(No Model.) 2 Sheets—Sheet 1.

J. B. ALLFREE.

GgovernOR FOR STEAM ENGINES.

No. 382,932. Patented May 15, 1888.

Fig. 1.

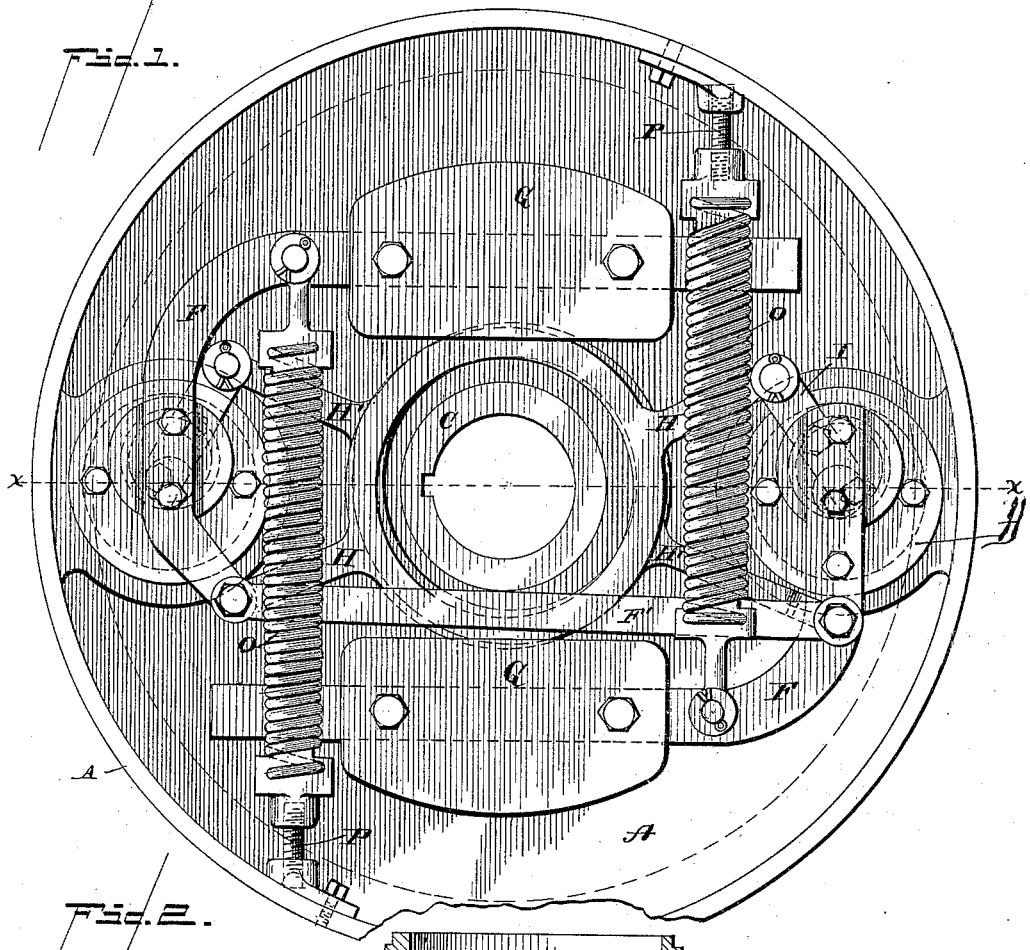
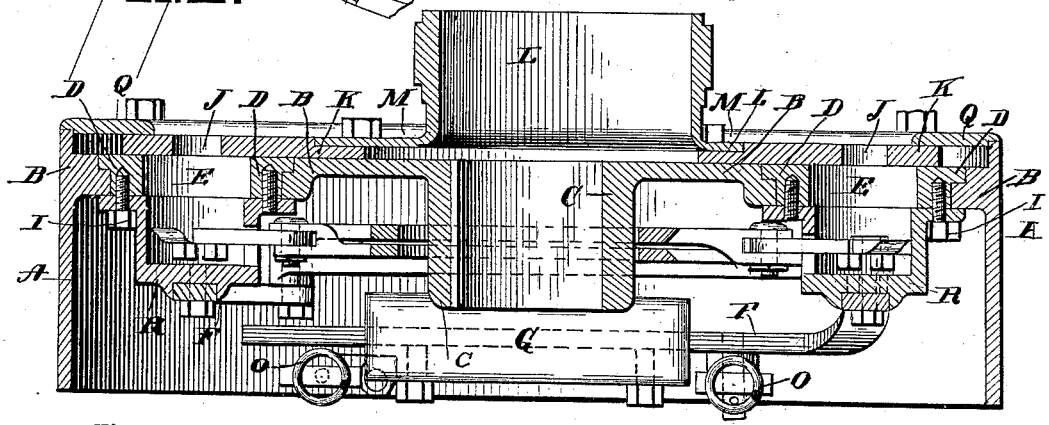


Fig. 2.



WITNESSES.

Edwin I. Yewell.

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INVENTOR.

James B. Allfree,

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

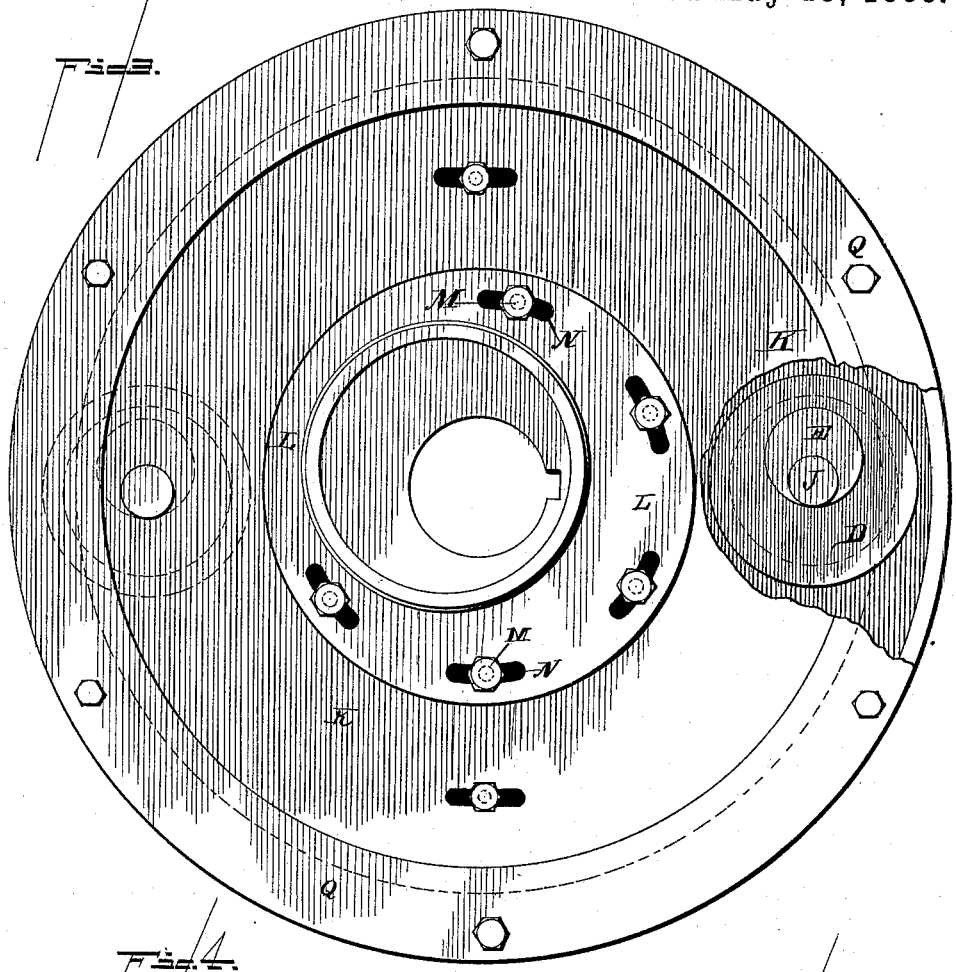


Fig. 4.

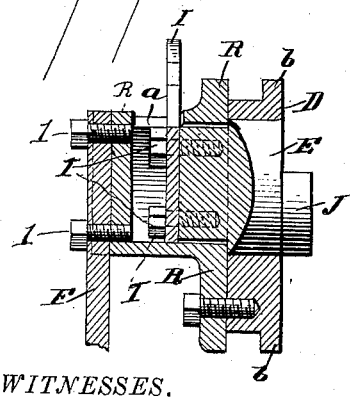
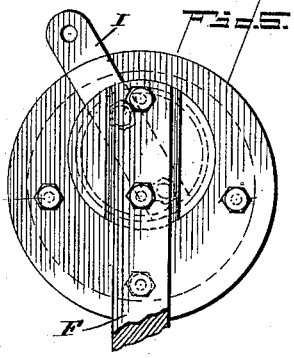


Fig. 5.



WITNESSES.

Edwin I. Yewell,

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UNITED STATES PATENT OFFICE.

JAMES B. ALLFREE, OF INDIANAPOLIS, INDIANA, ASSIGNOR OF ONE-HALF TO ROBERT SHRIVER AND HARRISON SWARTZWELDER, OF CUMBERLAND, MARYLAND.

GOVERNOR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 382,932, dated May 15, 1888.

Application filed September 1, 1887. Serial No. 248,553. (No model.)

To all whom it may concern:

Be it known that I, JAMES B. ALLFREE, a citizen of the United States, residing at Indianapolis, Indiana, have invented new and useful Improvements in Governors for Steam-Engines, of which the following is a specification.

My invention relates to certain new and useful improvements in governors for steam-engines.

My invention has for its object to provide a governing apparatus which will be free from the usual effects resulting from undue friction of the eccentric-strap (which generally tends to effect the perfect regulation) and from the effects due to the action of the valve.

My invention has for its further object to secure the movement of the main eccentric in a direct or straight line across the shaft of the engine and at the same time to obtain the lowest possible angle of friction.

My invention has for its further object to provide better means for regulating or setting the governors to secure the speed at which it is desired to have the engine run.

My invention has for its further object to obtain a more sensitive action with fewer and less intricate parts than is customary, thereby securing closer and better regulation of speed and cheapness in the cost of construction.

With these ends in view my invention consists in the construction and arrangement of parts, hereinafter fully described and specifically claimed.

In order that those skilled in the art to which my invention appertains may know how to make and use my invention, I will proceed to describe the particular construction and arrangement of the several parts, referring by letters to the accompanying drawings, in which—

Figure 1 is a back view with its cover removed to expose the parts. Fig. 2 is a central section taken at the line *x x* of Fig. 1, the eccentrics being shown in elevation. Fig. 3 is a front view with the plate partly broken away to expose one pair of the double eccentrics. Fig. 4 is a detail sectional view of one of the pairs of double eccentrics and connections, with a part of the inner eccentric shown in elevation. Fig. 5 is a plan of one pair of the double eccentrics, showing the means for attaching the operating-levers.

Similar letters of reference indicate like parts in the several figures.

To obtain the objects sought by my invention, I construct a pulley-shaped casing, A, having a web, B, placed nearer to one side and connecting the rim with the hub C. In this web B, and on either side of the hub C, near to the rim, I introduce compound or double eccentrics, which consist each of two eccentrics, and I shall hereinafter refer to these as the "double eccentrics," each composed of an inner and outer eccentric, as will be hereinafter more fully described. The double eccentrics arranged each side of the hub are each composed of an outer eccentric, D, and an inner eccentric, E. To the outer eccentric, D, of each pair I attach by means of suitable screws, *l l*, levers F, provided with weights G, and to these levers F, I secure links H and H′, which diametrically cross the shaft, the central portion being made ring-shaped to surround the hub C. Each of these links is connected in the following manner—that is to say, one end of H is connected to the large lever F on the left of the hub C, and the opposite end of said link is connected to the end of a small lever, I, extending radially from the inner eccentric, E, of the pair of double eccentrics to the right of the hub, and one end of the link H′ is connected to the large lever F on the right of the hub C, and its opposite end is connected to the end of the small lever I, extending radially from the inner eccentric, E, of the pair on the left of the hub, (it being understood that the two small levers I are each connected to the inner eccentric of the pairs on each side of the hub.)

The two levers F F on each side of the hub are connected, as clearly illustrated at Fig. 1, by a rod, F′, by which means uniformity of movement is secured.

Each of the inner eccentrics, E, of the pairs each side of the hub is formed with an eccentric-pin, J, which takes into a circular movable plate, K, which latter is of less diameter than the

inner portion of the rim of the pulley-shaped casing A, as clearly indicated by the dotted circle shown at Fig. 1. To this plate K the main or valve-actuating eccentric L is adjustably connected by cap-screws M, passing through curved slots N in the plate.

To the weighted levers F, near to each of the weights G, I attach a spiral spring, O, the opposite end of which spring is connected through the medium of an adjusting-screw, P, to the rim of the casing A.

Outside of the circular movable plate K, to which the main eccentric L is attached, I attach to the pulley-shaped casing A a suitable ring or flange, Q, for the purpose of retaining the movable plate K in place and allowing free movement of the plate between the flange and the web of the casing.

In order to provide suitable means for attaching the weighted levers F to the outer eccentrics, D, and at the same time provide means for retaining both the outer and inner eccentrics in place, I construct chambered flanges R, (see particularly Fig. 4,) having in each an opening, *a*, through the wall of said chamber, through which passes the small lever I, connected to the inner eccentric, E, said levers being thus permitted to vibrate freely and the chamber R admitting of ample room for the attachment of the small levers to the inner eccentrics, while the flange of said chamber, projects over both the inside eccentric, E, and the outside eccentric, D, sufficiently to hold both in their proper relations, and as the outer eccentric, D, is formed with a lip or flange, *b*, on one side (see Fig. 4) it will be seen that when the double eccentric is secured in place the web B will enter the groove or channel *c*, formed between the outer eccentric, D, and the flanged chamber R.

Having described the construction and arrangement of the several parts, I will now proceed to explain the operation.

When the engine is set in motion, the weights by centrifugal force will tend to be carried outward from the center of the shaft, rotating the outer eccentric, to which each of said weights is connected through the medium of the levers F, and also rotating in the same direction, through the links H H′, connected thereto, the inner eccentrics on the opposite side, thereby moving the outer and inner eccentrics of each pair of auxiliary eccentrics in opposite directions to each other, thus moving the plate K, carrying the main eccentric, in a direct line across the shaft through the medium of the eccentric-pins J, the weights all opposed in this motion by the springs, which constantly tend to draw the weights toward the center. When the speed of the engine is slackened, this force of the springs overcomes the centrifugal force of the weights, and the parts are restored to their normal position.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a centrifugal governor, the combination of a valve-actuating eccentric having an opening or transverse slot adapted to fit freely over a crank-shank, and two double auxiliary eccentrics (composed of inner and outer eccentrics) fitted into the web of the casing and connected with the movable plate K, carrying the valve-actuating eccentric, by eccentric-pins J, substantially as set forth.

2. In a centrifugal governor, the combination of a suitable casing, a valve-actuating eccentric having an opening or transverse slot adapted to fit freely over a crank-shaft, two double auxiliary eccentrics (composed each of an inner and an outer eccentric) fitted into the web of the casing and connected with the movable plate K, carrying the valve-actuating eccentric, by eccentric-pins J, and intermediate mechanism connecting the two pairs of auxiliary eccentrics to secure their proper relative movements, substantially as and for the purposes set forth.

3. In a centrifugal governor such as described, the arrangement of two pairs of auxiliary eccentrics on opposite sides of the valve-actuating eccentric, in combination with suitable mechanism for rotating the inner and outer eccentrics of each pair in opposite directions to secure the movement of the valve-actuating eccentric in a straight line, substantially as set forth.

4. In a centrifugal governor, the two double auxiliary eccentrics arranged opposite to each other on opposite sides of the hub, the movable plate K, carrying the valve-actuating eccentric, weighted levers F, and small levers I, bolted to the eccentrics, in combination with links H H′, pivoted to the levers I at one end and to the lever F at the other, as and for the purpose hereinbefore set forth.

5. The weighted levers F, rigidly bolted to the auxiliary eccentrics, whereby the eccentrics form the pivots of the weighted levers, substantially as hereinbefore set forth.

6. In combination with the two double auxiliary eccentrics, weighted levers F, small levers I, and links H H′, the connecting rod or bar F, substantially as and for the purpose set forth.

7. In a governor such as described and provided with two double auxiliary eccentrics on opposite sides of the main eccentric, the inner eccentric of each pair connected with the outer eccentric of the other by suitable mechanism, substantially as and for the purpose set forth.

8. The combination of the casing A, movable plate K, and securing ring or flange Q, substantially as and for the purpose set forth.

9. A steam-engine governor comprising a suitable casing attachable to the driving-shaft of the engine, two pairs of double auxiliary eccentrics journaled in said casing on opposite sides of its center, levers secured to said eccentrics, one to one of each pair, respectively, weights adjustably attached to said levers, counteracting-springs adjustably attached to said levers and to said casing, suitable connections between said levers, and also between the outer and inner eccentrics of the opposite

pairs of said auxiliary eccentrics, whereby they are caused to move in harmony, a valve-actuating eccentric, a movable disk or plate to which said valve-actuating eccentric is suitably attached, said disk being sustained and regulated in its movements by one of each pair of said auxiliary eccentrics, and suitable means for holding said disk in place, all substantially as described, so arranged and combined as to operate as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JAMES B. ALLFREE.

Witnesses:
E. EVERETT ELLIS,
CURTIS LAMMOND.