No. 642,340. Patented Jan. 30, 1900.

C. W. LAWRIE.

STEAM ENGINE GOVERNOR.

(Application filed Nov. 18, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

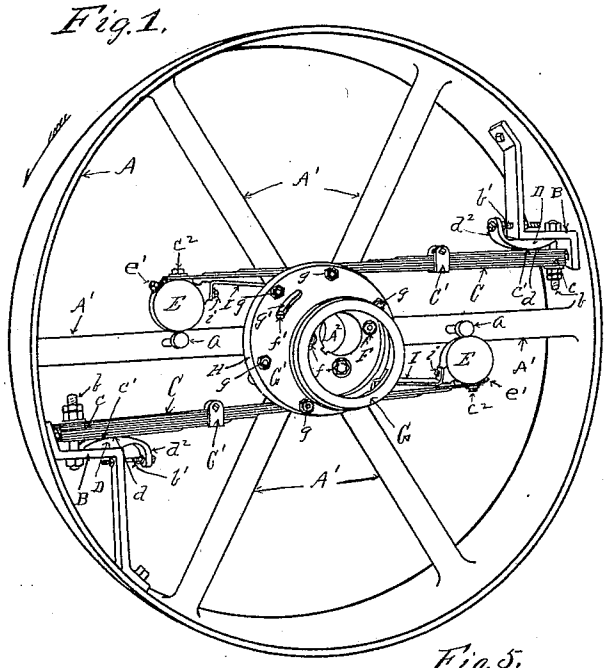


Fig. 4.

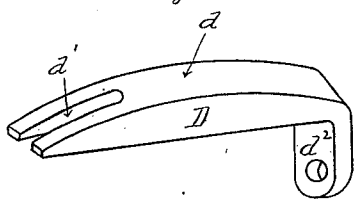


Fig. 5.

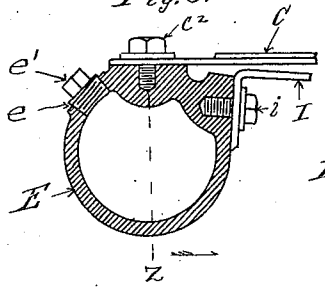
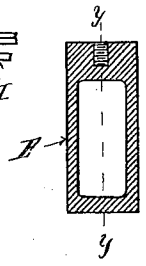


Fig. 6.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

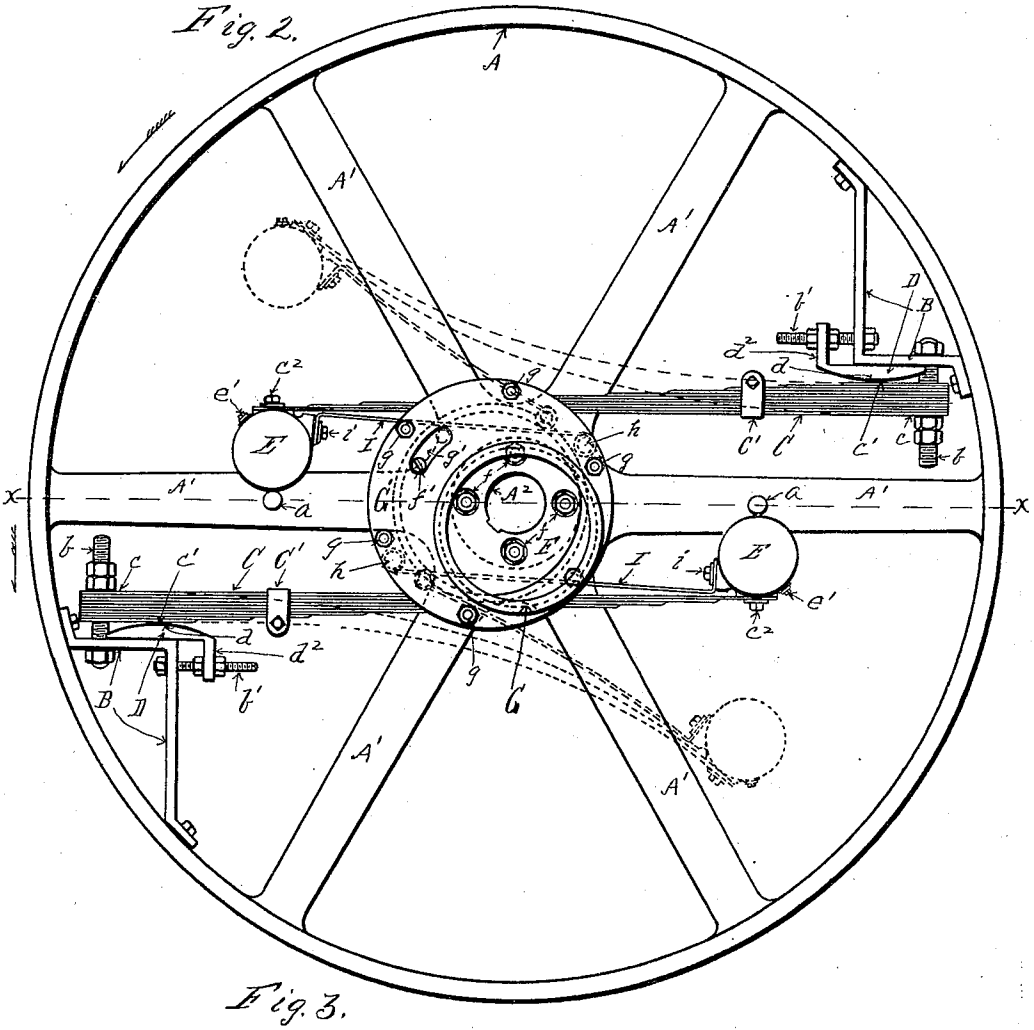
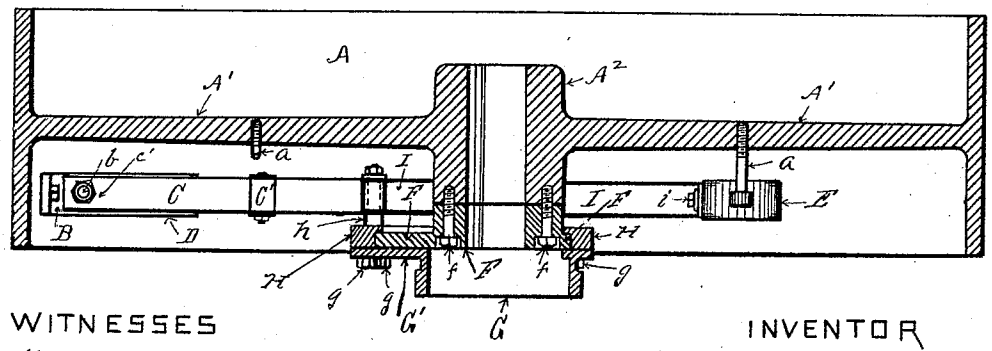


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES W. LAWRIE, OF ERIE, PENNSYLVANIA.

STEAM-ENGINE GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 642,340, dated January 30, 1900.

Application filed November 18, 1899. Serial No. 737,468. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. LAWRIE, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Engine Governors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, forming part of this specification.

This invention relates to steam-engine governors, and particularly to that class thereof known as "shaft-governors;" and it consists, substantially, of a governor-wheel mounted on the engine-shaft, having a pair of leaf-springs secured therein, at opposite sides thereof, and extending across the wheel in opposite directions substantially parallel to each other upon which springs weights are secured, so that when the wheel is in motion the centrifugal force of the weights is fully exerted upon the respective springs supporting them. These weights are connected with a shifting eccentric mechanism mounted upon the wheel-hub or shaft by means of spring-links rigidly secured to the weights and extending backward therefrom at a slight angle with the springs upon which the weights are mounted to pins or studs on the shifting eccentric mechanism, so that as the weights move outward and inward the angular motion thereof is in the opposite direction to the angular motion of the eccentric mechanism. This reversal with relation to each other of the angular motion of the weights and the angular motion of the eccentric mechanism insures the greatest possible stability in the operation of the governing mechanism and at the same time the quick response thereof to sudden changes of load. To obtain perfect isochronous adjustment of the springs, curved shoes are provided, which are adjustably secured under the heels of the springs, so as to operate as fulcrums therefor, and by means whereof the operative portions of the springs can be shortened or lengthened, as desired. The objects attained by means of this construction are that I am enabled thereby to make a steam-engine governor in which the inertia properties of the weights are fully exerted upon the shifting eccentric mechanism, which makes the governor very stable and at the same time extremely sensitive to changes of load when in operation. These and other features of this invention are hereinafter fully set forth and described, and illustrated in the accompanying drawings, in which—

Figure 1 is a front view in perspective of my improved steam-engine governor. Fig. 2 is a front view in elevation of the same. Fig. 3 is a transverse section of the same on the line $x\ x$ in Fig. 2. Fig. 4 is a perspective view of one of the adjustable shoes forming the spring-fulcrums. Fig. 5 is a vertical longitudinal section of one of the governor-weights on the line $y\ y$ in Fig. 6. Fig. 6 is a tranverse vertical section of the same on the line z in Fig. 5.

In the drawings thus illustrating my invention, A is a steam-engine band-wheel provided with spokes A′ and a hub A^2, adapted to be secured to the main shaft of a steam-engine. On the opposite sides of the inside of the rim of this wheel A, I secure spring-supports B B, to which the heels $c\ c$ of leaf-springs C C are secured by means of bolts $b\ b$, and in front of said bolts, between the supports B and the under faces c' of the leaf-springs C, I place shoes D. (See Fig. 4.) These shoes are provided with a curved upper surface d, which forms a bearing-surface upon which the spring rests. A slot d' is also provided in the rear end thereof, so as to permit of the longitudinal adjustment of the shoes D without interference with the bolt b. The front ends d^2 of the shoes D are turned downward, and adjusting-bolts b' pass through them into the spring-supports B, by means whereof the shoes D can be moved in or out, so as to operate as adjustable fulcrums for the springs C.

The springs C C extend in opposite directions, substantially parallel to each other, across the wheel A, at each side of the hub A^2 thereof, and are provided with clamps C′ to retain the leaves thereof in proper alinement with each other. To the free ends of these springs C, I secure weights E by means of bolts c^2. These weights E, I make preferably hollow, (see Figs. 5 and 6,) so that they can be

filled more or less with shot or other suitable material, so as to adjust the weight thereof as desired, and for this purpose I provide therein openings *e*, having screw-plugs *e'* for closing the same. For limiting the inward movement of the weights E, I provide stops *a a* on the arms A' of the wheel A. The shifting eccentric mechanism shown in the drawings comprises a fixed eccentric F, secured to the hub A^2 of the wheel A by means of screw-bolts *f*. It could, however, be either made integral with the hub A^2 or otherwise secured directly to the engine-shaft, if desired. Upon this fixed eccentric F there is mounted a valve-driving eccentric G, preferably in the following manner: On the back of the eccentric G there is a circular plate G', and surrounding the eccentric F there is an eccentric-strap H, which is secured to the back of the plate G' by means of bolts *g* or in other convenient manner. In the plate G' there is a slot *g'*, in which a stud *f'*, secured to the fixed eccentric F, travels, which operates to limit the rotation of the eccentric G upon the eccentric F, and thereby operates to limit the outward movement of the weights of the governing mechanism, which are connected therewith in the following manner: In the back of the eccentric-strap H are studs *h h*, on opposite sides thereof, as shown in dotted lines in Fig. 2. Upon these studs *h h* I pivot the ends of spring-links I I, which extend forward at a slight angle with the springs C to the weight E, to which their opposite ends are firmly secured by means of bolts *i*, so that as the springs C and weights E move outward or inward the angular motion of the eccentric G is in the opposite direction to the angular motion of the springs C and the weights E, which has the effect of producing at the same time great stability and extreme sensitiveness to changes of the load on the engine. It will also be observed that by means of this construction the springs C, being secured near the rim of the wheel A, at opposite sides thereof, and extending in opposite directions and substantially parallel with each other nearly across the diameter of the wheel and having weights secured to the free ends thereof, not only balance each other in all positions, but the springs and weights combine to form the weight mechanism of the governor, and the inertia properties of their weight are thereby utilized to their fullest extent through the spring-links I, which so connect the weights E with the shifting eccentric G as to cause the angular motion of the eccentric to be in the opposite direction to that of the weights, whereby the governor mechanism exerts its full inertial force upon the eccentric mechanism, and thereby makes it not only stable, but exceedingly sensitive to changes of load when in operation.

I have shown and described herein as a part of the mechanism of this governor an eccentric mechanism comprising fixed and loose eccentrics. I do not, however, claim this feature as new, nor is this particular form of eccentric a necessary feature of this invention, as I can utilize any ordinary shifting eccentric mechanism therein, if desired. I have thus shown and described convenient mechanism for utilizing my invention. It is obvious, however, that the details thereof may be considerably varied without departing from the spirit of the invention.

Therefore what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination in a steam-engine governor, of a rotating member or wheel, centripetal springs secured thereto, at opposite sides thereof, and extending crosswise of the same at each side of the hub, weights secured to the free ends of said springs, a shifting eccentric at the hub of the wheel, and links secured to said weights extending backward to and connecting with said shifting eccentric so that the angular motion thereof is in the opposite direction to that of the weights, substantially as set forth.

2. The combination in a steam-engine governor, of a rotating member or wheel, centripetal springs secured to said wheel and extending in opposite directions crosswise of the same at each side of the hub thereof, substantially parallel with each other, weights secured to the free ends of said springs, a shifting eccentric at the hub of the wheel, and spring-links secured to said weights extending backward at a slight angle to said springs, to and connecting with the shifting eccentric, substantially as set forth.

3. The combination in an inertia steam-engine governor, of a rotating member or wheel, centripetal springs secured thereto, at opposite sides thereof and extending approximately two-thirds of the distance across the face of the wheel in opposite directions, at each side of the wheel-hub, centrifugal weights secured to the free ends of the springs, a fixed eccentric on the wheel-hub or engine-shaft, a valve-driving eccentric adapted to rotate on said fixed eccentric, and spring-links secured to said weights extending backward, substantially in line with said springs, to and connecting with said valve-driving eccentric, substantially as set forth.

4. The combination in an inertia steam-engine governor, of a rotating member or wheel, centripetal springs secured to supports, at opposite sides of said wheel and extending crosswise thereof at each side of the wheel-hub, an adjustable fulcrum for said springs, centrifugal weights secured to the free ends of said springs, a shifting eccentric at the hub of the wheel, and links secured to said weights extending backward, substantially in line with said springs, to and connecting with said shifting eccentric so that the angular motion thereof is in the opposite direction to that of the weights, substantially as set forth.

5. The combination in a steam-engine governor, of a rotating member or wheel, spring-

supports at opposite sides of said wheel, centripetal springs secured to said supports and extending crosswise of said wheel, at each side of the wheel-hub, longitudinally-adjustable shoes between said springs and said supports operating as fulcrums for said springs, centrifugal weights secured to the free ends of said springs, a shifting eccentric at the hub of said wheel, and flexible links secured to said weights extending backward, substantially parallel with said springs, to and connecting with studs on said shifting eccentric, substantially as set forth.

6. The combination in a steam-engine governor, of a rotating member or wheel A, spring-supports B secured thereto at opposite sides thereof, leaf-springs C secured to said supports and extending crosswise of said wheel, at each side of the hub thereof, centrifugal weights E secured to the free ends of said springs, a fixed eccentric F on the hub of said wheel, a rotatable valve-driving eccentric G mounted on said fixed eccentric, studs *h* secured to said valve-driving eccentric, and flexible links I pivoted to said studs, and extending forward at a slight angle to the springs C, to and secured to the weights E, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES W. LAWRIE.

Witnesses:

FRED EINFELDT,

JOHN S. BILLING.