

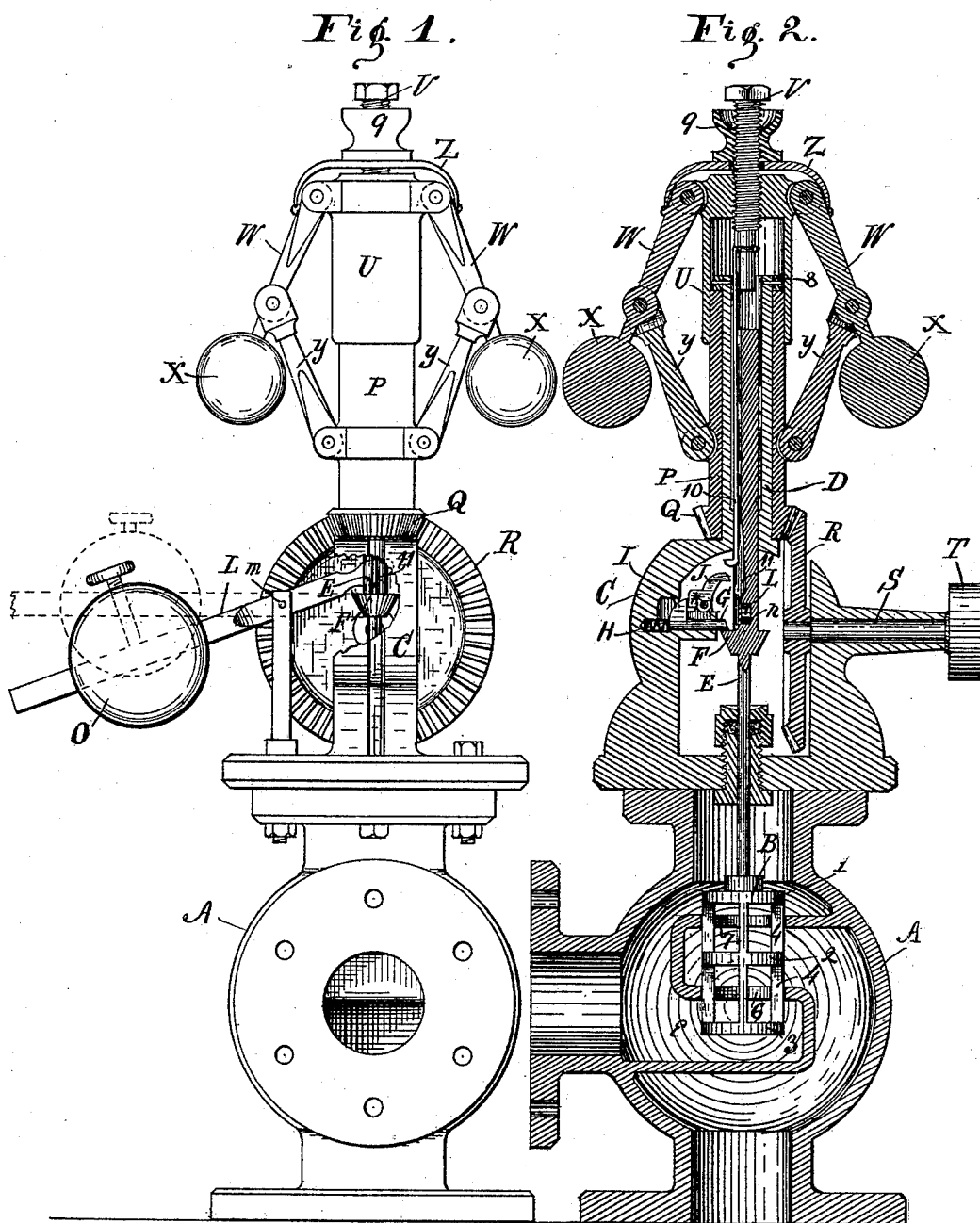
(No Model.)

2 Sheets—Sheet 1.

C. J. RINDERKNECHT.
STEAM ENGINE GOVERNOR.

No. 427,615.

Patented May 13, 1890.



Witnesses
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Inventor
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(No Model.)

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Fig. 3.

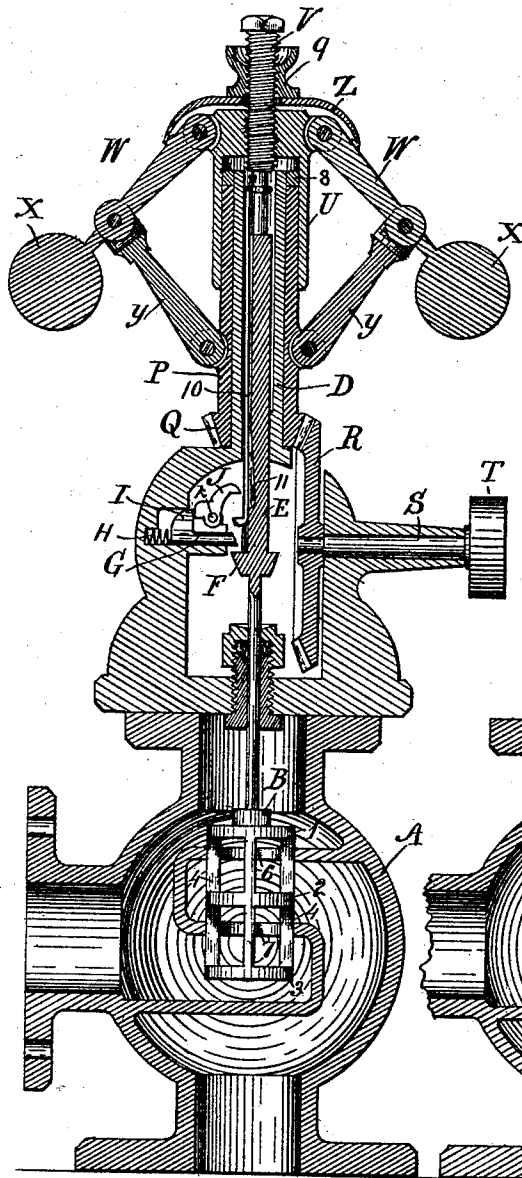
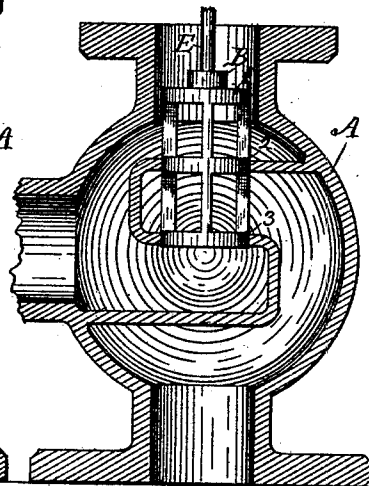


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES J. RINDERKNECHT, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO
THE SINKER-DAVIS COMPANY, OF SAME PLACE.

STEAM-ENGINE GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 427,615, dated May 13, 1890.

Application filed September 2, 1889. Serial No. 322,711. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. RINDERKNECHT, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Improvement in Steam-Engine Governors, of which the following is a specification.

My invention relates to an improvement in that class of steam-engine governors in which the steam-valve is operated by a pair of balls suspended from a vertical shaft, so as to swing outward when the shaft is rotated, and the valve is automatically closed when the rotation of the vertical shaft ceases.

The objects of my improvement are, first, to provide such a connection between the suspended balls and the valve-stem that the balls may attain nearly their average rate of revolution before having any action on the valve, and so that a slight movement of the balls thereafter may produce a comparatively large movement of the valve; second, to provide means for adjusting the point of divergence and consequent speed which the balls may attain before affecting the valve; third, to provide adjustable means for resisting the divergence of the balls during their revolution to the end that the speed required to cause the balls to diverge a given distance may be regulated; fourth, to provide means for holding the valve open irrespective of the balls, and, fifth, to provide means for automatically closing the valve when the revolution of the balls ceases or falls below a given rate, all as hereinafter fully described.

The accompanying drawings illustrate my invention.

Figure 1 represents a side elevation showing the position of the parts when the valve is closed and the governor is at rest. Fig. 2 represents a central vertical section in a plane at right angles to that shown in Fig. 1, and showing the position of the parts when the valve is held open independently of the governor-balls and the balls have just commenced to revolve. Fig. 3 represents a section like that shown in Fig. 2, and showing the position of the parts when the engine has attained its

normal speed and the valve is under control of the revolving governor-balls. Fig. 4 is a section of the valve-chamber and valve, showing the position of the valve when the governor is at rest, as in Fig. 1.

A is the valve-chamber, and B the valve, both of well-known form, 1, 2, and 3 being disks, connected by bars 4 and fitting nicely the valve-seats 6 and 7.

C is the main frame of the governor, which is bolted to the valve-chamber and terminates in a hollow cylindrical shaft D.

E is the valve-stem, which is fitted to slide vertically in the hollow shaft D, and is provided near the middle of its length with an enlarged portion F, which is fitted to engage the under side of a sliding bolt G, mounted in the main frame and held normally outward by a spring H. Bolt G is provided with a lug I, which engages the heel of a trip-lever J, which is pivoted at *k* to the main frame. The valve and its stem are held normally upward by a lever L, pivoted to the main frame at *m* and having one end inserted in a mortise *n* in the valve-stem, and a weight O, mounted adjustably on the other end of the lever.

P is a hollow vertical shaft mounted and adapted to turn on the hollow shaft D of the main frame and having secured to its lower end a bevel-pinion Q, which engages a bevel gear-wheel R, secured to the driving-shaft S, having the belt-pulley T. Shaft P is prevented from sliding longitudinally on shaft D by a fixed collar 8.

U is a sleeve adapted to slide easily on the upper part of shaft P, and having its upper end closed and provided with an adjusting-screw V.

W W are arms pivoted at one end to opposite sides of sleeve V, and each carrying at its other end a ball or weight X. Arms W are connected near their lower ends with the hollow shaft P by links *y y*, which are pivoted at opposite ends, respectively, to the shaft P and the arms W. It will be observed that the distance from the upper ends of the arms W to the point of connection of the links *y* is much greater than the distance from said connection to the ball or weight X. This ar-

rangement is for the purpose of causing a quick and long movement of the sleeve U to follow a slight outward movement of the balls, and adds much to the sensitive properties of the governor.

5 Z is a flat spring having its ends curved downward and resting on the arms W with a greater or less pressure, which is determined by the position of the check-nut 9, the purpose being to provide an adjustable resistance to the outward movement of the balls X. A light rod 10 is attached to the lower end of the adjusting-screw V and extends downward along a groove 11 in the valve-stem. The lower end of said rod is turned outward, so as to engage in its upward movement the hooked end of the trip-lever J.

The operation of my governor is as follows: The governor being at rest, as in Fig. 1, and the valve closed, as in Fig. 4, the weighted end of the lever L is raised to the position shown in dotted lines in Fig. 1, thus bringing the valve-stem and valve into the position shown in Fig. 2 and permitting steam to pass through the valve-chamber and valve-seats 6 and 7 to the full capacity of the engine. The return of the valve and its stem to the position shown in Fig. 1 is now prevented by the engagement of the enlarged portion F' of the valve-stem with the sliding catch-bolt G. It will be observed that in this position of the valve-stem there is a considerable space between the upper end of the valve-stem and the lower end of the adjusting-screw V and that the lower end of rod 10 is above the trip-lever J. The balls X have now no connection with the valve-stem and are free to move outward without other resistance than the inertia of themselves and their attached parts and the resistance of the spring Z. As soon as the engine starts shaft P and the balls connected therewith are revolved at a high rate of speed by means of the driving-shaft S, bevel gear-wheel R, and pinion Q, causing the balls to diverge, thus drawing sleeve U downward until the lower end of the adjusting-screw rests on the top of the valve-stem and forces the stem and valve down to the position shown in Fig. 3, thus partially closing the valve and bringing the engine down to its normal speed.

It is obvious that by turning the adjusting-screw up or down a greater or less divergence of the balls will bring it into engagement with the valve-stem and that the force necessary to produce such divergence may be regulated by adjusting the tension of spring Z by the check-nut 9. It will be further observed that when sleeve U and the screw V move downward rod 10 also moves downward until its lower end passes the hooked end of trip-lever J, as shown in Fig. 3. When the revolution of the shaft P is stopped either by the breaking or slipping of the governor-belt or the stopping of the engine, the balls fall, the

sleeve U and screw V move upward, allowing the valve-stem to move upward until stopped by bolt G, and on a further falling of the balls rod 10 engages the hooked end of trip-lever J and forces bolt G backward, thus releasing the valve-stem and allowing the weight O to close the valve, as in Fig. 4. By this construction a governor is provided which is very sensitive to slight changes in the speed of the engine and one which may be easily adjusted within reasonable limits to run the engine at different speeds, according to the work to be done, and which automatically stops the engine in case of breakage of the governor-belt.

I claim as my invention—

1. In a governor, the combination of the following elements, namely: a main frame terminating in a hollow shaft, a reciprocating valve-stem mounted in said frame, a valve attached to said valve-stem, means, substantially as shown and described, for raising the valve and its stem, a revoluble hollow shaft mounted on the shaft of the main frame, a drive-wheel secured to said hollow shaft, a sleeve adapted to slide on the driven shaft and carrying a central interiorly-projecting part, whereby a separable connection is established between the sleeve and the valve-stem, a pair of weighted arms suspended from opposite sides of said sleeve, a pair of links connecting said arms and the revoluble hollow shaft, and a spring arranged to resist the outward movement of the arms, all arranged to co-operate substantially as specified.

2. In a governor, the combination, with the valve-chamber, the main frame, the reciprocating valve-stem mounted therein and having a lateral projection, and the valve, of means, substantially as shown and described, for forcing the valve-stem normally upward and the sliding bolt mounted in the main frame and arranged to engage the projection on the valve-stem, whereby the valve is held open independently of the governor-balls, substantially as and for the purpose specified.

3. In a governor, the combination, with the valve-chamber, the main frame, the reciprocating valve-stem mounted therein and having a lateral projection, the valve, means, substantially as shown and described, for forcing the valve-stem normally upward, the sliding bolt mounted in the main frame and arranged to engage the projection on the valve-stem, and the trip-lever arranged to operate said bolt, of the sliding revoluble sleeve carrying an interior projecting part adapted to form a separable connection with the valve-stem and the rod secured at one end to said interior projecting part and adapted at its other end to engage the trip-lever, whereby the trip-lever is operated and the valve-stem is liberated by the upward movement of the sleeve, substantially as and for the purpose specified.

4. In a governor, the combination of the

revoluble hollow driving - shaft, the sleeve adapted to slide on said shaft, and to thereby operate the valve, the weighted arms pivoted to said sleeve, and the links pivoted to said
5 revoluble hollow sleeve and to the weighted arms, the points of attachment of the links to the arms being nearer the weighted free ends of said arms than to their points of attachment to the sleeve, substantially as and for the purpose specified.

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