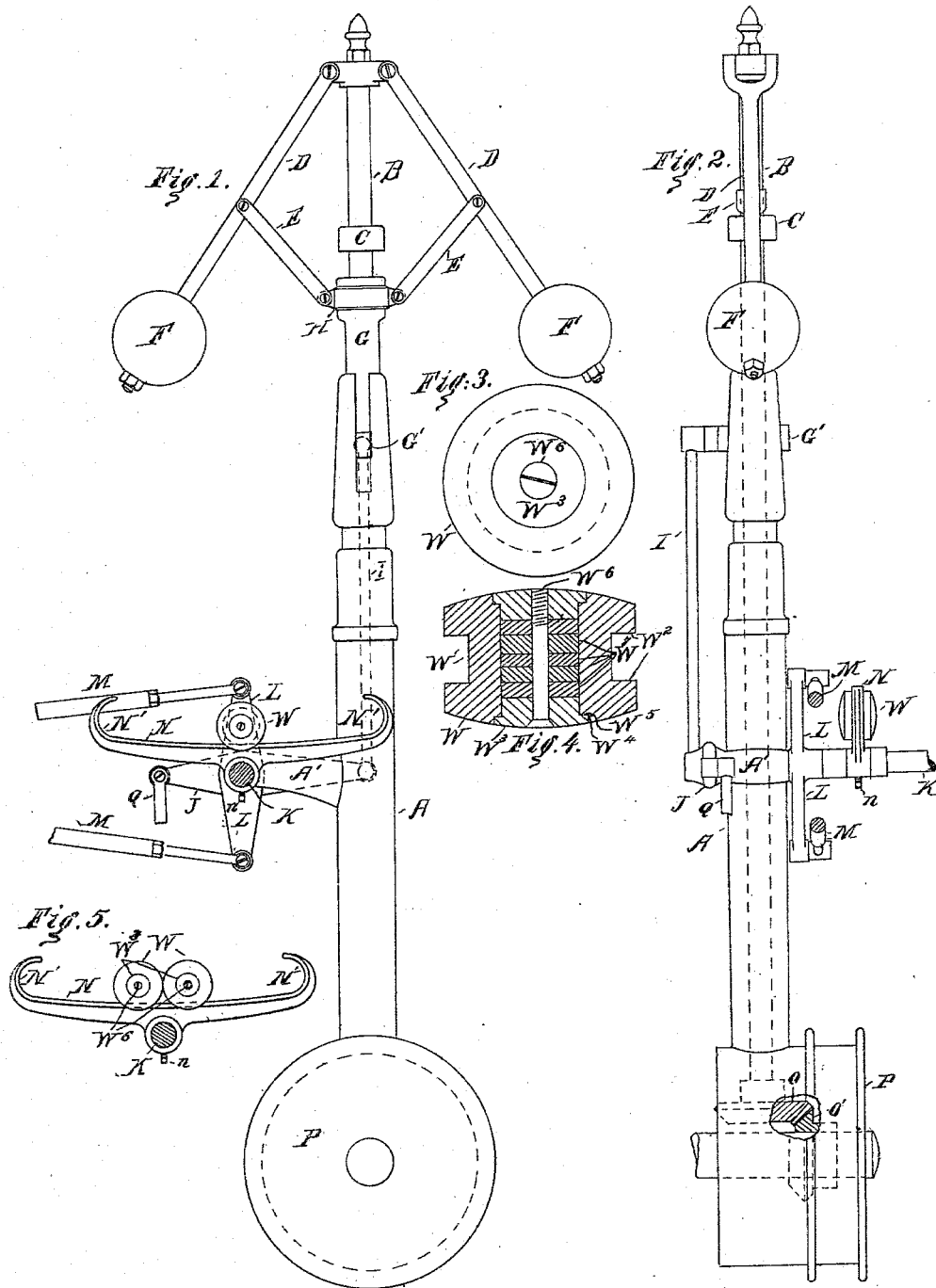


(No Model.)

F. A. GALE.  
SPEED GOVERNOR.

No. 301,712.

Patented July 8, 1884.



Witnesses\_

Edward W. Thompson  
Kirkley & Byde.

Inventor-

Frank A. Gale,  
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His Attorney

# UNITED STATES PATENT OFFICE.

FRANK A. GALE, OF LOWELL, MASSACHUSETTS.

## SPEED-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 301,712, dated July 8, 1884.

Application filed January 10, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK A. GALE, a citizen of the United States, residing at Lowell, in the county of Middlesex and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Speed-Governors, of which the following is a specification.

My invention relates to devices to be used, in connection with the speed-governors of steam, water, and other motors and engines, to render the speed uniform under a variation of load, such devices being applicable to any governor which can be so connected with a shaft as to rock the same by the variation of the speed of such governor.

In the accompanying drawings, Figures 1 and 2 are respectively a front and a side elevation of a centrifugal or ball governor such as is commonly used with steam-engines, its stand, the pulley which drives the governor, miter-gears, the cut-off shaft, the arm usually secured thereto, part of the cut-off rods and dash-pot rod, and my invention applied to the cut-off shaft; Fig. 3, a front elevation, and Fig. 4 a horizontal central cross-section, of the rolling weight; Fig. 5, a front elevation of the correction-arc (the cut-off shaft being in section) and two roller-weights supported on said arc.

The hollow stand A, the regulator-shaft B, the stop-collar C, arms D D E E, balls F F', sleeve G, sliding on regulator-shaft within the top of the stand, and raised by means of the collar H when the balls are thrown outward and prevented from turning by the guide-pin G', a regulator-rod, I, pivoted to said sleeve G, and to the double arm J, secured on the cut-off shaft K, said shaft being supported and turning on the bracket A' on said stand, the other end of said arm J being pivoted to the end of the dash-pot rod Q. Other arms, L L, secured to said cut-off shaft and pivoted to the cut-off rods M M', which operate the cut-off valves, gears O O, and pulley P, are all of the usual construction and operation. In the case of a steam-engine provided with the parts above named I apply to the cut-off shaft K a curved double arm, N, which I call a "correction-arc," the upper surface of which is of uniform width, and is curved upward lengthwise from the middle in each direction, like the arc of a circle, said arc being provided with a hole

which receives the shaft K, and with a set-screw, *n*, which thrusts against the shaft K and prevents the arc from turning on said shaft. The upper surface of the arc N serves as a track for a rolling weight, W. This weight is cylindrical, and is provided with an annular groove, W', of the width of the arm, so that the sides W<sup>2</sup> W<sup>2</sup> of the groove, or, in other words, the flanges of the weight, will prevent the weight from running off the side of the arc, and the ends of the arc are provided with hooks N', which prevent the weight from rolling off said ends. The hooks N' are preferably curved on their inner faces to fit said weight. The arc is so adjusted on the shaft K by means of the set-screw *n* that with an average load the weight W will stand directly over said shaft. The weight is provided with a central opening, as shown in Fig. 4, which is closed at each end by caps W<sup>3</sup>, which are flanged at W<sup>4</sup>, said flanges fitting against the shoulders W<sup>5</sup>, and are held in position by the screw W<sup>6</sup>, which passes through one of said caps and screws into the other. In the chamber thus formed in the weight W disks W<sup>7</sup>, of heavy material, preferably lead, may be placed according as a heavier or lighter weight is required. When the steam-pressure rises or the load decreases, the speed of the engine is slightly increased, and consequently the governor-balls fly outward, and by the usual means above mentioned rock the shaft K, thereby depressing the end of the arc N farthest from the stand, and causing the weight to roll toward the last-named end of said arc, and immediately augmenting the action of the governor in cutting off the steam at an earlier part of the stroke, and of course immediately reducing the speed. On the other hand, when the steam-pressure decreases or the load increases, the action of the governor in increasing the amount of steam admitted to the cylinder is augmented by the weight rolling in the other direction—that is, to the left in Fig. 1—because the arc will then be tilted in the direction last named. The gravity of the rolling weight and the curvature of the arc may be so adjusted that the variation of speed will be so slight as to be imperceptible in several hours, even with a great variation of load.

In Fig. 5 two weights are used. The use of two such weights on the same arc is desirable

where there is a very sudden variation of the load, because the slight friction between the surface of the weights will prevent their rolling too far with a sudden movement of the governor.

5 The arc and rolling weight herein described may be used in connection with a throttling-valve, and with any form of power-governor which can be made to rock a shaft by the variation of the speed of such governor.

10 I claim as my invention—

1. The combination of a speed-governor, a shaft, means of rocking the same by the variation of the speed of said governor, a correction-arc secured to said shaft, and a weight  
15 provided with flanges, as and for the purpose specified.

2. The combination of a speed-governor, a shaft, means of rocking the same by the variation of the speed of said governor, a correction-arc secured to said shaft and provided  
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with hooks, and a weight adapted to roll upon said arc, as and for the purpose specified.

3. The combination of a speed-governor, a shaft, means of rocking the same by the variation of the speed of said governor, a correction-arc secured to said shaft, a weight adapted to roll upon said arc, and means of varying the gravity of said weight, as and for the purpose specified.

4. The combination of a speed-governor, a shaft, means of rocking the same by the variation of the speed of said governor, a correction-arc secured to said shaft, and a weight adapted to roll upon said arc, and having a central opening and shoulders, caps provided with flanges, the screw, and disks of heavy material, as and for the purpose specified.

FRANK A. GALE.

Witnesses:

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