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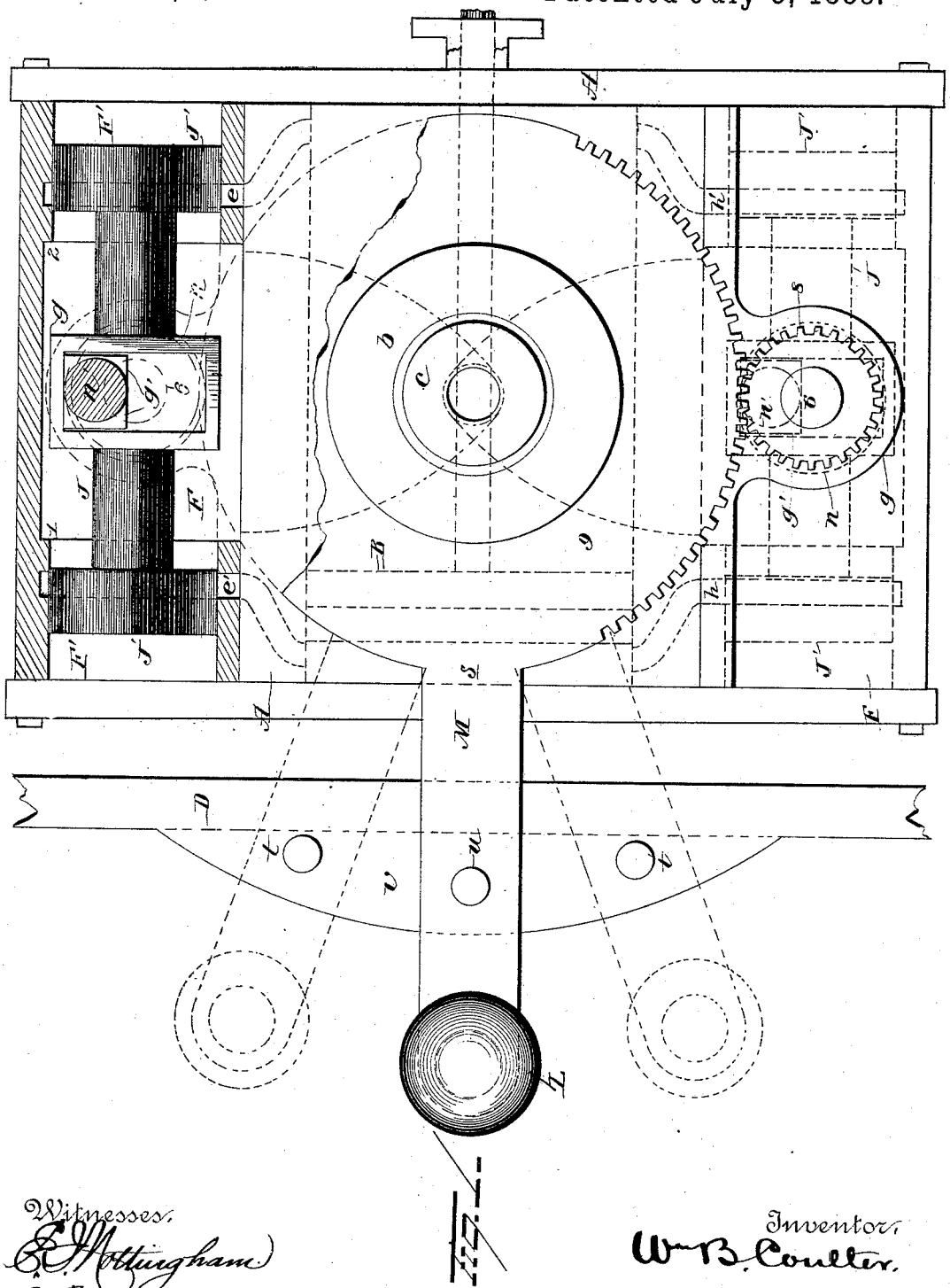
W. B. COULTER.

VALVE MECHANISM FOR OSCILLATING ENGINES.

No. 385,506. Patented July 3, 1888.



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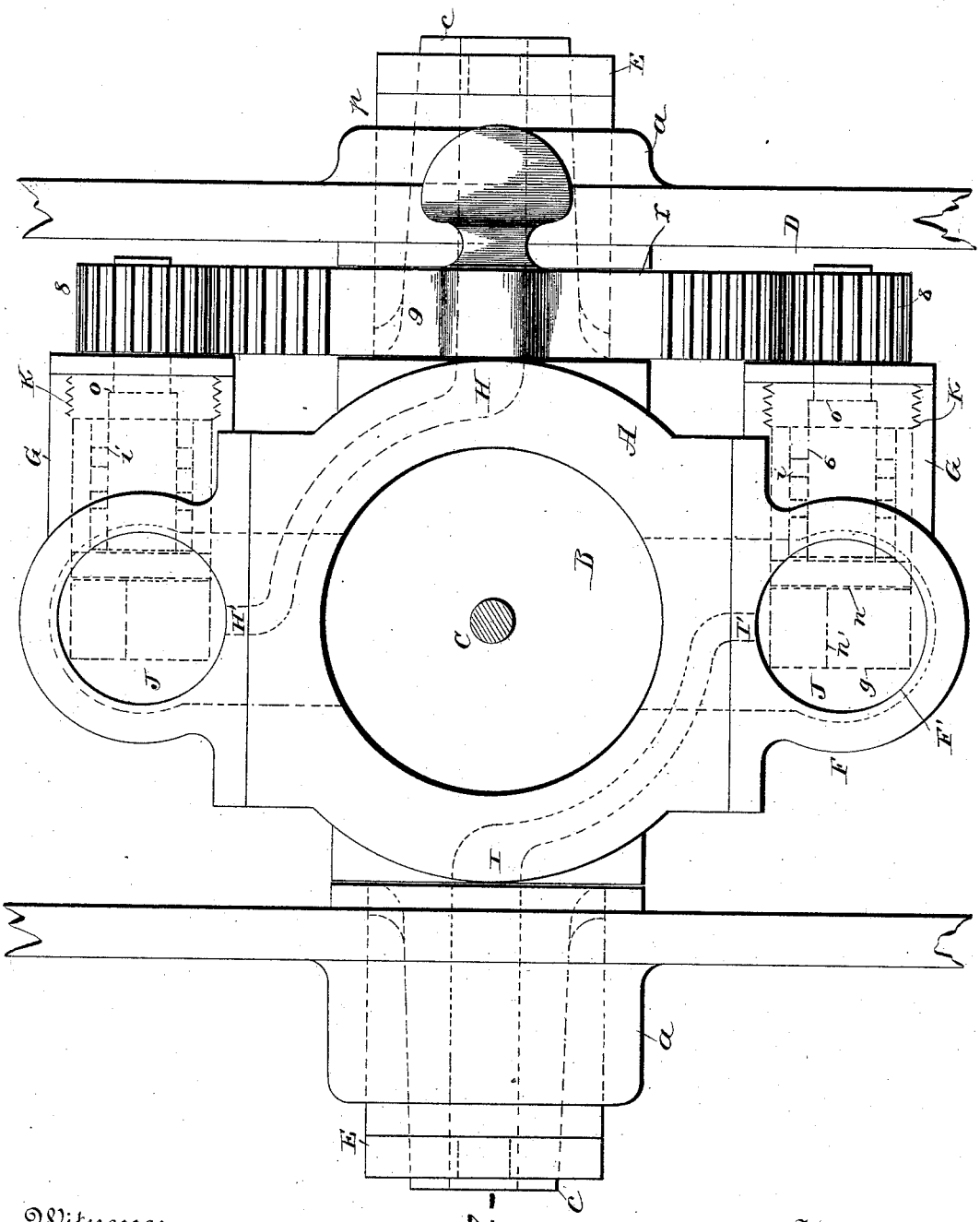

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 4.

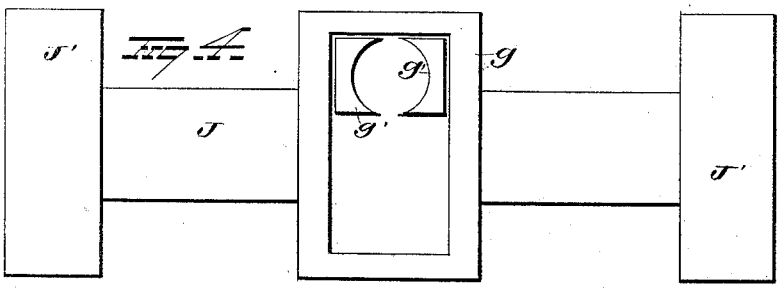


Fig. 5.

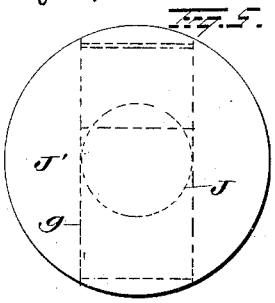


Fig. 3.

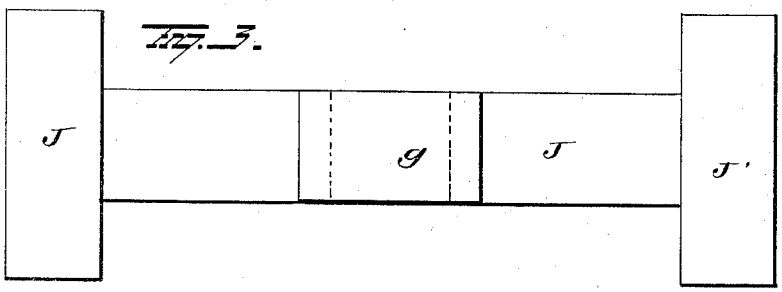


Fig. 6.

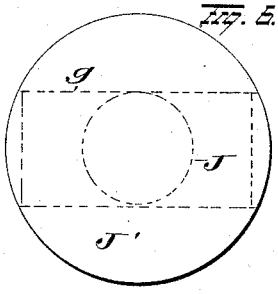


Fig. 9.

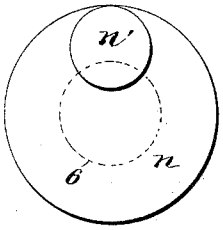


Fig. 7.

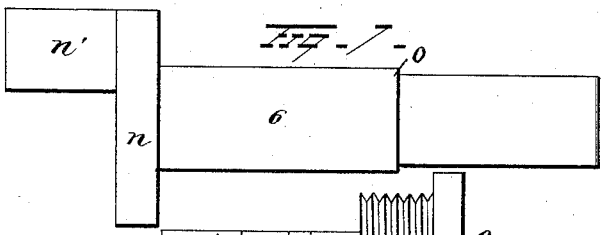


Fig. 8.

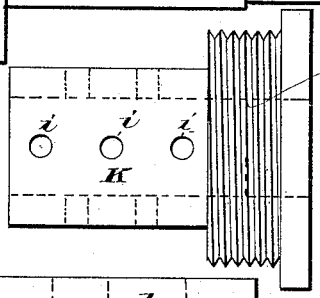


Fig. 10.

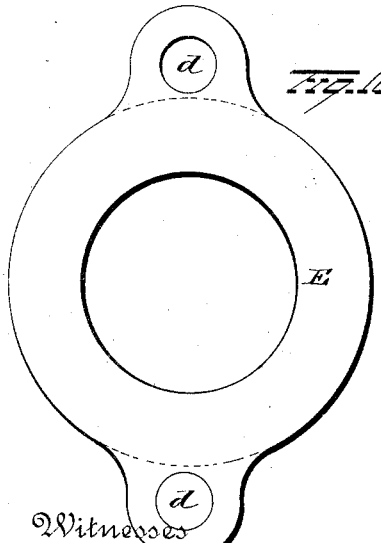
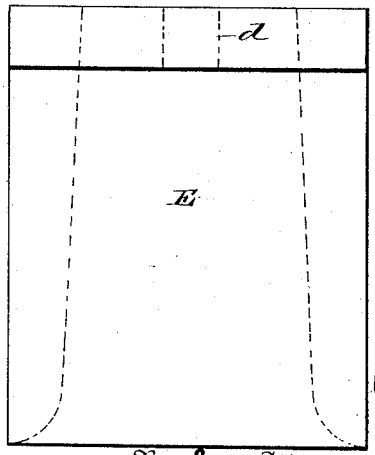


Fig. 11.



Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM B. COULTER, OF BRISTOL, CONNECTICUT.

VALVE MECHANISM FOR OSCILLATING ENGINES.

SPECIFICATION forming part of Letters Patent No. 385,506, dated July 3, 1888.

Application filed October 22, 1887. Serial No. 253,037. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. COULTER, of Bristol, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Valve Mechanism for Oscillating Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to valve mechanism for oscillating engines; and it consists, primarily, in the provision of a simple valve-operating mechanism, whereby the induction into and discharge of steam from the cylinder of an oscillating steam-engine will be readily accomplished and the reversal of motion of the engine provided for.

My invention further consists in the combination of one or more balanced piston-valves with an oscillating steam-cylinder and actuating gear-wheels, so that the valves will be properly reciprocated for the admission and discharge of steam by the oscillation of the steam-cylinder.

Referring to the drawings, Figure 1 represents a side elevation of my improved engine, with the novel valve-gear and valves in position. Fig. 2 is a plan view of the engine-cylinder and its supporting-frame. Figs. 3 and 4 are top and side views, respectively, of the piston-valves removed from the valve-chests. Figs. 5 and 6 are end views of the piston-valve shown in Figs. 3 and 4. Figs. 7, 8, and 9 are views of one of the valve-actuating crank-shafts and the supporting-box for the same. Figs. 10 and 11 are end and side views of one of the trunnion-boxes.

A is the engine-cylinder. It is made of a proper bore and length of stroke to afford the amount of power desired, and has a piston, B, rod C, and crank provided, of usual approved form of construction, the crank being omitted from the drawings. The cylinder A is supported in a frame, D, that is provided with true round holes formed at opposite points in the bosses *a*.

To properly sustain the cylinder in a manner that will permit free vibration upon its trunnions *c*, (see Fig. 2,) these trunnions are tapered properly and rendered axially true with each other, so as to have a neat fit in the flanged sleeves E, (see Fig. 2,) the form of construction of these sleeve-bushings E being shown in the detached views 10 and 11. The cylindrical outer diameter of the bushings E is such in relation to the holes in the bosses *a* of the frames D that they will slide in the same without improper freedom or lateral motion.

Set-bolts are inserted into or affixed to the sides of the frame D to enter the holes *d* in the flanges of the bushings E, and thus furnish a means for taking up any wear of the body of the trunnions and keep the cylinder A in proper alignment with the frame.

Upon opposite sides of the cylinder A true flat seats are formed for the reception of the steam-chests F, these chests being made of same length as the cylinder and secured in place by any proper means. The valve-chests F are made cylindrical internally and of equal diameter for a portion of their length at each end, the central portions from the points 1 2 being enlarged for a purpose that will be explained.

At points about the center of length of the valve-chests F a laterally-projecting enlargement, G, is formed on each chest. These projections G are perforated throughout their length, the cylindrical holes in their bodies cutting through the side walls of the valve-chests F, at right angles to the bores of the same.

Steam-passages H I are made in the side walls of the cylinder A, which extend from the central bore of the trunnions *c* to intersect steam ports or inlets H′ I′ made through the steam-chests F, and it will be seen that the ports mentioned cut through the walls of the steam-chests F into the enlarged steam-space bounded endwise by the shoulders 1 2, (see Fig. 1,) thus affording a continuous influx of steam into the upper chest at the point named.

The true cylindrical portions F′ of the steam-chests F, which extend from the points 1 2 toward the ends of said chests, (see Fig. 1,) are each intersected with steam inlet and exhaust ports *e e′ h h′*. These passages, forming annular grooves in the steam-chests, are extended downward and outward through the wall of the steam-cylinder A until they perforate the interior surface of the cylinder A near the ends

of the same. In each of the steam-chests F a valve, J, constructed as shown in Figs. 3 and 4, is located.

The valves J are provided with piston-heads J′, which are of such a relative diameter to the caliber of the valve-chests as to move freely therein without escape of steam through the joints. The bodies of the valves between the heads J′ are reduced to afford free passage for steam around them, and at or near the center of length of each valve an enlargement is formed integral with the body, which is slotted to produce a yoke, *g*, at this point.

The yokes *g*, that are formed in the valves J, are provided for the reception of the sliding boxes *g′*, which latter are adapted to slide vertically within the slots of the yokes, and are perforated through their centers to receive crank-pins, as will be explained.

The interior surface of the outer ends of the transverse perforated enlargement or bosses G, which project from corresponding sides of the steam-chests F F, are threaded to receive the threaded ends of the thimbles or cylindrical boxes K, these latter having shoulders made on their outer ends at proper points to engage similar shoulders in the receiving-orifices to determine their proper relative position longitudinally.

The boxes K are perforated axially throughout their length, of a proper diameter to receive the true cylindrical bodies of the crank-shafts 6. The ends of the shafts 6, that extend within the steam-chests F, are diametrically enlarged to produce disks *n*, and upon the inner surfaces of the disks *n* crank-pins *n′* are affixed, which latter are made of a correct diameter to loosely fit the holes in the boxes *g′*, in which they are inserted.

The annular walls of the boxes K are perforated at several spaced intervals to allow lubricants to enter and moisten the bodies of the crank-shafts 6, and it will be noticed that the outer ends of these bodies are reduced and thus afford offset shoulders *o*, these shoulders abutting against similar shoulders formed in the boxes K, this contact of parts being rendered steam-tight by grinding together of the surfaces to prevent loss of steam through the joints at these points when the device is in service.

It should be stated that the introduction of the lubricant into the steam-chests by any approved means will moisten the valves and also penetrate the orifices *i* in vaporized condition, thus permeating the joints and effectually lubricating the crank-shafts 6 while the engine is in motion.

Upon the reduced outer ends of the crank-shafts 6 are mounted the toothed small pinions 8, and these have meshing-contact with the large gear-wheel 9, this latter-named wheel being supported to oscillate upon an inwardly-projecting sleeve, *p*, that is formed integrally upon the adjacent inner surface of the frame D. A thin collar, *r*, which is affixed to the frame D, and faced off at right angles to the bearing-surface formed on the sleeve *p*, provides a true surface for the abutment of the wheel 9 and prevents its lateral displacement.

At a point, *s*, (see Fig. 1,) a projecting arm, M, is affixed to the peripheral edge of the wheel 9. It is of sufficient length to give necessary leverage to freely move this wheel on its bearing-support, and is provided on the side of its free end with a knob, L, to facilitate the movement of the wheel and connected parts.

The body of the arm M is perforated to receive a pin, and the adjacent flange *v* of the frame D is also similarly perforated at a point, *u*, so that when the two holes are made to register with each other the pin may be inserted into the flange of the frame and thus lock the arm M in place. Other perforations, *t t*, are made through the flange *v* of the frame D at equal distances above and below the hole *u*, and by the movement of the arm M a proper distance above or below this central hole, *u*, the holes *t* may be caused to line with the hole in the arm M, and said arm locked in position by the insertion through the hole of a pin or key.

In Fig. 1 the valves J are shown with their piston-heads J′ covering the steam and exhaust ports in chests F, while the engine-piston B is located at or near the end of the cylinder A, so that the engine is on its centers. The length of the valves J is so proportioned that the inner edges of their heads J′ will slightly cover the ports *e e′*, *h h′*, and it should be mentioned that when two valve-chests and valves are employed the upper valve and chest are intended to introduce steam into the cylinder and the lower chest and valve to exhaust it therefrom. As shown in Fig. 1, the valves are adjusted for forward motion of the engine.

A description of the operation will now be given, with the parts in position as shown in Fig. 1, in which the ports are covered by the piston-heads J′ of the valves J and the engine-piston B is at the end of its extreme stroke.

The movement of the piston B will oscillate the cylinder A, and the fixed position given the gear-wheel 9 will communicate rotative motion to the small pinions 8 8 that are affixed to the crank-shafts 6 6. These shafts will thus be rocked in opposite directions. The movement of the upper valve of the engine from motion transmitted through the crank-shaft 6 will be in the direction indicated by the arrow or toward the left-hand end of the valve-chest F. This will uncover the steam-port at this end of the chest and admit steam into the cylinder A at the port-opening *e′*. When the steam is introduced at *e′* into the cylinder, the oscillation of the same will uncover the port *h* in the lower steam-chest, and thus afford escape for exhaust-steam from the cylinder A at the port-opening *x*, and thence into the enlarged cavity of the lower steam-chest, from which there is a continuous exhaust-passage, I, into and through the trunnion, to which is connected an exhaust-pipe by any suitable means.

It is apparent that motion once established in the manner indicated will continue while steam is admitted to the upper valve-chest, and should it be desired to change the direction of motion of the engine to move attached machinery in an opposite direction the lever or bar M is moved to take the position indicated in dotted lines in Fig. 1. This change of position of the large gear-wheel 9 will partially rotate the smaller pinions, 8 8, and thus cause the pins n' of the crank-disks n to make a half-revolution, causing the valves to move in the opposite direction, the result of which will be a reversal of motion of the engine and attached machinery.

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

1. In an oscillating engine, the combination, with a frame and a cylinder having trunnions, of a steam-chest, a sliding valve having two piston-heads, and a lever having a toothed edge, the latter adapted to engage a toothed wheel for moving the valve endwise when the cylinder is rocked, substantially as set forth.

2. In an oscillating steam-engine, the combination, with a steam-chest, and a valve provided with a cylindrical head on each of its ends, and a yoke or slotted connecting-body, of a sliding box, a crank-shaft that engages the box with its crank-pin, a toothed pinion, and a meshing gear-wheel adapted to partially rotate the pinion and move the valve longitudinally when the cylinder is rocked, substantially as set forth.

3. In an oscillating engine, the combination, with the frame, a toothed wheel, a handle or bar affixed to the wheel, and a means for securing the wheel to the frame in changed positions of adjustment, of a pinion, a crank-shaft that supports the pinion, and a sliding piston-valve placed in a steam-chest and connected loosely to the pin of the crank-shaft, substantially as set forth.

4. In an oscillating steam-engine, the combination, with a steam-chest and a piston-valve adapted to slide endwise and uncover a port in the chest, of a yoke formed in the body of the valve, a sliding box, a crank-shaft, and a perforated sleeve or box which gives support to the crank-shaft and is adapted to make a steam-tight joint with a shoulder formed thereon, substantially as set forth.

5. In an oscillating steam-engine, the combination, with a frame, a cylinder, two trunnions, and a piston with its rod, of two valve-chests, two piston-valves, steam and exhaust ports leading from the chests into the cylinder, and valve mechanism that will actuate the valves endwise and in opposite directions when the cylinder is rocked and its piston reciprocated, substantially as set forth.

6. In an oscillating steam-engine, the combination, with a frame, a cylinder, two hollow trunnions that are in connection with live-steam and exhaust passages formed in the cylinder, and a piston and rod, of two valve-chests affixed to the cylinder at opposite points and connected to the steam-exhaust passages of the cylinder, two piston-valves, and a means to move the valves in opposite directions when the cylinder is oscillated, substantially as set forth.

7. In an oscillating steam-engine, the combination, with a frame, a cylinder supported in boxes on the frame to oscillate thereon, a piston, two cylindrical valve-chests attached to the cylinder at opposite points, and passages formed in the cylinder and steam-chests, of two balanced piston-valves having cylindrical heads on their ends, a yoke formed in each valve-body, a sliding box for each yoke, a crank-shaft to engage each sliding box, a toothed pinion affixed to each crank-shaft, and an adjustable gear-wheel that moves the pinions when the cylinder oscillates to reverse the motion of the engine, substantially as set forth.

8. The combination, with two valve-chests attached to an oscillating cylinder, and a valve located in each chest, of pinions connected to the valves to actuate them, and a larger adjustably-secured gear-wheel supported concentric with the engine-trunnions and meshing with two pinions to move the valves when the cylinder is rocked, substantially as set forth.

9. The combination, with a cylinder supported upon trunnions, valve-chests attached to the cylinder, and valves located in these chests, of a pinion connected to each valve to communicate motion to it, and an engine-frame, a gear-wheel supported in this frame concentric with the engine-trunnions and meshing with the valve-pinions to rotate them and move the attached valves when the cylinder is rocked on its trunnions, substantially as set forth.

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

WILLIAM B. COULTER.

Witnesses:

SAMUEL P. NEWELL,

JOHN J. JENNINGS.