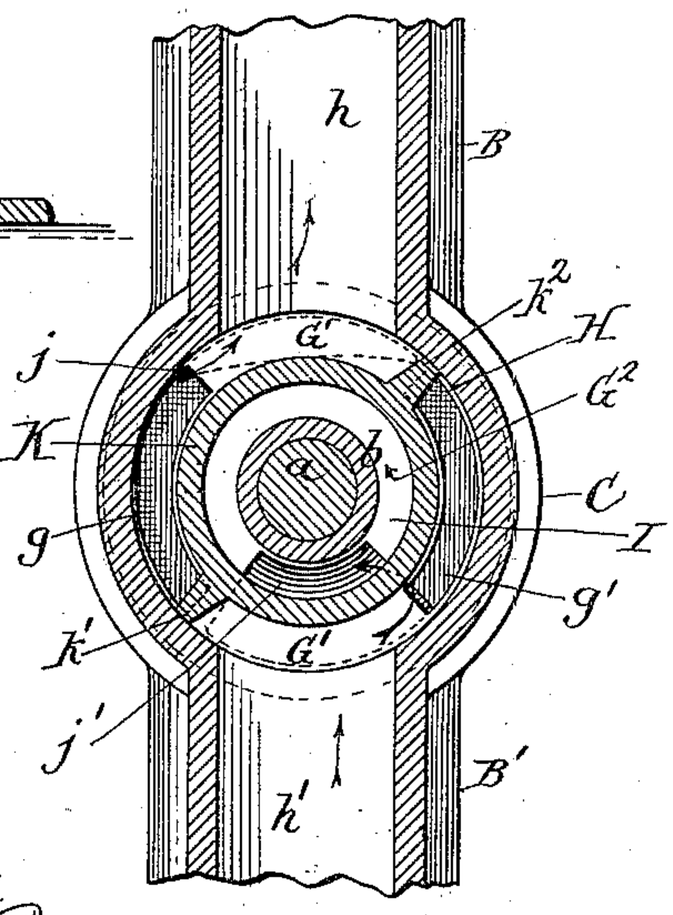


Fig. 3.

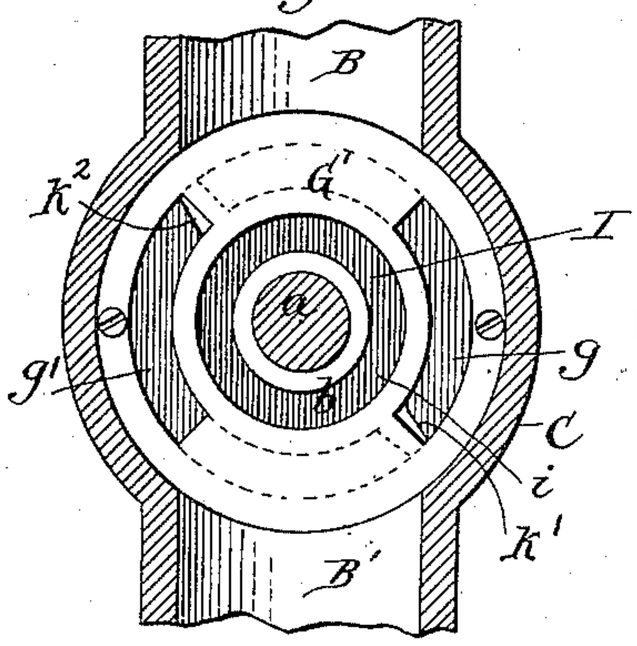


Fig. 5.

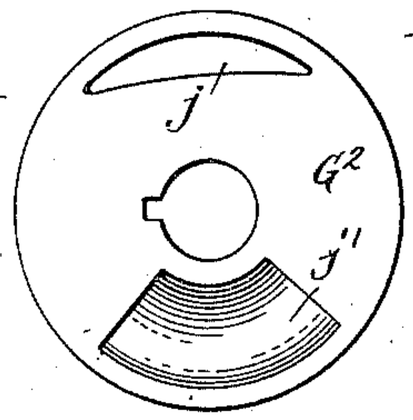
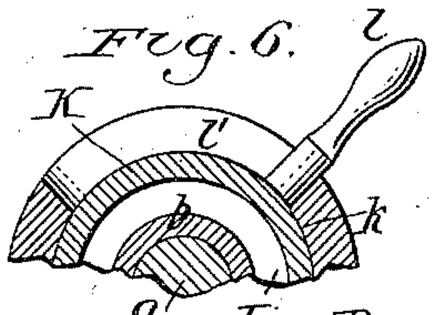


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSEPH W. DENNIS AND FRANK A. SHOEMAKER, OF BUFFALO, NEW YORK.

REVERSING-VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 424,183, dated March 25, 1890.

Application filed August 26, 1889. Serial No. 321,933. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH W. DENNIS and FRANK A. SHOEMAKER, citizens of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Reversing-Valves for Steam-Engines, of which the following is a specification.

This invention relates to that class of steam-engines which contain two or more cylinders and connected pistons, and in which the steam enters a chamber formed between the cylinders and is admitted from said intermediate chamber to the outer ends of the cylinders and exhausted therefrom by a rotary valve secured to the engine-shaft. An engine of this kind is shown and described in Letters Patent No. 409,457, dated August 20, 1889.

The object of our present invention is to provide means whereby the motion of the engine can be readily reversed.

In the accompanying drawings, Figure 1 is a sectional elevation of our improved steam-engine. Fig. 2 is a fragmentary longitudinal section at right angles to Fig. 1, showing a front elevation of the rotary valve. Fig. 3 is a similar view with the valve removed. Fig. 4 is a vertical longitudinal section in line $x\,x$, Fig. 1. Fig. 5 is a face view of the rotary valve. Fig. 6 is a fragmentary cross-section in line $y\,y$, Fig. 1. Fig. 7 is a perspective view of the shifting-cylinder.

Like letters of reference refer to like parts in the several figures.

A A′ represent two single-acting pistons arranged in two cylinders B B′, which communicate at their inner ends with an intermediate steam-chamber C.

a represents the engine-shaft, journaled in an elongated bearing *b*, which is formed on the rear side of the chamber C. The shaft *a* projects into the chamber C and carries within the latter a counterbalanced crank D, having a wrist-pin *d*, which is connected with both pistons A A′ by rods E E′.

f is the steam-supply pipe opening into the intermediate chamber C and attached to a removable head or cover F, which closes an opening in the front wall of said chamber.

G represents a circular valve-chamber formed in the rear portion of the chamber C, behind the crank-wheel D, and concentric with the engine-shaft.

G′ represents a circular valve-seat arranged in the valve-chamber G, and G^2 represents the circular or disk valve which is secured to the engine-shaft behind the crank-wheel.

The valve-seat G′ is provided with two segmental slots or openings *g g′*, arranged horizontally on opposite sides of the shaft and forming a communication between the valve-chamber G and an annular chamber H, formed in rear of the valve-seat.

h h′ represent the steam-ports, which extend from the upper and lower sides of the chamber H, respectively, to the upper and lower ends of the cylinders B B′.

I represents an annular exhaust-port, which surrounds the inner portion of the bearing of the engine-shaft and communicates at its front end with an annular opening *i*, formed in the valve-seat G′ between the segmental openings *g g′*, and at its rear end with an exhaust-pipe *i′*. The valve G^2 is provided with an arc-shaped steam-port *j*, which is adapted to open a communication between the intermediate steam-chamber C and either of the openings *g g′* of the valve-seat.

j′ represents an exhaust-cavity formed in the rear side of the valve diametrically opposite the port *j* and adapted to open a communication between the annular exhaust-port I and either of the openings *g g′*.

The chamber H and the annular exhaust-port I are separated by a hollow cylinder or sleeve K, which is seated in a circular cavity or enlargement *k*, formed in the outer wall of the exhaust-port I. The front end of the cylinder K bears against the rear side of the valve-seat G′ between the annular opening *i* and the segmental openings *g g′*. The front portion of the outer surface of the cylinder K forms the inner wall of the annular chamber H.

k′ k^2 represent wings or partitions formed on the outer surface of the cylinder K on diametrically-opposite sides thereof and fitting snugly within the chamber H, and having their outer surfaces or edges bearing against the outer wall of the chamber H. The cham-

ber H is divided into two separate compartments by the wings or partitions k' k^2, so that each compartment communicates separately with one of the steam-ports h h'. The wings k' k^2 are arranged between the segmental slots g g' on the valve-seat G', so that one of said slots is in communication with one of the compartments of the chamber H, while the other slot is in communication with the other compartment.

The cylinder K is capable of being turned in its seat to change the position of the wings k' k^2 in the chamber H, and the cylinder K is provided for this purpose with a handle l, which projects through a slot l', formed in the outer wall or casing surrounding the bearing b. When the cylinder K is in the position shown in Fig. 4 of the drawings, in which position the handle l is at one end of the slot, as shown in Fig. 6, the wing k^2 is arranged at the upper end of the segmental opening g' and the wing k' at the lower end of the segmental opening g. The segmental opening g communicates with the steam-port h, while the segmental opening g' communicates with the steam-port h'. Upon turning the cylinder K in its seat until the handle l rests against the opposite end of the slot l' the wing k' will be placed at the upper end of the segmental opening g and the wing k^2 at the lower end of the segmental opening g', and in this position of the wings the segmental opening g communicates with the steam-port h', while the segmental opening g' communicates with the steam-port h. By thus shifting or reversing the partition-cylinder K the communication of the openings g g' of the valve-seat with the ends of the two cylinders is reversed and the engine-shaft is caused to rotate in a reversed direction without changing the position of the valve.

We claim as our invention—

1. The combination, with two cylinders and an intermediate connecting-chamber, a shaft provided with a crank within said intermediate chamber, and two pistons connected with said crank, of fixed ports leading to the outer end of each cylinder, a fixed valve-seat provided with an opening for each port, a valve rotating with the crank-shaft, and movable partitions arranged between the valve-seat and the ports, whereby the communication between the openings in the valve-seat and the ports can be reversed, substantially as set forth.

2. The combination, with two cylinders and an intermediate connecting-chamber, a shaft provided with a crank within said intermediate chamber, and two pistons connected with said crank, of ports leading to the outer end of each cylinder, a chamber communicating with the inner ends of said ports, a shifting-cylinder provided with partitions arranged in said chamber, a valve-seat provided with openings arranged between the partitions of the shifting-cylinder and exhaust-port, and a valve rotating with the shaft, whereby upon shifting the partition-cylinder the communication between the openings in the valve-seat and the steam-ports is reversed, substantially as set forth.

3. The combination, with two cylinders and an intermediate connecting-chamber, a shaft provided with a crank within said intermediate chamber, and two pistons connected with said crank, of ports leading to the outer end of each cylinder, an annular chamber communicating with the inner ends of said pistons, a hollow shifting-cylinder having its bore communicating with the exhaust-port and provided with partitions in the annular chamber, a valve-seat provided with an annular exhaust-port communicating with the bore of the shifting-cylinder and with two segmental openings arranged between the partitions of the shifting-cylinder, and a valve rotating with the shaft and provided with a steam-port and an exhaust-cavity, substantially as set forth.

Witness our hands this 22d day of August, 1889.

JOSEPH W. DENNIS.
FRANK A. SHOEMAKER.

Witnesses:
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