No. 648,997. Patented May 8, 1900.

A. E. RHODES.

VALVE GEAR.

(Application filed July 27, 1898.)

(No Model.) 2 Sheets—Sheet 1.

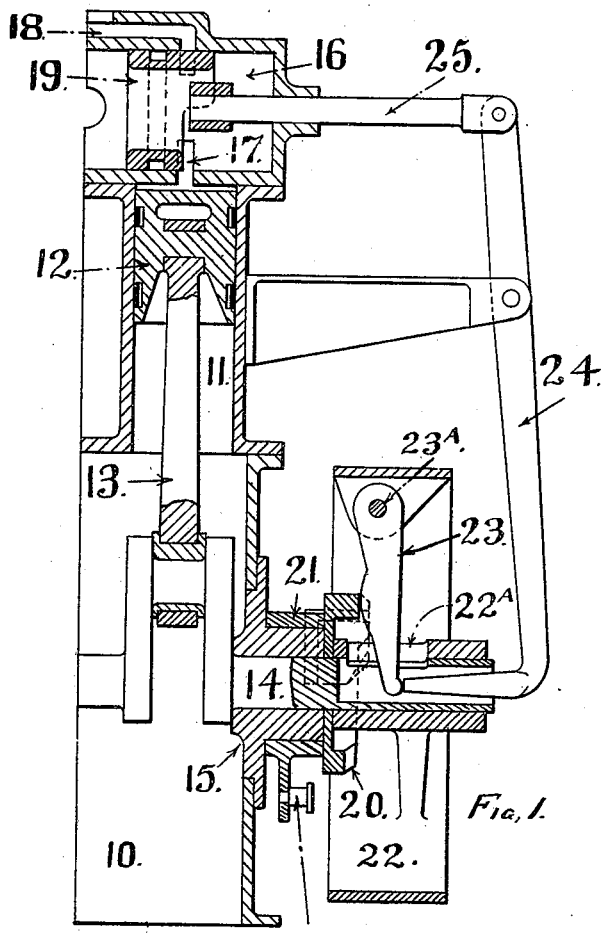

Fig. 1.

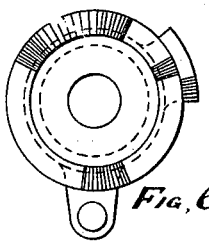

Fig. 6.

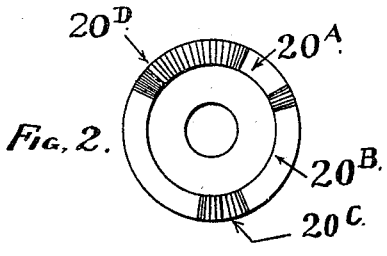

Fig. 2.

Fig. 3.

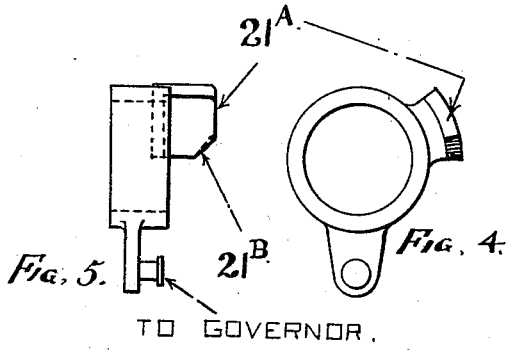

Fig. 5.

Fig. 4.

WITNESSES.

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A. Edward Rhodes.

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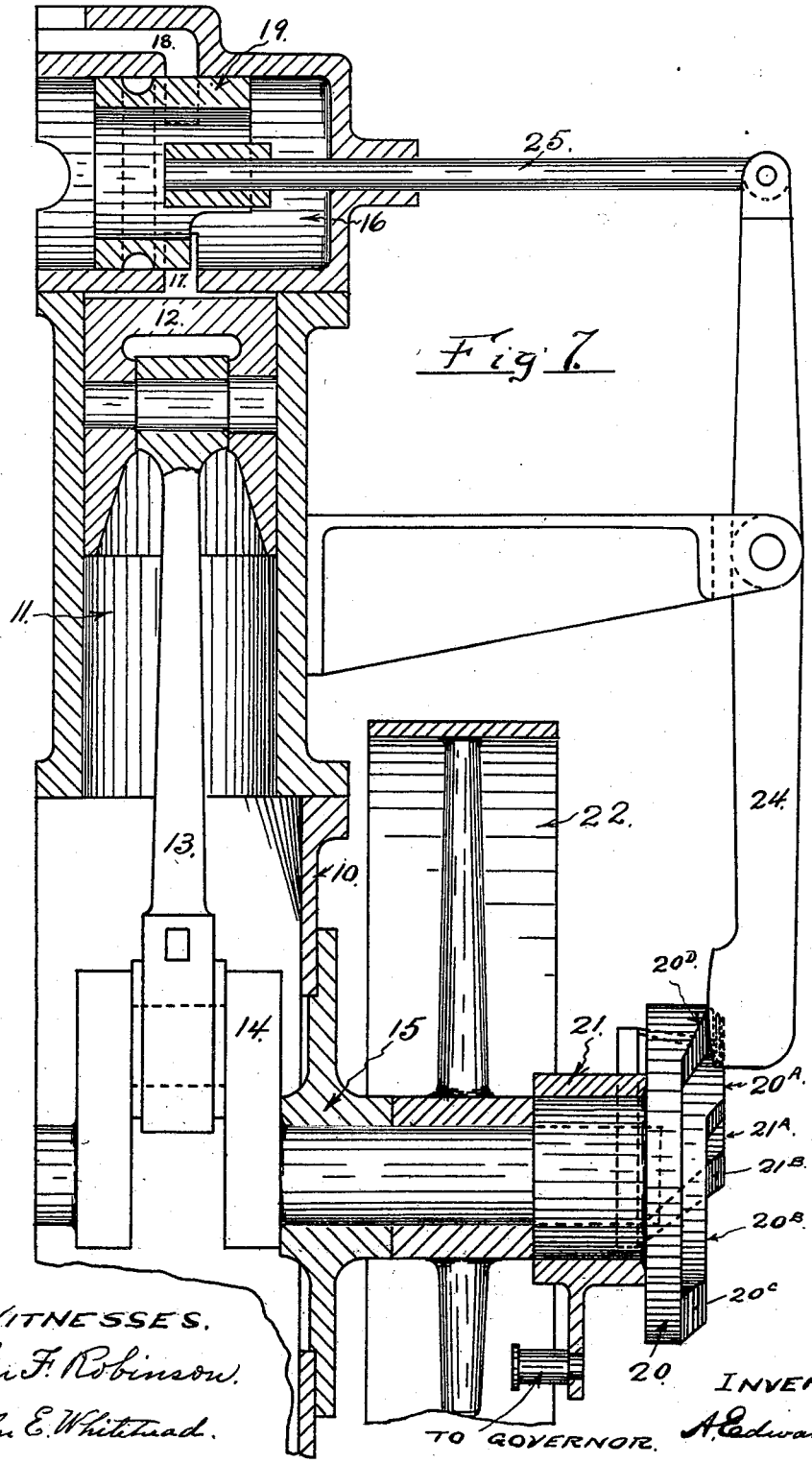

Fig. 1.

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UNITED STATES PATENT OFFICE.

ALONZO EDWARD RHODES, OF WILMINGTON, DELAWARE.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 648,997, dated May 8, 1900.

Application filed July 27, 1898. Serial No. 687,055. (No model.)

To all whom it may concern:

Be it known that I, ALONZO EDWARD RHODES, a citizen of the United States, residing in Wilmington, in the county of New Castle and State of Delaware, have invented a new and useful Valve-Gear, of which the following is a specification.

My invention relates to improvements in that class of valve-gears in which the amount of steam admitted to the cylinder is determined by a governor varying the moment of steam-valve closure by means of a cam; and the objects of my improvement are to provide a high-speed valve-gear that will cost less to manufacture and which will control the passage of steam to and from the cylinder in a better manner than has been done. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of half of a single-acting steam-engine as usually constructed and showing a modified construction of my invention, the several parts of which will hereinafter be more fully described. Figs. 2 and 3 are front and end views of what I call the "stationary cam" and show the raised and depressed portions for imparting motion to the steam-controlling valve and for causing said valve to be stationary at other times, as more fully hereinafter described. Figs. 4 and 5 are front and end views of the governor-controlled cam, showing part for forming a variable continuation of the steam-admission portion of the stationary cam. Fig. 6 is an end view of the stationary and governor-controlled cams as they appear when placed together in their proper position and showing how the steam-admission part of the stationary cam can be prolonged or shortened by the governor actuating the governor-controlled cam.

Similar figures refer to similar parts throughout the several views.

Referring to Fig. 1, 10 is the main frame of the engine.

11 is the cylinder in which the steam-piston 12 slides. Secured to the steam-piston is a connecting-rod 13, which is connected to and rotates a crank-shaft 14 in bearings 15. Secured to the top end of the cylinder is a valve-chamber 16, which is filled with steam and is provided with a steam passage-way 17, communicating with the cylinder 11, and an exhaust passage-way 18, opening to a condenser or the atmosphere. Said passage-ways are adapted to be covered and uncovered by a valve 19. Rigidly secured to the bearing 15 is a stationary cam 20, which is provided with raised and depressed portions, as shown in Figs. 2 and 3. Fitted to and actuated on the bearing 15 by any suitable governor (not shown) is a governor controlled or actuated cam 21, which is provided with raised portions 21^A and 21^B, Figs. 4 and 5, for forming a variable continuation of the raised portion 20^A of the stationary cam 20, and thus determine the moment of cut-off or steam-admission closure. Secured to the crank-shaft is a fly-wheel 22 or any other suitable device for rotating the lever 23, which is fulcrumed at 23^A and is adapted to be pushed out by the stationary cam 20. The free end of lever 23 passes through an opening 22^A in the fly-wheel and crank-shaft and abuts against the end of lever 24 and pushes the same out an amount determined by stationary cam 20. The said lever is connected to the valve by means of the usual valve-stem 25. Steam acting against the valve-stem 25 tends to hold the lever 23 against the faces of cams 20 or 21 at all times. Now suppose the steam-piston is sliding down and rotating the top of fly-wheel 22 away from front of engine, the valve 19 being stationary and steam entering the cylinder through the passage-way 17. Then steam will continue to enter the cylinder until the lever 23 meets the closing portion 21^B of the governor-controlled cam 21, when the steam, acting upon the valve-stem 25, pushes the valve to cut-off or steam-admission closure position 20^B, Figs. 2 and 3. Steam is now working expansively in the cylinder. The valve 19 is stationary and remains so until the lever 23 meets the exhaust-opening part 20^C of the stationary cam 20, when steam, acting on the valve-stem 25, pushes the valve to exhaust-opening. The valve again remains stationary until it is pushed to exhaust-closing and steam-admission position by the lever 23 meeting the exhaust-closing and steam-opening portion 20^D of stationary cam 20, when the cycle

of admission of steam to the cylinder and exhausting the steam from the cylinder after it has done its work is repeated.

I do not wish to confine myself to the construction shown and described, as there are many other modifications which can be made, whereby the same movements can be imparted to the valve by means of cams like mine, one of which is represented by Fig. 7, Sheet 2, in which the cams are rotated, and they impart motion to the steam-controlling valve through the lever 24 directly.

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

1. In a valve-gear, the combination of a main cam formed of alternate straight and inclined parts, a governor-controlled cam formed of one straight and one inclined part and adapted for forming with the main cam a cam-face of substantially the configuration shown and described, and a lever or levers for connecting said cam-face to the steam-controlling valve, substantially as set forth.

2. In a valve-gear, the combination of the cam 20 provided with a straight portion 20^A, a straight portion 20^B, an inclined portion 20^C, a straight portion between and connecting the inclined portions 20^C and 20^D, an inclined portion 20^D between and connecting the last-mentioned straight portion and the straight portion 20^A, and the governor-controlled cam 21 provided with a straight portion 21^A and an inclined portion 21^B, all for forming a cam-face of such configuration as to cause the steam-controlling valve to be stationary during variable parts of the times of admission and expansion and during an unvarying part of the time of exhaust and for causing said valve to move from stationary position to stationary position quite rapidly, substantially as shown and described.

3. In a valve-gear, the combination of the main cam 20 provided with a cam-face formed of, first, an inclined portion for moving the steam-controlling valve for closing to exhaust and opening for admission; second, a straight portion for holding the steam-controlling valve stationary during part of the time of admission; third, another inclined portion connecting the admission and expansion controlling portions; fourth, another straight portion for holding the steam-controlling valve stationary during practically all of the time of expansion; fifth, another inclined portion for permitting the steam-controlling valve to be moved to exhaust position, and, sixth, another straight portion for holding the steam-controlling valve stationary during practically all of the time of exhaust, and the governor-controlled cam 21 provided with a cam-face formed of one straight portion for holding the steam-controlling valve stationary during part of the time of admission and one inclined portion for permitting the steam-controlling valve to be moved to expansion position, substantially as shown and described.

4. In a valve-gear, the combination of the main cam 20 provided with a cam-face formed of alternate straight and inclined parts, the governor-controlled cam 21 provided with a cam-face formed of a straight part 21^A and an inclined part 21^B, and the lever 23 connected to the steam-controlling valve and adapted for being pushed in one direction by the inclined part 20^D of the cam 20 and in the opposite direction by steam or other elastic pressure, all for causing the steam-controlling valve to be stationary during an unvarying part of the time of exhaust and during variable parts of the times of admission and expansion, substantially as shown and described.

5. In a valve-gear, the combination of a main cam having a cam-face formed of three straight and three inclined portions placed alternately, a governor-controlled cam having a cam-face formed of one straight and one inclined portion, and a lever connected to the steam-controlling valve and held against the cam-face formed by the aforesaid cams by steam or other flexible pressure in such a manner as to cause the steam-controlling valve to be stationary during such times as the said lever is in contact with the straight portions of the aforesaid cams and to impart motion to said steam-controlling valve during such times as the aforesaid lever is in contact with the inclined portions of the aforesaid cams, substantially as shown and described.

6. In a valve-gear, the combination of the main cam 20, the governor-controlled cam 21, and the lever 23 connected to the steam-controlling valve and held against the cam-face formed by said cams by steam or similar elastic pressure, all for causing the steam-controlling valve to, first, be stationary during a variable portion of the piston travel or time of admission, second, move rapidly to close to admission, third, be stationary during practically all of the time of expansion, fourth, move rapidly to open to exhaust, fifth, be stationary during practically all of the time of exhaust, and sixth, move rapidly to close to exhaust and open to admission, substantially as shown and described.

7. The combination, in a valve-gear, of a stationary cam provided with an exhaust-controlling portion and another portion adapted for opening and holding open the valve for steam-admission, a governor-actuated cam for forming a variable continuation of said valve-opening and holding-open portion of said stationary cam, a rotated lever connected to the steam-controlling valve, and steam acting on the valve-stem to hold said rotated lever against the faces of the aforesaid cams, all substantially as set forth.

8. In a valve-gear, the combination of the stationary cam 20, the governor-actuated cam 21 for forming a variable continuation of the

steam-admission-controlling portion of cam 20, the wheel 22, the lever 23 fulcrumed to and rotated by the wheel 22, the opening 22^A in the hub of said wheel and in the crank-shaft 14 to receive the lever 23, the lever 24 and the valve-stem 25 for connecting the lever 23 to the steam-controlling valve, and steam acting on said valve-stem to hold the lever 23 against the faces of the cams 20 and 21, all substantially as set forth.

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Witnesses:
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JOHN S. JONES.