

(No Model.)

2 Sheets—Sheet 1.

J. C. NICHOLSON.
REVERSIBLE VALVE GEAR.

No. 475,601.

Patented May 24, 1892.

Fig. I.

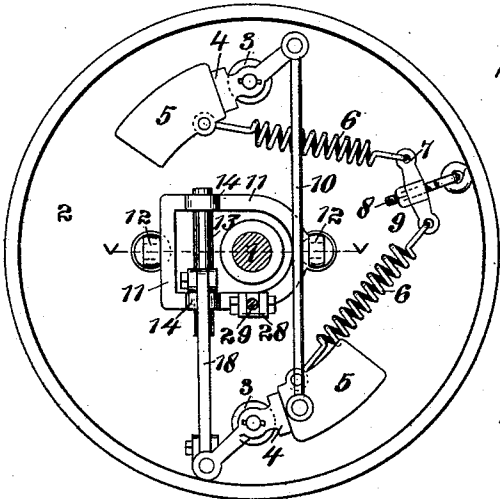


Fig. II.

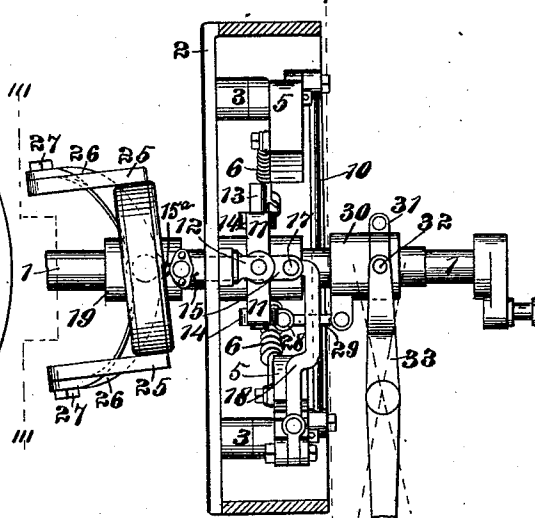


Fig. III.

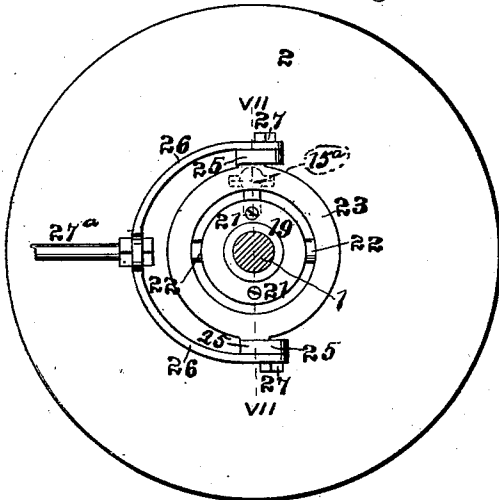


Fig. IV.

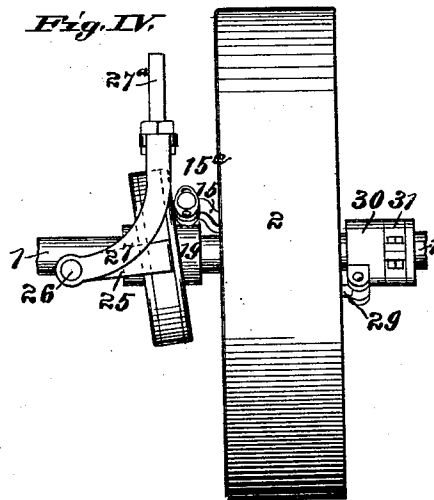


Fig. V.

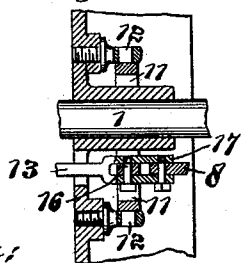


Fig. VI.

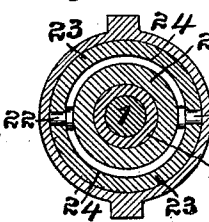
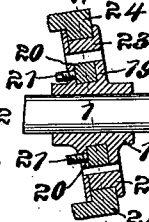


Fig. VII.



Attest;

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(No Model.)

2 Sheets—Sheet 2.

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Fig. VIII.

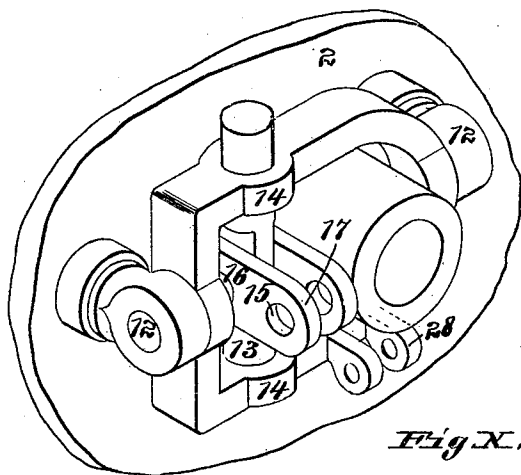


Fig. IX.

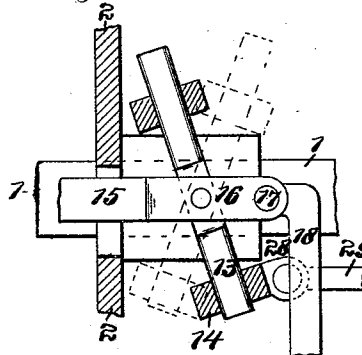


Fig. X.

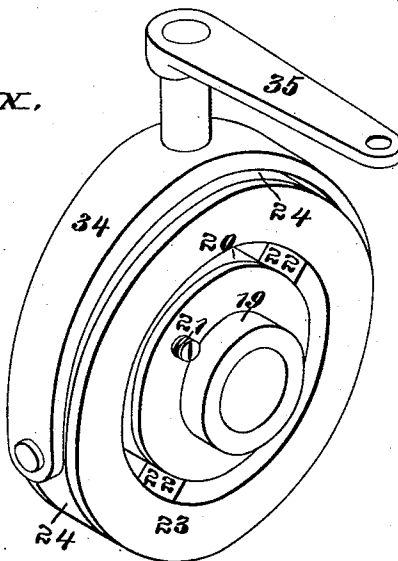


Fig. XI.

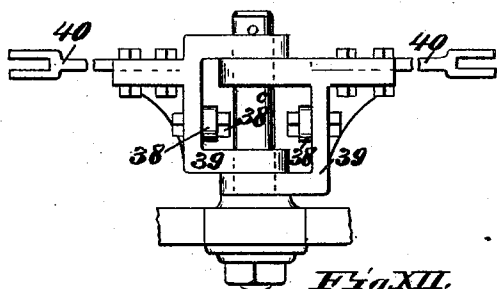
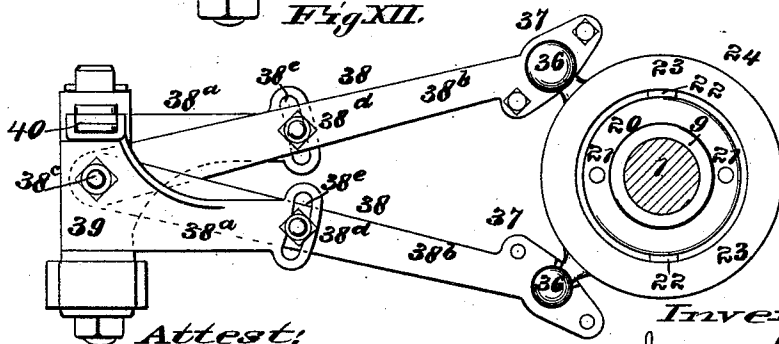


Fig. XII.



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Inventor,

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UNITED STATES PATENT OFFICE.

JAMES C. NICHOLSON, OF LITCHFIELD, ILLINOIS, ASSIGNOR OF ONE-HALF TO
WILLIAM C. BEINDORF AND FREDERICK BEINDORF, OF SAME PLACE.

REVERSIBLE VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 475,601, dated May 24, 1892.

Application filed November 24, 1891. Serial No. 412,911. (No model.)

To all whom it may concern:

Be it known that I, JAMES C. NICHOLSON, of Litchfield, in the county of Montgomery and State of Illinois, have invented a certain new and useful improvement in a Combined Reversible Valve-Gear and Governor, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This is an improvement on the reversible valve-gear for engines for which Letters Patent No. 459,525 were granted to me September 15, 1891.

The principal part of the present invention consists in the addition of a governor, but there are improvements to the reversing-gear proper.

The novel features will be set forth in the claims.

Figure I is a vertical section taken at I I, Fig. II, showing the governor in elevation. Fig. II is an elevation of the device at right angles to Fig. I, with part of the governor-wheel broken away. Fig. III is a vertical section taken at III III, Fig. II. Fig. IV is a top view. Fig. V is a detail horizontal section taken at V V, Fig. I. Fig. VI is a vertical section taken at VI VI, Fig. VII. Fig. VII is a vertical section taken at VII VII, Fig. VI. Fig. VIII is an enlarged detail perspective view of shifting yoke, &c. Fig. IX is an enlarged detail vertical section taken at IX IX, Fig. I. Fig. X is a perspective view of the eccentric-ring, showing a modified view of the valve connection. Fig. XI is an end view of a locomotive-valve connection, and Fig. XII is a side elevation of the same.

1 is the main shaft of the engine.

2 is a governor-wheel fixed to the shaft. 3 are studs upon the wheel, forming the pivots of the weighted governor arms or levers 4. The weighted ends 5 of the levers are drawn toward the shaft by springs 6, connected to a bar 7 upon a bolt 8. (See Fig. I.) The bolt 8 is connected to the rim of the governor-wheel and passes through the bar.

9 is a nut, which screws on the bolt and retains the bar 7. By means of the nut the

tension of the springs may be adjusted as 50 may be desired. The weighted arms or levers 4 are connected together by a rod 10, such connection insuring their equal movement on their pivots 3. It will be seen that the weighted ends 5 will be moved outwardly 55 from the shaft or centrifugally by the rotation of the wheel and will be drawn toward the shaft, or centripetally, by the springs 6.

11 is a frame or yoke pivoted at 12 to the governor-wheel.

13 is a bar sliding endwise in bearings 14 in the sides of the frame.

15 is a combined lever and connecting-rod 60 hinged to the bar 13 at 16 and hinged at 17 to a rod 18, whose other end is connected to the end of one of the weighted levers, so that 65 as the weighted levers turn on their pivots the lever or rod 15 causes the endwise movement of the bar 13 in the frame 11.

Upon the main shaft is a fixed collar or 70 hub 19, having an oblique groove or channel surrounding it, in which is a trunnion-ring 20, that may be adjusted around the hub and which is held in place by set-screws 21.

22 are trunnions extending outwardly from 75 the ring 20 and having bearing in the eccentric 23, which is thus adapted to oscillate on the trunnions. The eccentric has a circumferential groove containing a ring 24. The rod or lever 15 is connected to the side of the 80 eccentric by a ball or other joint 15^a, so that the rod 15 acts by its endwise movement to swing the eccentric on its trunnions.

The eccentric-ring 24 has two arms 25, projecting transversely from it and connected to 85 a yoke 26 by pivots 27, passing through their ends and the ends of the yoke. To this yoke is attached the valve-stem 27^a.

28 is an ear on the side bar of the yoke 11, 90 connected by a rod 29 with a collar 30, having endwise movement on the main shaft, but feather-keyed to the shaft, so as to turn with it. The collar has a circumferential groove, in which is a ring or yoke 31, connected by 95 trunnion-pins 32 with the forked end of a reversing-lever 33.

The position of the parts when the main shaft is at rest is shown in Fig. I, and the po-

sition they may have when at fastest speed is shown in Figs. II, VIII, and IX. In the latter case the steam would be completely cut off by the governor whatever the position of the reversing-lever. It will be seen that the point 16, or pivotal connection between the rod 15 and sliding bar 13, may be moved by the governor-arms from the lower side bar of the frame 11, as seen in Fig. I, to a point intermediate between the said side bars, as seen in Figs. II, VIII, and IX.

When the reversing-lever is in an intermediate position, as seen in Fig. II, no movement of the governor-arms will cause any movement of the eccentric, because the endwise movement of the bar 13 will not impart any endwise movement to the rod 15. When the point 16 is in the position seen in Fig. I, any movement of the reversing-lever will tilt the eccentric and cause the movement of the slide-valve. This movement of the eccentric by the reversing-lever will vary, according to the position of the point 16, as will be evident. Supposing the point 16 to be in the position shown in Fig. I and the reversing-lever should be moved to the fullest extent, then the slide-valve would also be moved to the fullest extent by the eccentric which would be at the utmost obliquity to the main shaft. As soon as the shaft would begin to turn the weighted ends 5 of the governor-arms would begin to move outward, carrying the point 16 toward the middle of the frame 11, and thus lessening the obliquity of the eccentric and shortening the play of the slide-valve. It will be seen that the mean speed is governed by the position of the reversing-lever and is kept uniform by the governor.

The oblique position of the trunnion-ring 21 upon the collar or hub 19 gives means for regulating the play of the slide-valve as to lead, for it will be seen that the trunnions 22 may be adjusted in position by turning the trunnion-ring on the hub.

In the modification shown in Fig. X a yoke 34 is pivoted by its ends to the eccentric ring or yoke 24, and the middle of the yoke carries an arm 35, extending in the same direction as the arms 25. The end of the arm 35 is connected to the valve-rod.

Figs. XI and XII show the device modified to suit a locomotive or two engines working side by side. In this modification two ball-headed studs 36 project radially from the eccentric-ring 24. These balls form one member of ball-and-socket joints, the socket members 37 of which are upon the ends of arms 38 of rocking frames 39. Each rocking frame has an arm 40 extending at about a right angle with the arm 38 and connected at the end with the rod of the slide-valve. The arms 38 are preferably made in two parts—a part 38^a, rigid upon the frame, and a part 38^b, pivoted to the frame at 38^c and connected to the part 38^a by a bolt 38^d, passing through both parts, one of the

parts having a slot 38^e, concentric with the pivot 38^d, in which slot the bolt has a slight movement as the eccentric swings from side to side, for it will be seen that the studs 36 move in the arc of a circle.

Two springs 6 for drawing in the weighted ends of the governor have been described and shown; but as the arms are connected together it is obvious one of these springs may be dispensed with.

I claim as new and of my invention—

1. The combination of the shaft 1, the revolving weighted arms 4 in operative connection with the shaft, springs 6, drawing in the weighted arms, rod 10, connecting the weighted arms, a rod 15, connected with the weighted arm 4, an eccentric adapted to rock on the shaft and connected to the engine-valve and to the rod 15, a rocking frame 11, connected to the reversing-lever, and a bar 13, pivoted to the rod 15 and working endwise in the rocking frame, substantially as set forth.

2. The combination, with a rocking eccentric connected with a revolving weighted arm and a reversing-lever, in manners substantially as set forth, of the hub 19 upon the shaft, having an oblique circumferential groove, a trunnion-ring 20, adjustable in such groove, and an eccentric 23, supported on the trunnions 22 and carrying a loose ring 24, connected with the engine-valve stem, all substantially as and for the purpose set forth.

3. The combination of the shaft 1, the hub 19 with an oblique circumferential groove, the trunnion-ring in said groove, and an eccentric 23, supported on said trunnions and having a loose ring connected to the engine-valve stem, substantially as set forth.

4. The combination, in a reversing and governing device for steam-engines, of a shaft 1, the reversing-lever 33, sliding collar 30, connecting-rod 29, rocking frame 11, bar 13, sliding in the frame, revoluble weighted arms 4, spring 6, rod 18, connected to the weighted arm, to the sliding bar 13, and to an eccentric supported on trunnions 22, and the said eccentric connected to the stem of the engine-valve, substantially as set forth.

5. The combination, with an engine-valve, of an eccentric capable of rocking on the shaft 1 of the engine and having a ring or yoke, carrying arms 25, connected with the valve, a rod connected with revolving governor-arm 4 and with a slide-bar 13, and a rocking frame in which the slide-bar has bearing connected with a reversing-lever 33, all constructed and adapted to operate substantially as set forth.

6. The combination, with a shaft 1 and eccentric 23, supported on trunnions and having loose ring 24, and means for rocking the eccentric on the trunnions, of arms 38, having ball-joint connection to the eccentric-ring 24 and having connection with swinging frames 39, carrying arms 40, connected with the stems of the engine-valve, substantially as set forth.

7. The combination, with a shaft 1 and eccentric 23, supported on said shaft by trunnions 22 and having a loose ring 24, and means for rocking the eccentric on the trunnions, of
5 arms 38, composed of parts 38^a 38^b, jointed together and having connection with the swinging frames 39, carrying arms 40, connected to the stems of the steam-engine valves, substantially as set forth.

JAMES C. NICHOLSON.

In presence of—

SAML. L. CRATTY,
W. W. BEINDORF.