

(No Model.)

2 Sheets—Sheet 1.

B. BERTERMANN.
VALVE GEAR FOR STEAM ENGINES.

No. 472,100.

Patented Apr. 5, 1892.

Fig. 2.

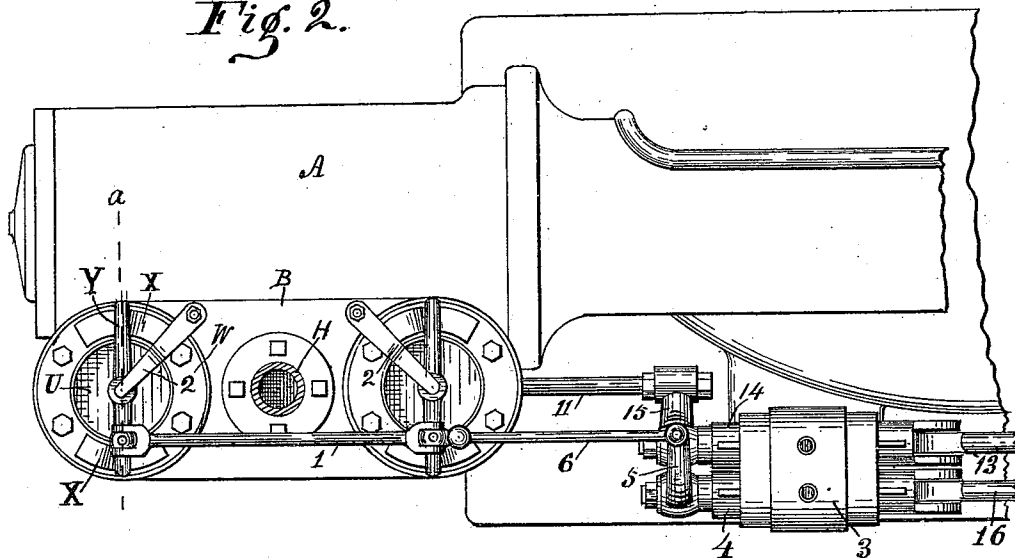
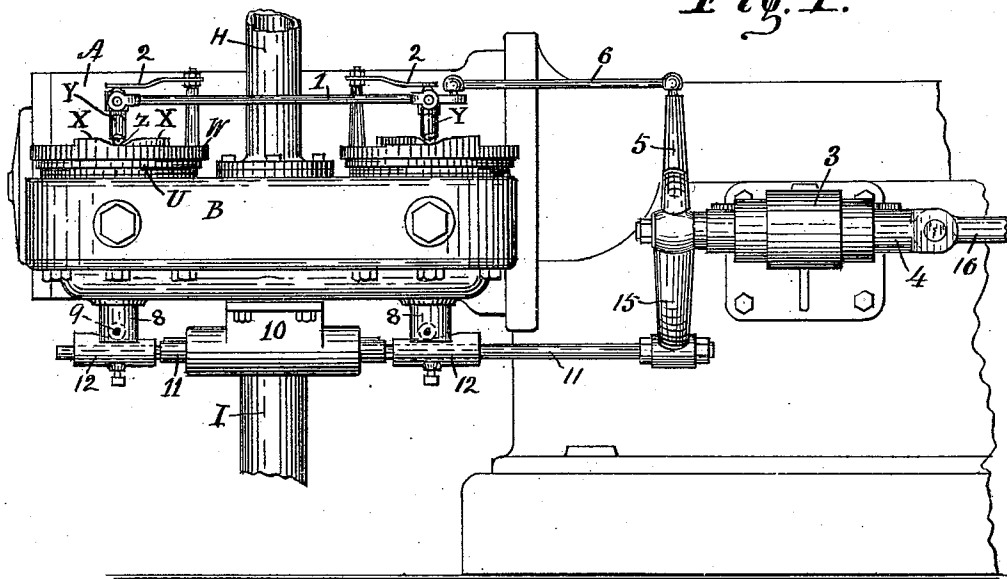


Fig. 1.



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Fig. 4

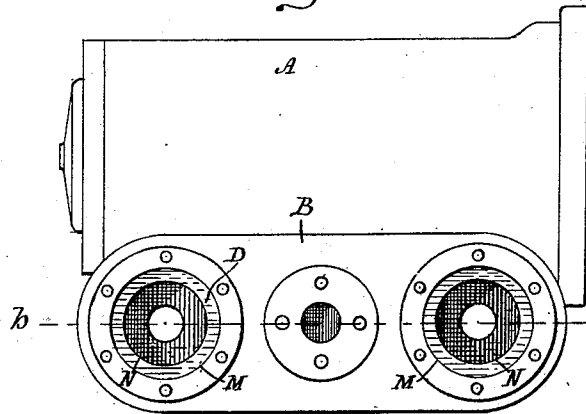


Fig. 6.

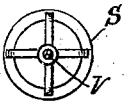


Fig. 3.

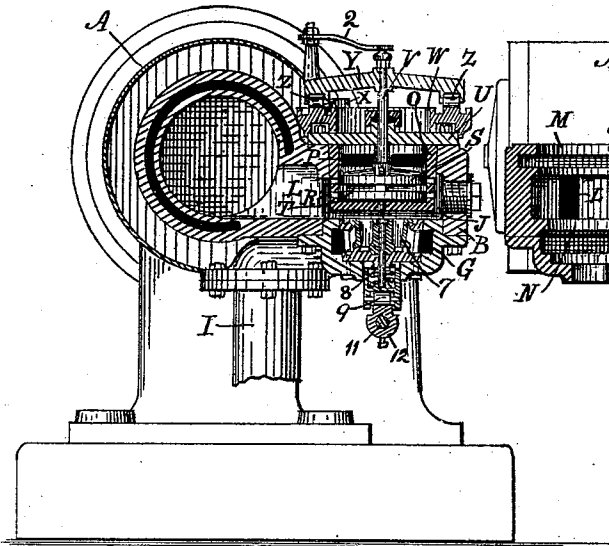
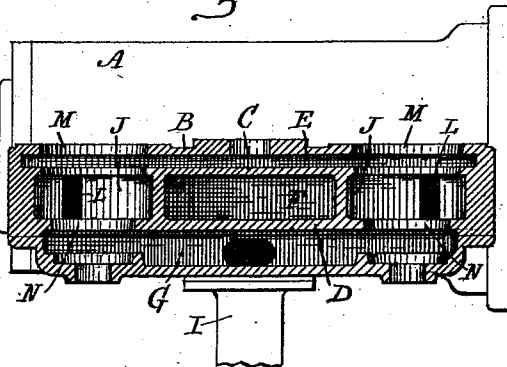


Fig. 5.



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BENEDICT BERTERMANN, OF INDIANAPOLIS, INDIANA.

VALVE-GEAR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 472,100, dated April 5, 1892.

Application filed December 21, 1891. Serial No. 415,719. (No model.)

To all whom it may concern:

Be it known that I, BENEDICT BERTERMANN, a subject of the Emperor of Germany, residing at Indianapolis, in the county of Marion and State of Indiana, United States of America, have invented a new and useful Improvement in Valve-Gear for Steam-Engines, of which the following is a specification.

My invention relates to an improved valve mechanism for that class of steam-engines in which separate valves are used for each end of the cylinder and the induction-valves are controlled by a shifting-eccentric governor.

The objects of my improvement are, first, to provide a valve and valve-seat which may be easily and cheaply fitted to the cylinder; second, to provide means for operating the induction-valves which shall insure the uniform wearing of the valve-surface; third, to provide such a construction of valves and valve-seats and means for operating the valves and connecting them to the governor as shall insure the quick opening and closing of the induction-valves at the proper points, so as to render them sensitive and responsive to the action of the governor; fourth, to so connect the exhaust-valves with the main-shaft eccentric as to insure the uniform opening and closing the exhaust-valves.

The accompanying drawings illustrate my invention.

Figure 1 represents a side elevation of the cylinder and valve-gearing. Fig. 2 is a plan of the same. Fig. 3 represents a section at *a*, Fig. 1. Fig. 4 represents a plan of the cylinder and steam-chest having the valves and valve-seats removed. Fig. 5 is a section at *b*, Fig. 4. Fig. 6 is a plan of one of the induction-valves.

In the drawings, A indicates the cylinder; B, the steam-chest. The steam-chest is divided by horizontal partitions C and D into three compartments E, F, and G. Compartment E communicates with the steam-pipe H. Compartment G forms the exhaust-chamber and communicates with the exhaust-pipe I. At the opposite ends of compartment F are two separate cylindrical chambers J J, which communicate, respectively, through an induction-port, as at L, with the interior of the cylinder at its opposite ends. Circular openings M M extend vertically through the upper wall of

the steam-chest and through the partition C. Similar circular openings N N extend through partition D and form a communication between the chambers J J and the exhaust-chamber G. Fitted into each of the openings M is a hollow cylindrical casing O, having its lower end closed and projecting into the chamber J. The walls of casing O are provided with peripheral openings P, which communicate with compartment E of the steam-chest, and peripheral openings R, which communicate with the chamber J. Fitted within casing O so as to slide vertically therein is the hollow cylindrical balanced valve S, having in its walls a peripheral opening T, which is adapted to register with the uppermost of the openings R in casing O. The lower part of the interior of casing O thus forms a valve-seat into which the valve is fitted. The upper end of casing O is closed by a circular plate U, through which the valve-stem V extends. Mounted upon the upper side of plate U is a circular annular ring W, having on its upper surface at diametrically-opposite points a pair of cams X X. A yoke Y is rigidly secured at the center to the upper end of the valve-stem, having its ends provided with friction-rollers Z Z, which rest upon the cams X. The yokes of the respective valves at the opposite ends of the cylinder are connected so as to move in unison by a connecting-rod 1, and the friction-rollers of the yokes are held in contact with the cams X X by light springs 2 2.

Mounted upon the engine-frame in a bearing 3, so as to slide horizontally therein, is a bar 4, having a vertical arm 5, which is connected by a connecting-rod 6 with one of the yokes Y, the arrangement being such that a reciprocating longitudinal movement of the bar 4 imparts to the yokes Y Y an oscillating rotating movement over the surface of the cams X, thus imparting to the valves S a combined vertical and rotating movement, by means of which the ports R R in casing O are opened and closed, the arrangement of the cams X being such that the respective valves S at opposite ends of the cylinder move vertically in opposite directions. A reciprocating movement is imparted to the bar 4 from the eccentric of a governor of that class commonly designated as "shifting-eccentric" gov-

ernors, mounted on the main shaft of the engine (not shown here) and having its eccentric connected with bar 4 by a connecting-rod 16.

- 5 The cylindrical exhaust-valves 7 are seated in the openings N N, with their stems 8 projecting through the bottom of the steam-chest. Each of said valve-stems is provided at its lower end with a friction-roller 9. A
10 fixed bearing 10 depends from the under side of the steam-chest, and in this bearing there is mounted a bar 11, arranged to slide longitudinally in the bearing without turning therein. Adjustably secured to the bar 11,
15 immediately beneath the exhaust-valve stems, is a pair of cams 12 12, so arranged that when a reciprocating movement is given to bar 11 the cams engage the friction-rollers on the exhaust-valve stems, and the valves are
20 thereby alternately raised and lowered.

- Bar 11 is connected with the usual fixed eccentric on the main shaft of the engine, (not shown,) so as to receive therefrom a regular reciprocating movement at each revolution of
25 the main shaft, by means of the connecting-rod 13 and sliding bar 14, having arm 15, which is coupled to bar 11.

- In operation, at the starting of the engine sliding bar 4 is reciprocated the full length of
30 the stroke of the shifting eccentric of the governor, thus causing yokes Y to traverse the cams X X and alternately opening and closing the steam-balanced induction-valves S to their fullest extent. The cams X each include a higher and lower plane connected by
35 an incline. When the yokes Y rest upon the higher plane, the induction-valves are wide open, and the valves are closed when the yokes rest upon the lower plane. When the
40 engine is running at its normal speed with its medium load, the throw of the shifting eccentric of the governor is at its medium length and the yokes traverse the central part of the inclined plane of the cams, and the opening
45 of the induction-ports is increased or diminished, according to the requirements of the load, by the increased or diminished movement of the yokes upon the cams. The exhaust-valves are regularly opened and closed

at each stroke of the engine by the reciprocating movement of bar 11 bringing cams 12 into engagement with the valve-stems 8.

I claim as my invention—

1. The combination of the engine-cylinder, the steam-chest having at opposite ends a pair
55 of chambers separate from each other but communicating, respectively, with the induction-ports of the steam-cylinder and with the steam-space of the steam-chest, said communication with the steam-chest being through
60 circular openings, the hollow cylindrical casings fitted in said openings and projecting into said chambers, the walls of each of said casings being provided with peripheral openings which communicate with the steam-space
65 of the steam-chest and other peripheral openings which communicate with said chamber, the open cylindrical valve mounted in said casing so as to slide longitudinally therein
70 and arranged to close the openings into said chambers, the pair of annular cam-surfaces arranged concentric with said valves, the yokes attached to the stems of the valves and resting upon said cams, and means for imparting an oscillating movement to said yokes
75 over said cams, all arranged to co-operate substantially as and for the purpose set forth.

2. The combination, with the engine-cylinder, the steam-chest, and the chambers therein, which communicate with the cylinder-
80 ports, of the exhaust-chamber arranged in the lower part of the steam-chest and communicating with said steam-chambers through circular openings, the cylindrical valves seated in said openings and having stems which project through the bottom of the steam-chest,
85 the sliding bar mounted in a bearing beneath the steam-chest so as to slide longitudinally thereof, the cams secured to said bar and arranged to engage said valve-stems, and means
90 for imparting a reciprocating movement to the bar, all arranged to co-operate substantially as and for the purpose set forth.

BENEDICT BERTERMANN.

Witnesses:

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