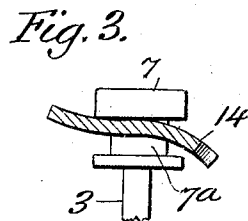
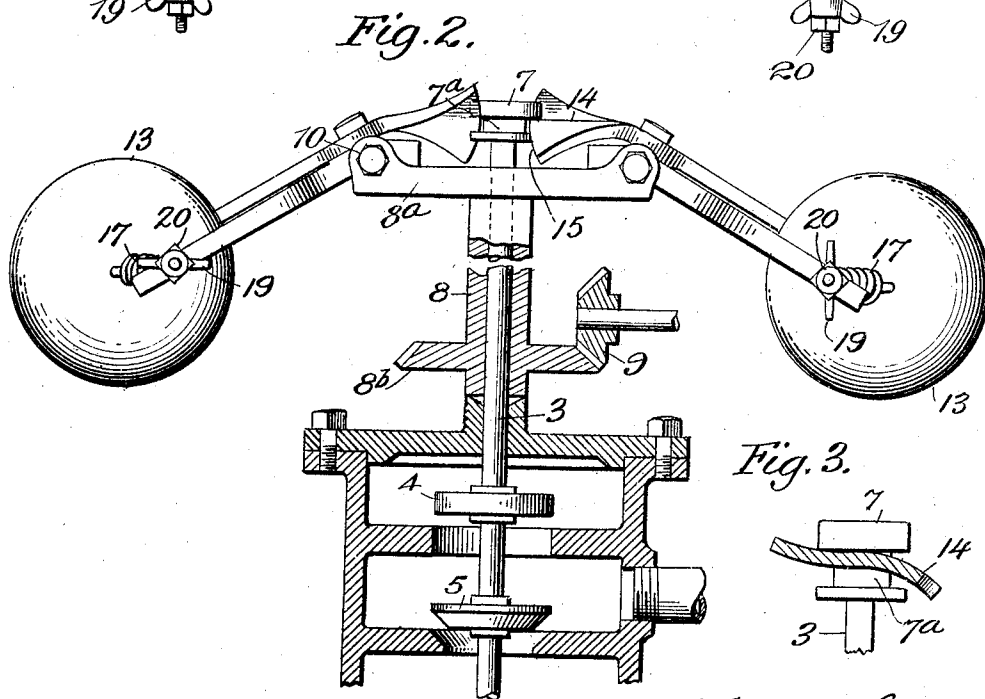
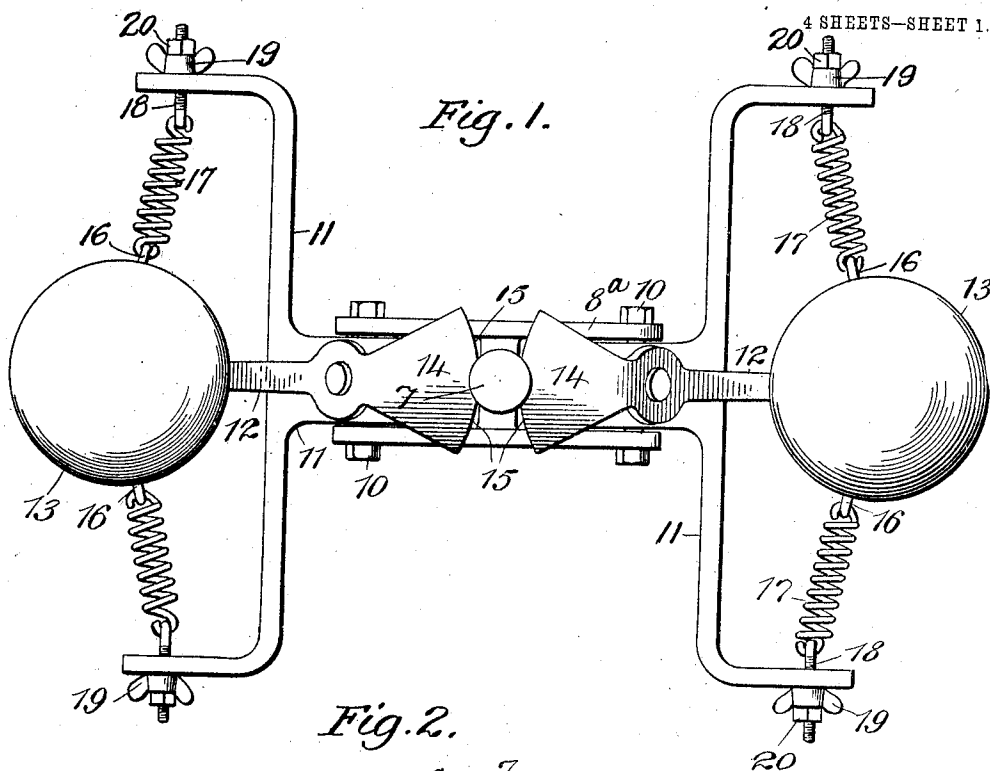


No. 821,286.

PATENTED MAY 22, 1906.

C. GRANT.
ENGINE GOVERNOR.
APPLICATION FILED OCT. 25, 1904.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

Fig. 4.

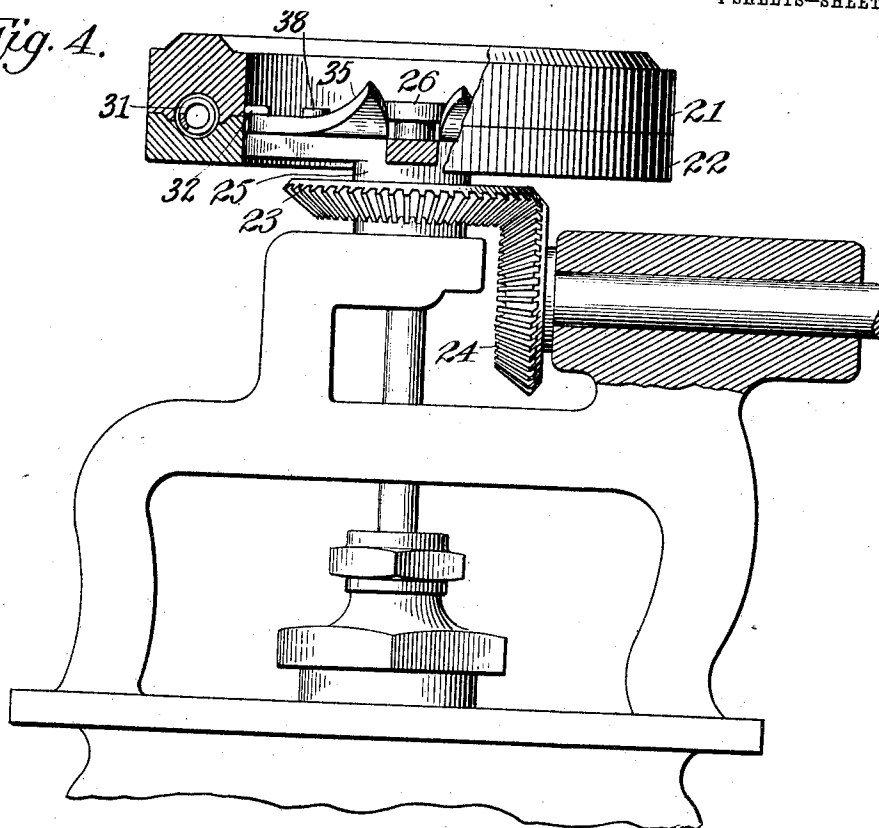
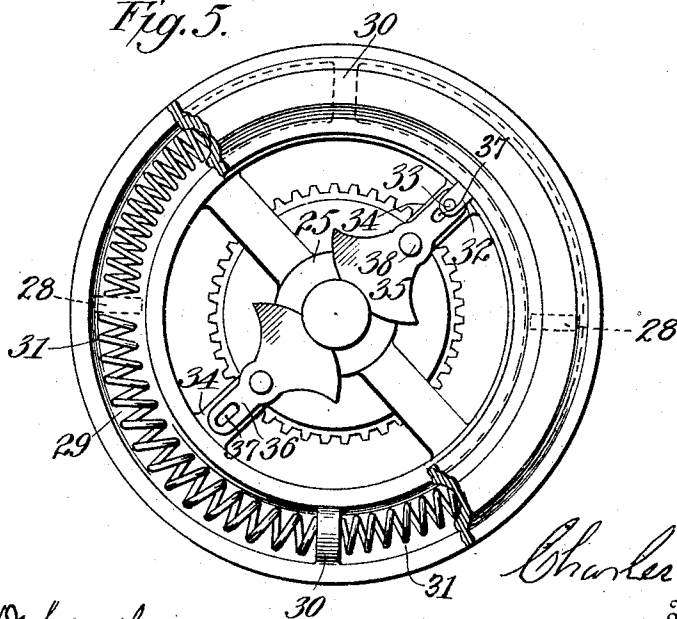


Fig. 5.



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Fig. 6

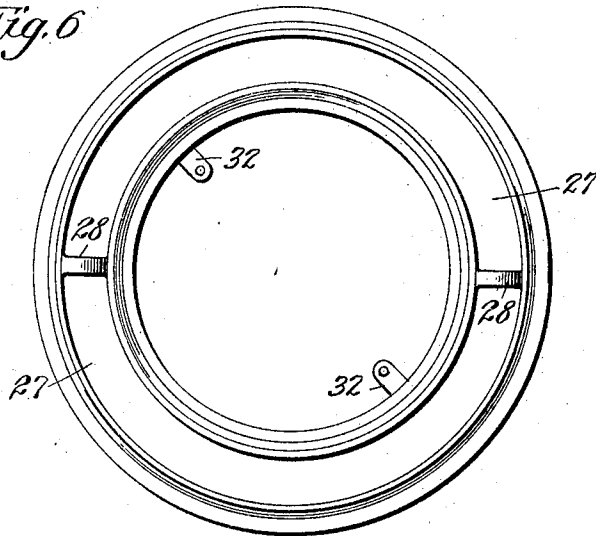


Fig. 7.

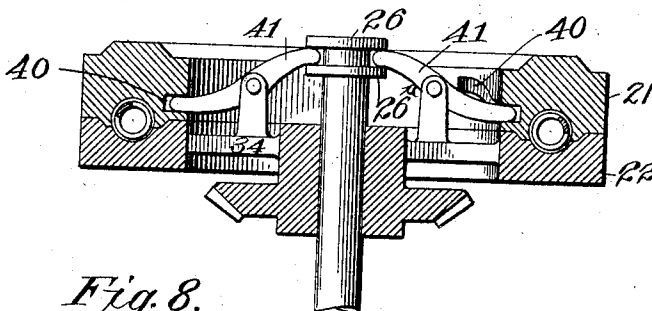
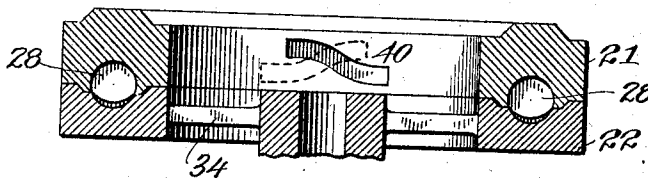


Fig. 8.



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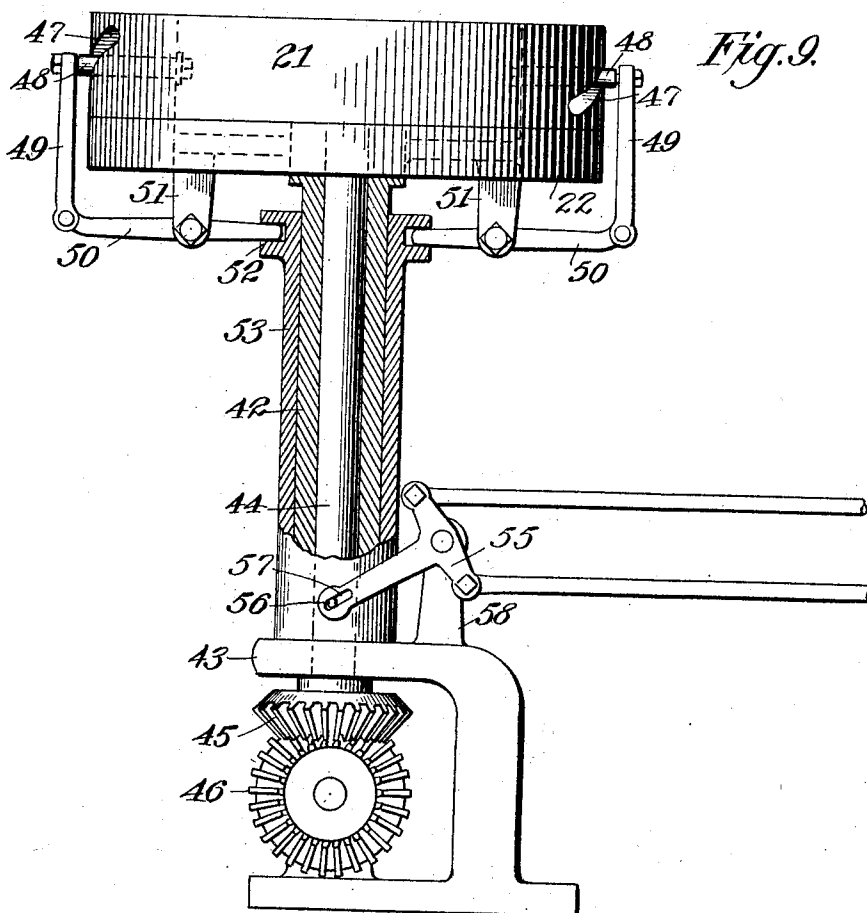
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UNITED STATES PATENT OFFICE.

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ENGINE-GOVERNOR.

No. 821,286,

Specification of Letters Patent.

Patented May 22, 1906.

Application filed October 25, 1904. Serial No. 229,965.

To all whom it may concern:

Be it known that I, CHARLES GRANT, a citizen of the United States of America, and a resident of Brooklyn, Kings county, State of New York, have invented certain new and useful Improvements in Engine-Governors, of which the following is a specification.

My invention relates to governors for engines, and has for its object the arrangement of the usual governor fly-balls or the adoption of a weight or weights by which, as an auxiliary to the centrifugal actuation of the same to operate the shut-off valve, they are also influenced by any irregularity of the momentum, and in consequence of such the balls or weights through their tendency to travel in a circular path at a regular and uniform rate of speed are so connected with the valve as to adjust it with much delicacy for the admission of the amount of the steam or vapor necessary for the steady and even operation of the engine. These and other objects and details of my invention are more clearly described in the following specification and set forth in the appended claims.

In the drawings which accompany this specification and form a part thereof like reference characters are used to designate like parts in the several figures.

Figure 1 is a plan view of my improved governor. Fig. 2 is a side elevation of the same and its valves, the valve-seats and adjacent parts being in section. Fig. 3 is a detail view showing the action of one of the cams on the valve-stem. Fig. 4 is an elevation, partly in section, of a modified form of my invention, in which I use a weighted ring instead of balls. Fig. 5 is a plan view of same, partly in section. Fig. 6 is a bottom view of the weighted ring. Fig. 7 is a cross-section of a modified form of the weighted ring and its connections with the valve-stem. Fig. 8 is a cross-section of the device at a right angle to the line of section of Fig. 7, and Fig. 9 shows how the weighted-ring form may be connected with Corliss valves.

The drawings show the governor adapted to operate the stem 3 of the compensating valves 4 and 5; but it is obvious that this governor may be applied to any valve which requires an automatic movement to regulate the necessary motive force that operates an engine. The stem is vertically disposed and has at its upper end a head or disk 7, with an

annular groove 7^a, while surrounding the stem and supported by the steam-chest is a sleeve 8, carrying at its upper end a frame 8^a and having a beveled pinion 8^b, which is driven by a similar pinion 9.

At each end of the frame 8^a is pivoted, by means of pins or bolts 10, yokes 11, which carry arms 12, pivoted to the upper faces of the yokes and having at their outer ends the usual governor balls or weights 13, while the inner ends of these arms 12 are shaped into the cam-faces 14, which actuate the valve-stem. The inner edges 15 of these cams 14 play in the groove 7^a of the disk 7, and any lateral movement of the arms 12 swings the edge of the cams in the groove and elevates or depresses the stem and valves according to the direction of movement of the balls.

Each side of the balls 13 is provided with perforated ears 16 to receive the ends of springs 17. The lateral arms of the yokes 11 have perforations through which pass screw-eyes 18, to which the outer end of the springs 17 are secured, and thumb-nuts 19 and check-nuts 20 hold the screw-eyes in place and adjust same to increase or decrease the tension of the separate springs.

The cams 14 are mounted on what is practically a universal joint, and centrifugal action will tend to throw the balls upward and depress the inner edges of the cams, which would act upon the grooved disk 7 and the valve-stem. Any irregular motion or action of the engine would interrupt the momentum of the balls and cause them to advance or to lag so as to be thrown out of the radial relation with the stem 3 and cause the cams 14 to ride in the groove of the disk 7 so as to raise or lower the stem and increase or decrease the flow of steam or vapor until the balls are restored to a regular and even motion around the stem. In case that the balls are suddenly thrown forward in consequence of the increase of a load from the engine or other causes the rising face of the cam is carried into the groove 7^a and the stem 3 with its valves are raised and the supply of steam increased until the movement becomes even and regular. Fig. 3 shows the shape of the edge of the cam and how it provides for the elevation or depression of the stem and valves. Each half of the cam is a circular segment, one turned up and the other down, so as to shift the valve-stem up or down in ac-

cordance with the movement of the ball, the circular form of the surface producing an accelerated movement of the valve-stem as the cam swings. It is obvious that when the springs 17 are properly adjusted the balls are held midway between the jaws of the yokes, and any irregular work of the engine would result in a jerking action, which would throw the balls to one side or the other of their normal position. This change of position of the balls would so operate the valve as to deliver to the cylinder a sufficient supply of steam or gas to insure a gradual even motion or would continue to so regulate the supply until an even motion was secured.

In Figs. 4 to 9 is shown a modified form of this improved governor in which I discard the centrifugal action and use a weighted ring 21, mounted concentrically on the horizontally-disposed wheel 22, which is driven by the beveled gears 23 and 24 or any other desirable means. The valve-stem 3 plays through the hub 25 of the wheel 22 in the forms shown in Figs. 4 to 8 and the wheel rotates about the stem, the latter being provided with the flange 26. The ring 21 has a groove 27 running around its under face; which groove is divided by partitions 28, and the wheel 22 has a corresponding groove 29 on its upper face and which is likewise divided by partitions 30. These partitions of these two members project high enough above the adjoining faces of each to fit into the groove of the other member, thus dividing the groove into four sections, and into each of these sections is fitted a coiled spring 31, adapted to exert a slight pressure on each of its confining partitions so as to normally retain the ring and the wheel in a certain relative position as to each other. On the inner edge of the ring at diametrically opposite points are the lugs 32, carrying dependent studs 33, and on opposite spokes 34 of the wheel are pivoted the cams 35, which play beneath the flange 26 and whose rear ends 36 are provided with slots 37 to receive the studs 33. It is obvious that any lateral movement of the studs will shift the cams on their pivots 38, and their faces playing under the flange 26 will tend to open or close the valves. This lateral movement of the studs and lugs is only accomplished by the shifting of the ring 21 on its wheel, and that follows any irregularity of the momentum of these two members and the change of their normal relation. A regular movement of the wheel enables it to carry with it the weighted ring, and their movement is identical regardless of speed; but any sudden stopping or jerking of the wheel will cause the ring to change its relation because of its momentum and shift the cams so as to cause them to operate the valves. Two of the four springs 31 will, however, be placed under tension and tend to restore the ring to its normal relation. If the

ring should be thrown back upon the other springs, the cam would again act upon the flange of the valve-stem and continue to do so until a regularity of speed is attained equivalent to the momentum of the weighted ring.

Figs. 7 and 8 show a modified form of the weighted ring in which the inner face of same is provided with inclined slots 40 to receive the outer ends of levers 41, fulcrumed on the spokes of the wheel 22. The inner ends of these levers play between the flange 26 and a second flange 26^a, and the relative positions of the wheel and ring are maintained by the springs in their coinciding grooves. Any change in the circumferential relations of the two members will result in a movement of the outer ends of the levers and of the inner ends which operate the valve-stem, and thereby operate the valves. While the stem is in this instance shown as capable of closing the valve by being depressed, it is evident that this may be rendered possible, if so desired, while the stems in the other forms close by lifting same.

In Fig. 9 I show the weighted ring adapted to operate the valves of a Corliss engine. The ring 21 is in this case similar to that shown in Figs. 4 and 5 and already explained and supported by a similar wheel whose hub is supported by the hollow shaft 42, that surmounts the bracket 43. Through this hollow shaft 42 runs a shaft 44, whose upper end carries the wheel and whose lower end is provided with the beveled pinion 45, which is driven by a similar wheel 46. On the periphery of the ring are two diametrically opposite cam-slots 47, in which play rollers 48, carried on studs at the outer end of the vertical rods 49, which are carried at the outer ends of levers 50, pivoted to depending ears 51 on the spokes of the wheel, and the inner ends of these levers play in a groove 52 at the upper end of sleeve 53, which loosely surrounds the hollow shaft 42. The rods 49 may be retained in their vertical position by passing the studs through the slots to the inside of the ring and heading them, so when the rods 49 are depressed by the change of position of the ring they cause the inner end of the levers 50 to elevate the sleeve 53 and raise the slotted end of the three-arm lever 55 by means of the stud 56 playing in its slot 57. The lever 55 is pivoted to the upper end of an upright 58 of the bracket 43 and the two other arms of this lever carry the rods 59 and 60, which operate the valves of a Corliss or similar engine.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A governor having weights supported upon the rotating frame by substantially universal joints so as to be capable of lateral or vertical movement relatively to said frame.

and means for utilizing both the lateral and vertical movements of said weights.

2. A governor having a rotated frame, yokes pivoted to the frame to swing vertically, and weights pivoted to the yokes to swing horizontally, and means for utilizing both the horizontal and the vertical movements.

3. A governor having a rotated frame, a lever mounted thereon with a substantially universal joint and carrying a weight at its outer end, and a cam at the inner end of said lever in engagement with the valve-stem to operate the same by the vertical movement of the weight and adapted also to operate the stem by the horizontal movement of the weight.

4. In a governor, the combination with a valve-stem, of a frame adapted to rotate about the same, yokes pivoted to the frame so as to move vertically, balls carried by laterally-moving arms pivoted to the yokes, springs connecting the balls with the yokes, and means connecting the arms with the valve-stems to operate the same when the balls change their relation with the yokes laterally or move vertically.

5. In a governor, the combination with a valve-stem, of a frame adapted to rotate about the same, pivoted yokes carried by the frame, laterally-swinging arms pivoted to the yokes and carrying the balls, a head on the valve-stem with an annular groove, cams on the inner ends of the arms and playing in the groove, and springs connecting the balls with the yokes.

6. A governor having its weights pivoted upon the rotated frame eccentrically to the

same, and means for utilizing the momentum of the weights to operate the valve-stem when the rotary movement is varied.

7. A governor having its weights pivoted on lines radial to the valve-stem and at a point eccentric thereto, and springs for retaining the weights in normal position.

8. In a governor for engines, the combination with a valve-stem, of weights adapted to revolve around the stem, rotating means carrying the weights, springs attached to the weights and the rotating means and adapted to hold the weights normally in equilibrium, and means interposed between the stem and the weights whereby any change in the relation of the weights with the rotating means moves the stem while the springs tend to restore these parts to their normal relationship.

9. In a governor for engines, the combination with a valve-stem, of weights whose action is controlled by centrifugal force and gravity and the interruption of their momentum, and means connecting the weights with the stem to produce an accelerated movement of the latter when the rotation of the weights is interrupted.

10. In a governor for engines, the combination with a valve-stem, of weights and cams shaped to produce an accelerated movement of the valve-stem as the weights are shifted from their normal positions.

Signed at Brooklyn this 19th day of October, 1904.

CHARLES GRANT.

Witnesses:

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