A. C. SMITH & W. E. RICKEY.

VALVE GEAR.

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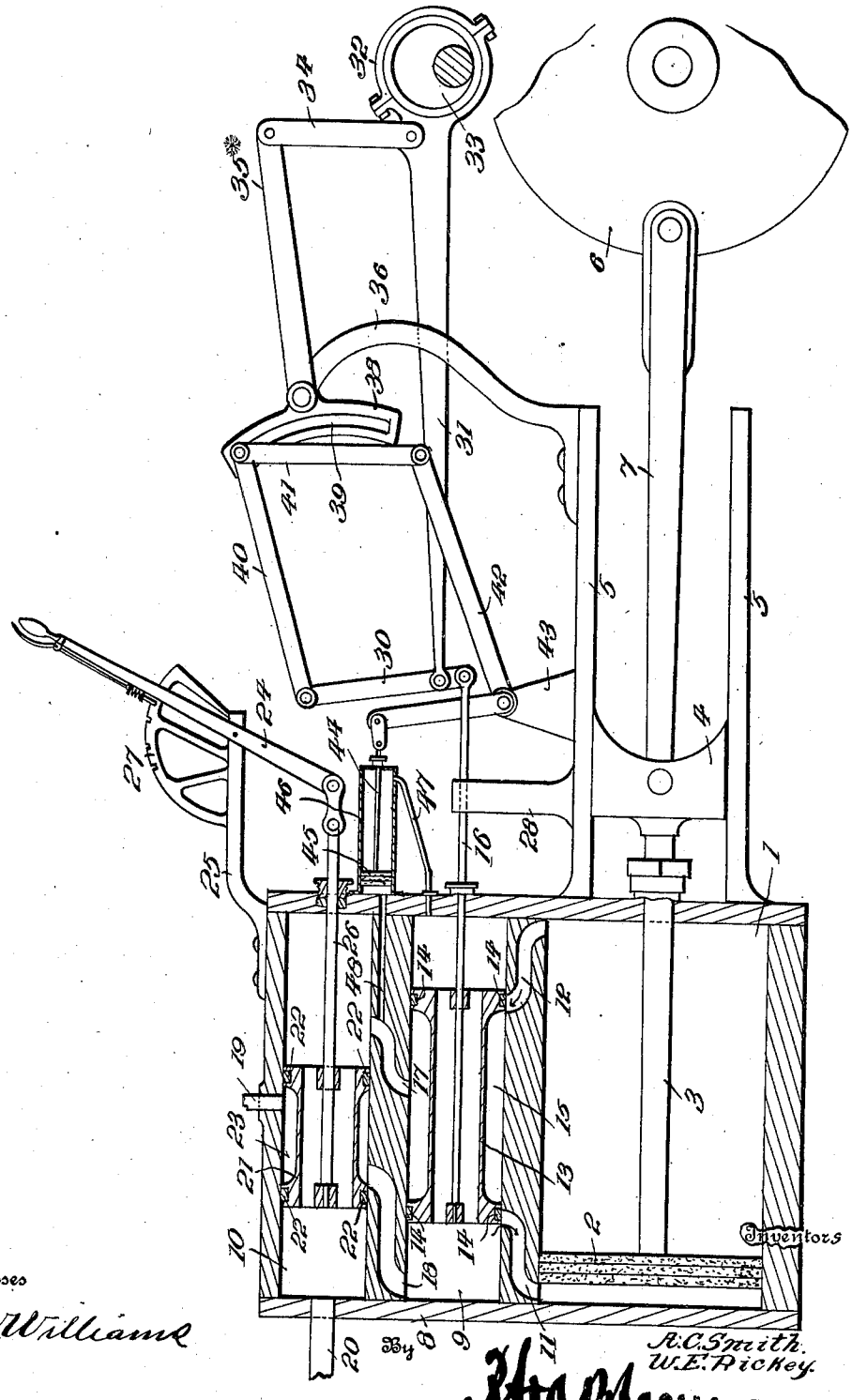
1,001,899.

Patented Aug. 29, 1911.



Witnesses

W. A. Williams

W. N. Goodman

Inventors

A. C. Smith.

W. E. Rickey.

By Atta. Macey. Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ALEXANDER C. SMITH AND WILLIAM E. RICKEY, OF ROCKY, OKLAHOMA.

VALVE-GEAR.

1,001,899. Specification of Letters Patent. **Patented Aug. 29, 1911.**

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To all whom it may concern:

Be it known that we, ALEXANDER C. SMITH and WILLIAM E. RICKEY, citizens of the United States, both residing at Rocky, in the county of Washita and State of Oklahoma, have invented certain new and useful Improvements in Valve-Gears, of which the following is a specification.

This invention comprehends certain new and useful improvements in steam engines, and the invention has for its object an improved valve gear which is designed for use in connection with the reversing mechanism of steam engines and is particularly adapted for application to the improved valve mechanism for which Letters Patent No. 896,324 were granted to us on August 18, 1908. And a further object of the invention is an improved valve gear that embodies a peculiar construction through the instrumentality of which the slide valve of the steam engine is positively shifted to maintain the proper lead by and upon the movement of the reversing valve to reverse the engine, the valve gear being comparatively simple in construction and entirely automatic in action, and possessing certain other advantages that will at once recommend its general adoption.

With these and other objects in view that will more fully appear as the description proceeds, the invention consists in certain constructions and arrangements of the parts that we shall hereinafter fully describe and then point out the novel features of in the appended claim.

For a full understanding of the invention and the merits thereof, and to acquire a knowledge of the details of construction, reference is to be had to the following description and accompanying drawing, in which the view is a longitudinal section with the parts in side elevation.

Referring to the drawing, the numeral 1 designates the cylinder of a steam engine, and 2 a piston of any approved construction which is mounted to reciprocate within the cylinder, and the piston rod 3 of which passes outwardly through one end of the cylinder and carries a cross-head 4 that works in longitudinal guideways 5, the cross-head being operatively connected to a crank disk 6 through the instrumentality of a pitman 7. A steam chest 8 is located upon one side of the cylinder 1 and subdivided into a pair of chambers, one of which constitutes a valve chamber 9, while the other serves as a reversing chamber 10. The opposite ends of the cylinder 1 are afforded communication with the valve chamber 9 by two ports 11 and 12, the said ports entering the valve chamber at points equally spaced from the opposite ends thereof. Mounted within this valve chamber 9 is a tubular slide valve 13 that is provided near its opposite ends with annular collars or flanges 14 preferably formed to receive packing rings which produce a steam-tight joint with the walls of the chamber, it being observed that the body portion of the valve is somewhat smaller in cross section than the valve chamber 9 and that an annular space 15 is thus provided upon the exterior of the valve and between the collars 14, which is shut off from the remaining portion of the chamber. The stem 16 of the slide valve is secured therein by one or more spiders or the like, and passes through a packing box at one end of the chamber and is adapted to be actuated in a manner hereinafter described, so as to reciprocate the slide valve within the chamber and throw the ports 11 and 12 alternately into communication with the annular space 15 surrounding the valve.

Leading from the reversing chamber 10 to the valve chamber 9, are two ports 17 and 18, the former being designed to always communicate with the annular space 15 upon the exterior of the slide valve 13, while the latter communicates with one end of the valve chamber 9. A steam supply pipe 19 enters the reversing chamber 10 at one side thereof, while an exhaust port 20 is located at one end of the chamber, as shown. Slidably mounted within the reversing chamber 10 is a tubular reversing valve 21 that is somewhat smaller in cross section than the chamber and is provided at its opposite ends with annular collars or flanges 22, the latter having packing rings for effecting a steam-tight joint with the walls of the chamber and producing an annular space 23 similar to the before mentioned space 15 on the exterior of the slide valve 13. This annular space 23 is always in communication with the steam inlet 19, while the remaining portion of the reversing chamber 10 is in continuous communication with the outlet or exhaust port 20. The collars 22 are

adapted to close either of the ports 17 and 18, and the reversing valve 21 is of such a length that when one of the ports is thus closed, the opposite port is in direct communication with the exhaust, and the other packing ring is located between the two ports. In the present instance, the movement of the reversing valve 21 within the chamber 10 is arranged to be manually effected through the instrumentality of the lever 24 that is fulcrumed intermediate of its ends on a suitable bracket 25. One arm of this lever is operatively connected to a rod 26 which is secured within the tubular reversing valve in any approved manner and passes outwardly through a packing box in the adjacent end of the chamber, the opposite arm of the lever carrying a latch that engages with a segmental rack 27.

The foregoing description relates to the improved steam engine valve mechanism to which the present invention is designed to be applied and for which Letters Patent No. 896,324, were granted to us on August 18, 1908.

The stem 16 which is operated by this improved valve gear, is arranged to slide longitudinally in a bearing 28 and is pivotally secured at its extremity to one arm of a lever 30 fulcrumed at an intermediate point upon the adjacent end of an eccentric rod 31. The other end of this eccentric rod carries a strap 32 that encircles a suitable eccentric 33 which is rotated in any approved manner and preferably turns in the same direction as the crank disk 6 and is set at an angle of 90° with respect thereto. A link 34 is pivotally connected at one end to the eccentric rod 31, preferably in proximity to the strap 32, and has its other end operatively connected to the longitudinal arm 35 of a substantially T-shaped lever that is fulcrumed at the juncture of its arms on a standard 36, the latter being carried by one of the guides 5. This T-shaped lever is designed to serve as a rocker, and for this purpose has its cross arm 38 slotted, as indicated at 39, a link 40 being slidably connected at one end to the slotted member in any approved manner, as by means of the usual block or the like, and being pivotally connected at its opposite end to the other arm of the lever 30.

In order to shift the link 40 in the slot 39, we employ a controlling device which consists essentially of a connecting link 41 that is pivoted at one end to the link 40 and at its other end to one arm of a bell crank lever 42. The bell crank lever is fulcrumed on a support 43 carried by one of the guides 5, and the other arm of said lever is operatively connected to the outer end of the rod 44 of a piston 45 which works longitudinally in an auxiliary steam cylinder 46. This cylinder is supplied with steam in any approved manner, and in the present instance, a lead 47 establishes continuous communication between the outer or right end of the auxiliary cylinder and the adjacent end of the valve chamber 9, while the lead 48 affords the inner end of such cylinder continuous communication with the port 17.

In the practical operation of an engine embodying the improvements of our invention, it will be apparent that when the parts are in the positions illustrated in the drawing, the live steam from the boiler will enter the chamber from the inlet 19 and will pass through the annular space 23 and through the port 18 into the valve chamber 9, and thence through the port 11 into the cylinder 1, the piston 2 being on its movement from left to right. The steam on the right side of the piston 2 will be forced through the port 12 and will pass around the annular space 15 and through the port 17 into the reversing chamber 10, such steam then passing through the hollow reversing valve 21 and escaping through the exhaust 20. Inasmuch as in this position of the reversing valve 21, live steam is admitted to the valve chamber 9, while the steam exhausting from the cylinder 1 is carried off through the annular space 15 and the port 17, as before described, it will be observed that live steam will pass from the valve chamber, through the lead 47 to the outer or right-hand end of the auxiliary cylinder 46, while a portion of the exhaust steam will be conducted by the lead 48 from the port 17 to the inner end of the cylinder 46, the difference in pressure between the live and exhaust steam serving to hold the piston 45 at the left end of the auxiliary cylinder, as shown in the drawing. When the piston 45 assumes such position, the bell crank lever 46 is rocked about its fulcrum so as to operate the link 40 through the instrumentality of the connecting link 41 and hold the former at the upper extremity of the slot 39. As the eccentric rod 31 is moved back and forth by the eccentric 33 during the continued operation of the engine, the T-shaped lever or rocker 37 is oscillated through the instrumentality of the link 34, such oscillatory movement of the rocker being transmitted by the link 40 to the lever 30 so as to rock the former about its movable fulcrum on the eccentric rod 31 and thus impart a reciprocatory movement to the slide valve 13 the various levers and links being so arranged and proportioned as to cause the valve to open and close quickly and to remain open for a maximum period during the movement of the piston in one direction. It will be apparent that by this movement of the slide valve the annular space 15 is brought alternately into communication with the ports 11 and 12 so that live steam is admitted to the cylinder 1 first on one side of the piston

2 and then on the other, to operate the engine and rotate the disk 6 continuously in one direction.

Should occasion demand that the engine be reversed, when the parts are in the position illustrated in the drawing, the operator manipulates the lever 24 to slide the reversing valve 21 to the right and bring the annular space 23 into communication with the port 17 so that live steam, in this instance, is passed into the latter, while the exhaust steam escapes into the reversing chamber from the port 18.

The live steam entering the port 17 is conducted through the lead 48 to the auxiliary cylinder 46 and having an excess of pressure over the pressure of the exhaust steam conducted from the valve chamber 9 by the lead 47, the piston 45 is therefore moved longitudinally to the right-hand of the auxiliary cylinder 46, and such movement of the piston turns the bell crank lever 42 about its fulcrum to draw downwardly upon the connecting link 41 and slide the link 40 to the lower extremity of the slot 39. The automatic shifting of position of the link 40 causes an independent rocking movement of the lever 30 about its fulcrum on the eccentric rod 31, and hence the slide valve 13 is moved to the left to establish communication between the annular space 15 and the port 11, so that the live steam thus admitted to the cylinder 1 will act upon the piston 2 to put the engine in motion in the reverse direction.

From the foregoing description, in connection with the accompanying drawing, it will be apparent that we have provided an improved valve gear which embodies essentially an auxiliary steam cylinder having continuous communication with the live and exhaust steam in the steam chest, so that the movement of the reversing valve to change the flow of steam through the engine serves to automatically shift the piston in the auxiliary cylinder and effect the requisite movement of the slide valve to cause the latter to maintain the proper lead. It will be manifest that this valve gear may be advantageously employed in connection with the reversing mechanism now in use, and that it is positive in action.

Having thus described the invention, what we claim is:

In a device of the class described, a main cylinder having a piston therein, a steam chest, a controlling valve dividing said steam chest into two chambers and controlling the admission and exhaust of steam to and from the main cylinder, a valve for admitting live steam to one of said chambers and connecting the other of said chambers to the exhaust, means for shifting said valve to reverse the said connections, a valve gear having means for varying the lead of the controlling valve, an auxiliary cylinder having a piston therein, a connection between said piston and the lead varying means, a steam passage from one chamber of the steam chest to one end of the auxiliary cylinder, and another steam passage from the other chamber of the steam chest to the opposite end of the auxiliary cylinder.

In testimony whereof we affix our signatures in presence of two witnesses.

ALEXANDER C. SMITH. [L. S.]
WILLIAM E. RICKEY. [L. S.]

Witnesses:
HARRY DREW,
ROY HART.