No. 647,355. Patented Apr. 10, 1900.

J. H. ANSELL.

VALVE GEAR FOR ENGINES.

(Application filed Dec. 1, 1899.)

(No Model.) 2 Sheets—Sheet 1.

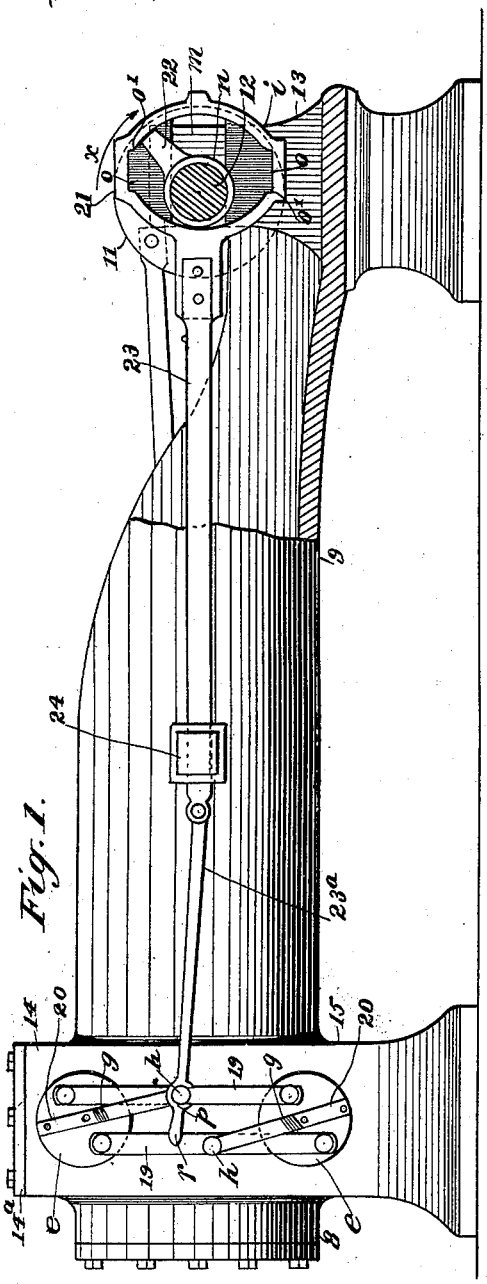

Fig. 1.

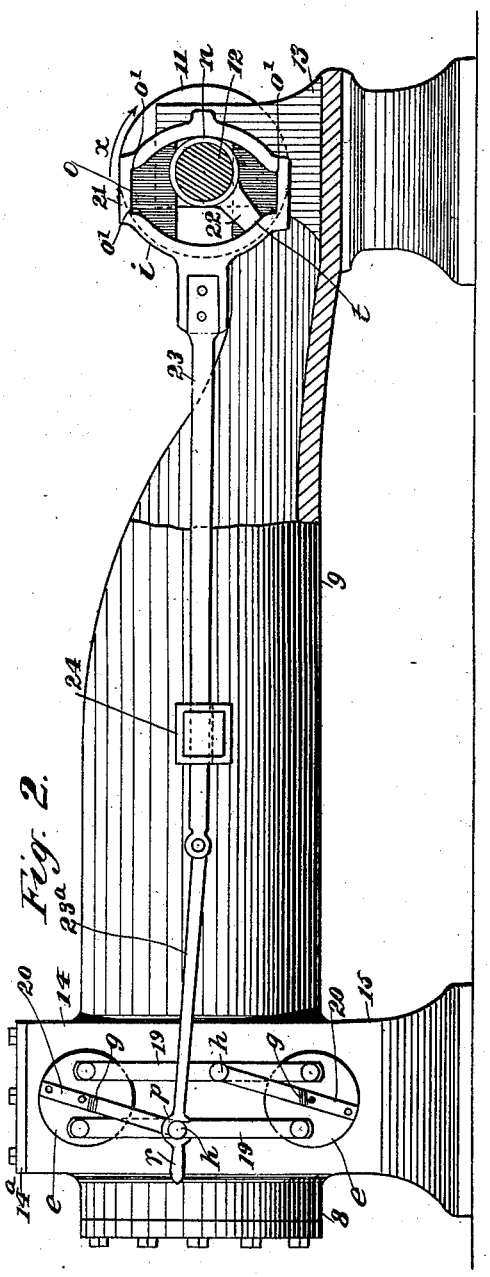

Fig. 2.

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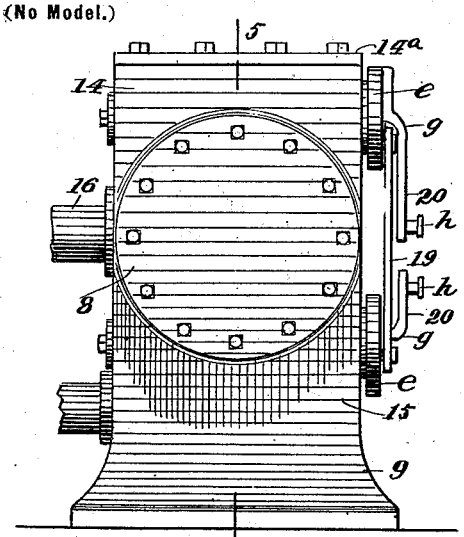

Fig. 3.

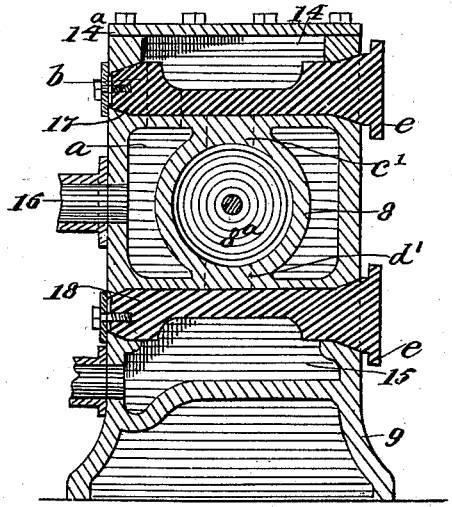

Fig. 4.

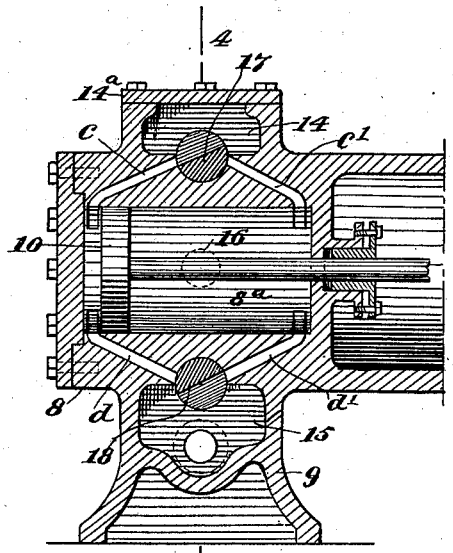

Fig. 5.

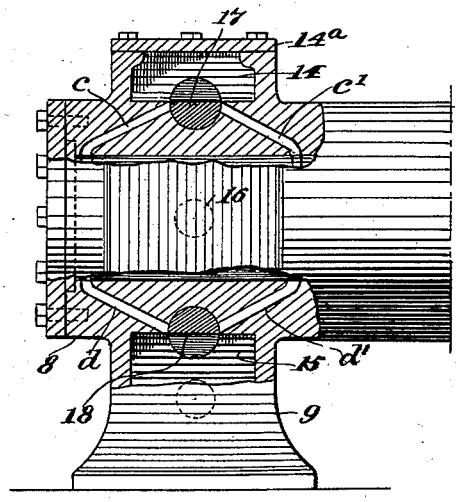

Fig. 6.

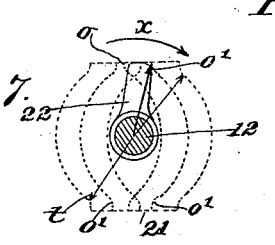

Fig. 7.

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VALVE-GEAR FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 647,355, dated April 10, 1900.

Application filed December 1, 1899. Serial No. 738,793. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH HAMILTON ANSELL, a citizen of the United States, and a resident of Fort Washakie, in the county of Fremont and State of Wyoming, have invented certain new and useful Improvements in Valve-Gear for Engines, of which the following is a full, clear, and exact description.

This invention relates to valve-gearing for the actuation of multiple rockable valves, and has for its object to provide a simple practical valve-gear of the character indicated which is of novel construction and adapted to operate effectively for movement of the valves in either direction of rocking movement, and thus cause the engine to run either forward or backward, as may be desired.

The invention consists in the novel construction and combination of parts, as is hereinafter described, and defined in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation showing the valve-gear adjusted to open the live-steam valve when the piston is at the forward end of its travel. Fig. 2 is a side view representing the relative adjustment of parts when the piston is at the opposite end of its stroke. Fig. 3 is a front end elevation of an engine having the improvements thereon. Fig. 4 is a transverse sectional view substantially on the line 4 4 in Fig. 5. Fig. 5 is a longitudinal sectional view taken through the center of the cylinder of the engine, showing the valves and steam-ducts and the piston at the forward end of its stroke, the section being taken on the line 5 5 in Fig. 3. Fig. 6 is a partly-sectional side view of the engine-cylinder, showing the valves in cross-section and adjusted to close the steam-ducts of the engine; and Fig. 7 is a diagrammatic illustration of the action of the novel cam mechanism which actuates the valve-gear.

In the drawings that represent the invention and its application, 8 indicates the cylinder, and 9 the frame, of a modern steam-engine of the horizontal type. In the bore 8^a of the cylinder 8 a piston 10 is held to slide and is reciprocated in the usual manner by a crank-disk 11, secured on the transverse shaft 12, held to rotate in boxes mounted on pedestals 13, positioned at the rear end of the frame 9, as indicated in Figs. 1 and 2. The cylinder side wall wherein the bore 8^a is formed is preferably of considerable thickness in its upper and lower side, and above and below said thickened wall the chests 14 15 are respectively positioned. The upper chest 14 is for the reception of live steam from a steam-generator through a conduit 16, which may be secured to the bonnet 14^a of the chest 14 or be connected with the side of the cylinder 8 and intersect a steam-cavity *a* therein, from which a passage *b* extends to the live-steam chest 14, as indicated by dotted lines in Fig. 4.

Two similar cylindrical valves 17 18 are provided, which are located transversely of the cylinder 8 in suitable bores formed in the thickened portions of the cylinder side wall, said bores cutting through the bottoms of the chests 14 15, so that the valves will be partly within said chests, as clearly shown in Figs. 4, 5, and 6, and the bodies of the valves are laterally reduced at opposite sides, as represented in said figures. The bores for the valves 17 18 are at or near the longitudinal center of the cylinder 8, and two live-steam ducts *c c'* extend, respectively, from the front and rear ends of the cylinder-bore inside the end-closing bonnets thereon to intersect the bore for the live-steam valve 17, where it cuts through the bottom of the chest and at each side edge of said bore, as clearly shown in Figs. 5 and 6. Two exhaust-steam ducts *d d'*, in like manner to the ducts *c c'*, extend from each side edge of the bore holding the exhaust-valve 18 diagonally toward the end of the cylinder-bore 8^a and intersect said bore near the end walls of the cylinder. The lateral reduction of the valves 17 18 may remove about one-half of the material in each valve for a portion of its length, thus leaving the reduced portion thereof in the form of a half-cylinder in cross-section, which will adapt the flat side of each valve to be about level with the bottom of the chest in which it is located, while the cylindric side of the valve closes

one or both ducts, depending upon the rocked adjustment of the valve, as will be further explained.

The rockable valves 17 18 are held to receive rocking movement by the means shown in Fig. 4 or any other means that may be preferred, and at a corresponding end of each valve which projects outside the side wall of the cylinder a circular-edged enlargement or head-wall *e* is formed or affixed thereon, as represented clearly in Figs. 3 and 4. The head-wall *e* on each valve 17 18 has clearance from the side of the engine-cylinder 8, and upon these ends of the valves the operating-gear therefor is mounted, which will now be described.

Two parallel bars 19 are pivoted at their ends upon the outer sides of the head-walls *e* at opposite sides of the axis of each valve, as shown in Figs. 1 and 2. Between the parallel bars 19 a radius-bar 20 is secured upon each head-wall *e*, the attached portion of each radius-bar extending from a point near the center of a respective head-wall, and thence projecting beyond the periphery of the head-wall over one of the parallel bars 19, each radius-bar having its free portion offset, as at *g*, to permit the parts of the radius-bars to pass over an appropriate parallel bar. On the free end of each radius-bar 20 a pin *h* is affixed and outwardly projected, one pin being lower than the other one.

It will be seen that the diagonal trend of the radius-bars 20 is the same and that they preserve parallelism at any point of rocking adjustment given either valve 17 18. Furthermore, the pivotal connection of the parallel bars 19 with the head-walls *e* serves to transmit rocking motion to the bodies of the valves if either radius-bar 20 is rocked. As the flat surfaces of the valves 17 18 face in opposite directions, that on the live-steam chest 14 facing upwardly and the flat surface on the valve 17 facing downwardly, it will be apparent that a rocking action of the live-steam valve 17, which will open the duct *c*, extending toward the forward end of the cylinder 8, will cause the exhaust-steam valve 18 to open the exhaust-steam duct *d'*, trending from the lower chest to the rear end of the cylinder-bore, as represented in Fig. 5, a reverse movement of said live-steam valve, which opens the port or duct *c'*, leading to the rear end of the cylinder, serving to rock the exhaust-steam valve to open the exhaust-steam duct *d*, leading to the forward end of the cylinder.

A preferred means for actuating the valve-gear from the crank-shaft 12 consists of the peculiarly-shaped cam-block 21 and arm 22, that has slidable engagement therewith. As shown in Figs. 1 and 2, the cam-block 21 comprises an essentially-ovate plate, whereon a peripheral flange *i* is laterally formed or secured. A transverse slot *m* is horizontally formed in the plate-like body of the cam-block at its center of length of a width to permit the location of the cam-block on the crank-shaft 12 by passing it through the slot. The arm 22 is projected from an integral collar *n*, that is mounted upon the shaft 12, and secured thereto at a proper point, so that the arm will lie in the recess at one side of the cam-block afforded by the peripheral flange *i*. At the upper and lower ends of the ovate cam-block 21 an indentation *o* is formed in the peripheral flange *i* and is defined by flat places on the flange which produce offset shoulders or corners *o'*, between which shoulders the flange *i* is concaved at the inner face. The distance from the center of the shaft 12 to the free outer end or toe of the cam 22 defines the throw or travel of the cam-block 21 in either direction to the front or to the rear, which throw is sufficient to properly move the valves 17 18. Upon the forward edge of the cam-block 21 a rod 23 is secured at its rear end and thence extends forwardly, passing loosely through a guide-box 24, which projects from the side of the engine frame or trunk. The forward portion of the rod 23, near the guide-box 24, is jointed, so as to permit flexure of the front section 23^a thereof, and a hook *p*, formed on the free front extremity of the valve-rod 23, is adapted for convenient manipulation by the handle *r* thereon to hook it upon either pin *h*. The length of the valve-rod 23 23^a is so proportioned that if the hook *p* thereon is hooked upon the upper pin *h*, and the cam-arm 22 is located in the upper recess or indentation *o*, the steam-valves 17 18 will be rocked to cause the steam-ducts *c c' d d'* to be closed, as represented in Fig. 6. If the crank-shaft 12 is to rotate in the direction of the arrow *x*, (shown in Figs. 1, 2, and 7,) the toe of the cam-arm 22 will impinge the offset shoulder *o'* when the shaft is initially moved, which will draw the valve-rod 23 rearwardly and dispose the live-steam valve 17 as shown in Fig. 5, thereby opening the forward steam-duct *c* for transmission of steam therethrough into the cylinder 8 in advance of the piston 10. When the piston is near the rear end of its stroke, the cam-arm 22 will have moved into the position shown in Figs. 2 and 7 at *t*, thus pressing the cam-block 21 forwardly and correspondingly actuating the valves 17 18 for influx and exhaust of steam to effect a return of the piston forwardly.

In case it is desired to reverse the rotatable movement of the shaft 12 this may be effected by changing the hook *p* from the upper pin *h* to the lower one, which will give the valves a reversed rocking movement, and thus adapt the engine to run in an opposite direction from that hereinbefore described.

It is claimed for this valve-gear that it is very simple, efficient in operation, durable, inexpensive to construct, and that the cam device is quick and reliable in service.

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

1. The combination with a cylinder having

a live-steam chest above the longitudinal bore thereof, and an exhaust-steam chest below said bore, of a cylindric rockable valve in each steam-chest, seated in transverse bores of the cylinder that cut through walls of said cylinder in the steam-chest, the valves having each a flat side reducing their thickness opposite the openings of their seats in the cylinder, two diagonal steam-ducts intersecting each valve-seat, and extending therefrom to intersect the longitudinal bore of the cylinder near its ends, and means to rock said valves.

2. In a steam-engine, the combination with a supported cylinder having the wall thereof thickened above and below the bore, a steam-chest on the upper side and on the lower side of the cylinder, said cylinder being transversely bored in the thick portions of its wall to afford seats for valves, a rocker-valve for each chest, substantially cylindric at the ends and flattened between the ends, means to hold the valves in place, steam-ducts formed in the thickened portions of the cylinder side wall, two for each steam-chest, and trending from the bore of the cylinder near each end to intersect the seat of the rocker-valve in said steam-chest, of two parallel bars pivoted on the outer ends of the valves, a radius-bar secured at one end on each valve intermediately of the parallel bars, a pin on each radius-bar near its free end, a cam-block on the transverse crank-shaft of the engine, a cam-arm on said shaft, and a rod extending from the cam-block to hook upon a pin on one of the radius-bars.

3. In an engine valve-gear for rocker-valves located in steam-chests respectively above and below the cylinder-bore, parallel bars pivoted at their ends upon the outer ends of the rocker-valves, a radius-bar extended diagonally from each valve-head and offset to move over the parallel bars, a pin on the free end of each radius-bar, and a cam-actuated valve-rod which is adapted to engage its hooked end with the pin on either radius-bar.

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Witnesses:
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E. A. CARTER.