

No. 859,387.

PATENTED JULY 9, 1907.

O. JUNGREN.
CENTRIFUGAL EMERGENCY GOVERNOR.

APPLICATION FILED DEC. 3, 1906.

2 SHEETS—SHEET 2.

Fig. 6

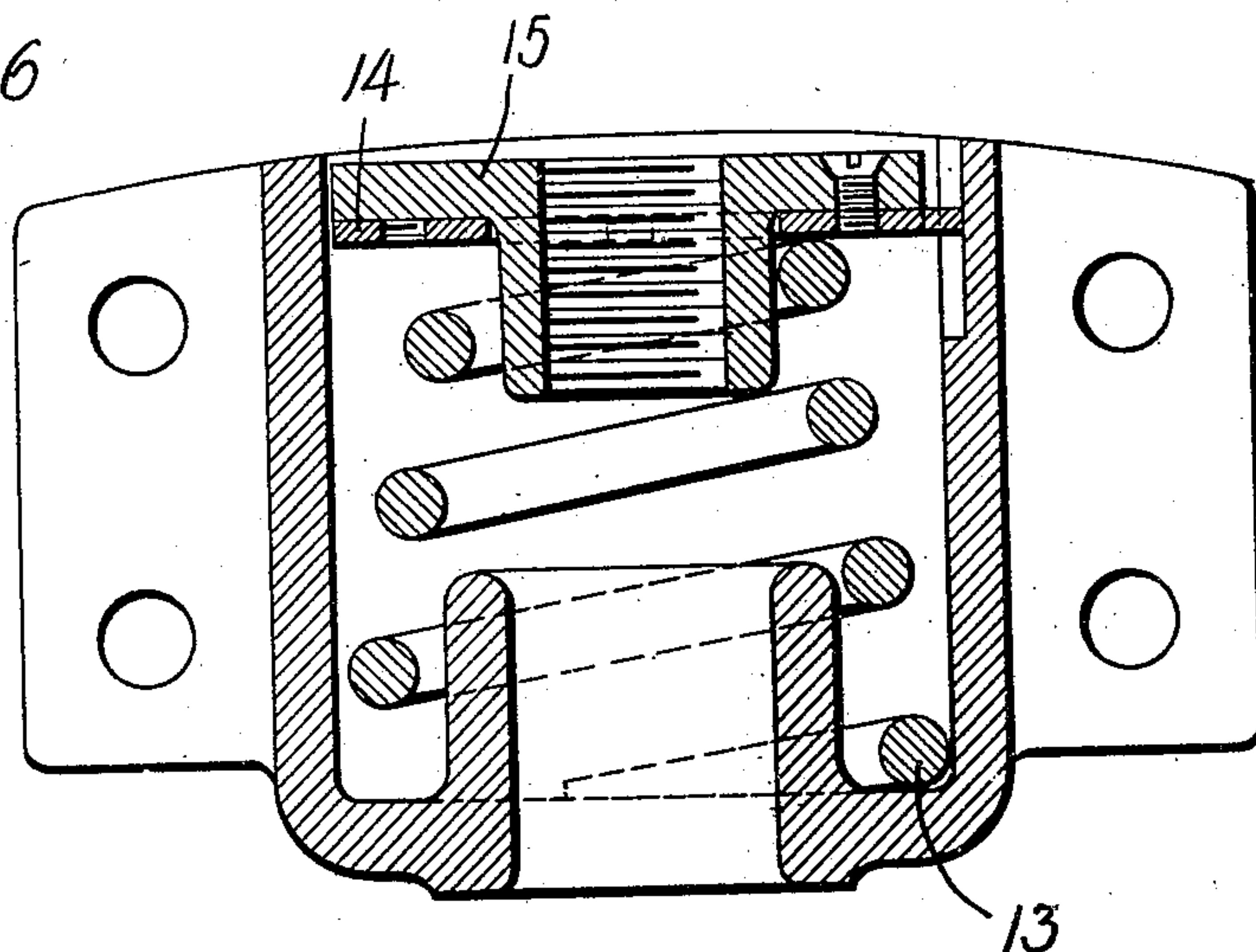
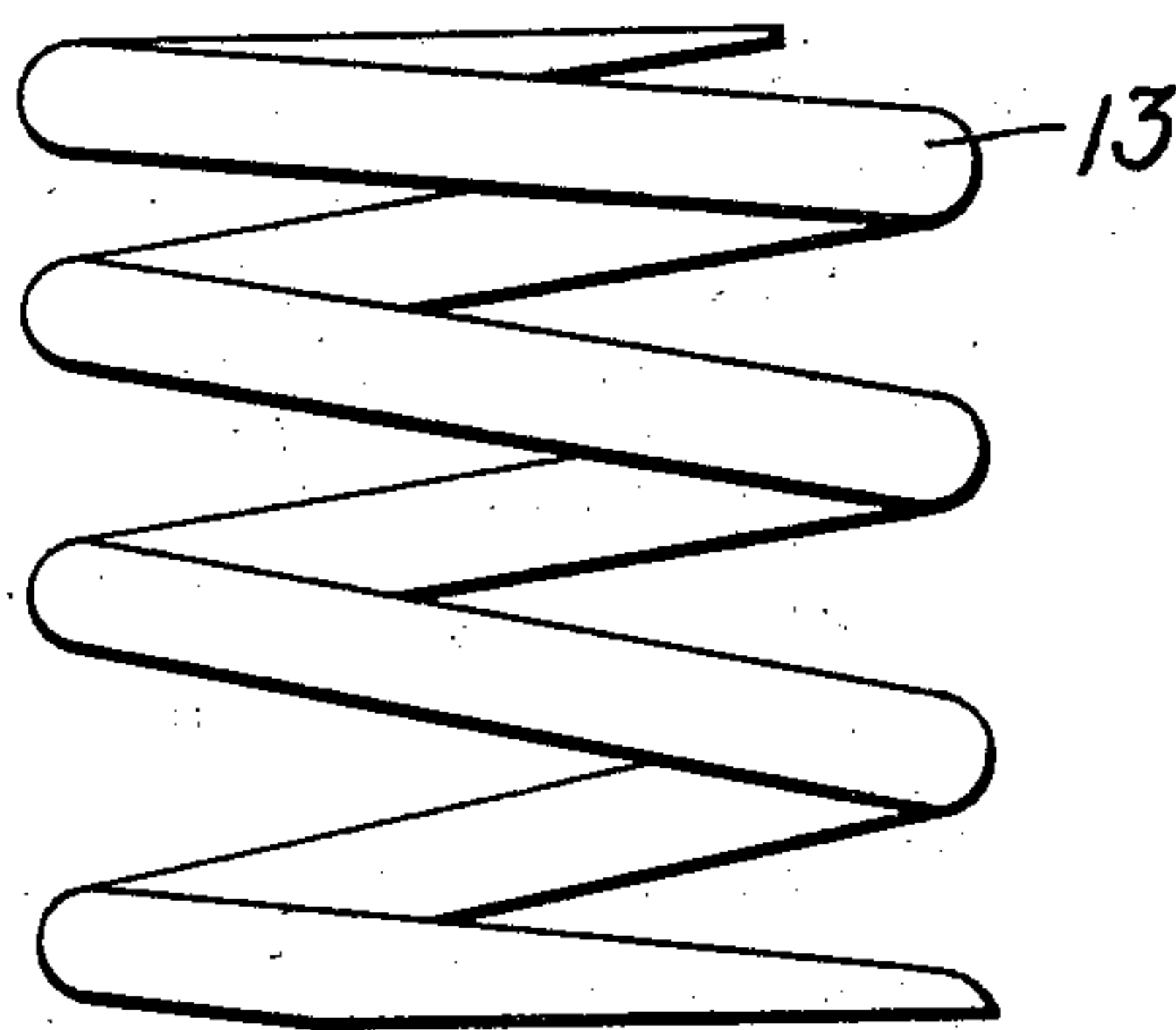


Fig. 5



Witnesses:
Benjamin B. Hill
Margaret E. Hooley

Inventor:
Oscar Junggren
By *Almon B. Davis* Att'y.

UNITED STATES PATENT OFFICE.

OSCAR JUNGREN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CENTRIFUGAL EMERGENCY-GOVERNOR.

No. 859,387.

Specification of Letters Patent.

Patented July 9, 1907.

Application filed December 3, 1906. Serial No. 346,047.

To all whom it may concern:

Be it known that I, OSCAR JUNGREN, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Centrifugal Emergency-Governors, of which the following is a specification.

The invention relates to centrifugal governors comprising a ring-shaped weight mounted slightly eccentric to the driving shaft and arranged to increase the eccentricity against the action of a spring and actuate a regulator when the speed increases beyond a predetermined point.

It also relates to the mechanism controlled by the governor for releasing a shut-off valve.

One object of my invention is to improve the construction of governors of the type mentioned whereby they are easier to balance, and further, by simplifying and cheapening their construction, and also by so arranging the parts that the governor can be applied to or removed from a shaft with the minimum expenditure of labor.

A further object is to improve the construction of the valve-releasing mechanism actuated by the governor.

In the accompanying drawing, which illustrates one embodiment of my invention, Figure 1 is a transverse section of a turbine shaft showing the governor mounted in place; Fig. 2 is a view in section of the spring and also the guide-pin case; Fig. 3 is a view in elevation of the same; Fig. 4 is a detail view of a suitable valve arranged to co-operate with the governor; and Figs. 5 and 6 are views of springs.

1 represents the driving shaft which may be the main shaft of a turbine or other engine or a low-speed governor shaft driven thereby. Surrounding the shaft is a split collar 2, the said collar being clamped to the shaft by the bolts 3. In addition to this, screws 4 are provided that enter the shaft and prevent the collar from turning independently thereof. The collar is also provided with tapped openings, the members of which are situated diametrically opposite. These openings are arranged to receive the guide-pin 6 and the spring-pin 7. I may provide a number of pairs of openings so that these pins can be mounted in the ring in such a position as to render the parts readily accessible for the purpose of inspection or repair, and also to permit of the valve-actuating member being located at the most convenient and accessible point.

Surrounding the collar and supported by the pins 6 and 7 is a ring 8 that forms the moving member or weight of the governor. The path of movement of the weight is transverse to the axis of the shaft. The ring is guided at two points on opposite sides of the shaft by the flanges on the split collar. It is made in two parts 9 and 10 to facilitate assembling and removing

the governor from the shaft. The parts of the ring are united on one side of the shaft by the spring case 11, the latter having slotted slugs on opposite sides to receive the ends portions of the parts of the ring. In each of these lugs are formed two or more holes to receive retaining screws or rivets for holding the parts together. The outer surface of the spring and guide cases may with advantage be made hexagonal or of some other irregular shape having projections such as 12 that can be chipped off if necessary to balance the parts of the governor. Located within the spring case and resting on the inner end thereof is a compression spring 13. The outer end of the spring engages a washer 14 which is seated on the nut 15, the latter being screw-threaded to the pin 7. On the pin 7 is an adjusting nut 16 arranged to limit the inward movement of the governor ring 8. By changing the position of this nut, the critical speed at which the governor will act can be changed. It is preferable to locate the inner end of the spring 13 as near to the axis of the shaft as possible in order to reduce to a minimum the effects on said spring due to centrifugal force.

The opposite ends of the parts of the ring are united by the guide case 17, the latter having slotted projections on opposite sides to receive the adjacent ends of the parts of the ring. The guide and parts of the ring are suitably united by screws or rivets. The guide 17 is bored centrally to receive the guide-pin 6 and may be provided with a hardened bearing surface. By preference the spring case 11 and the guide case 17 have the same weight, so as to facilitate the balancing of the governor. Ordinarily these parts will be weighed separately and metal added to or taken from one of the parts until they are both exactly alike. For example, in order to add weight a screw-threaded plug can be inserted in the guide case. The center of the ring 8 is located eccentric to the axis of the shaft. In the present instance the center of the ring is offset one-sixteenth of an inch from the center of the shaft when the parts are stationary, but this can be increased or decreased to meet the conditions of service. The ring moves outwardly when the speed of the shaft exceeds a predetermined limit and the centrifugal force exerted by the ring due to the unbalanced arrangement overcomes to a greater or less extent the stress of the spring 13.

The periphery of the ring is turned smooth, and located at a point adjacent thereto and engaging the periphery is a lock-releasing lever 19. The lever 19 is substantially U-shaped and is pivotally supported in the standard 20, the latter being secured to or forming a part of the wheel casing of the turbine or other support. Cooperating with the lever is a rod 21 moving in a suitable guide 22 carried by the standard. This rod may act on the shut-off valve 23 either by a push or a pull as desired. In the present arrange-

ment the right-hand end is attached to a bell-crank lever 24, the latter being pivotally supported by the upright arm 25 on the valve casing. Mounted on the arm is a second bell-crank lever 26 mounted above the first and normally occupying the position shown in Fig. 4. A spring or equivalent motive device 27 urges the rod 21 to the right at all times. The tendency of the rod to move is normally prevented by a locking device. In the present embodiment this device comprises a member 28 on the rod and a trigger 29 which for convenience and simplicity is mounted on the lever 19. The rod 21 in this case is normally under tension. Mounted on a sleeve carried by the arm 25 is a latch 30 which normally supports the weight 31 and is held in the position shown by the spring 32. When the weight drops it collapses the toggle 33 a half of which is shown, and shuts the valve. The valve is opened by suitable means which need not be specifically described.

The action of my improved mechanism is as follows: When the speed of the main or governor shaft as the case may be reaches a predetermined point the ring will travel in the path indicated by the broken-and-dotted line. This causes the lever 19 to release the trigger and the rod 21 moves to the right under the action of the spring 27. The end of the upper bell-crank lever shown in dotted lines will then strike the end 34 of the latch which holds the weight, moving it toward the valve spindle and causing the opposite end to release the weight permitting the same to fall and close the valve. Between the end of the lever 26 and the lower end of the latch is a short space forming a lost-motion so that the upper end of the lever 26 will strike the latch with a hammer blow and insure its operation. This action also moves the end of the lever 19 out of the path of the weight and the member 28 riding on the trigger and extension of the lever supporting it holds the lever 19 out of the path of the weight, thus preventing successive blows to the valve-releasing mechanism. It will be noted that the releasing of the weight is accomplished by the spring 27, and that the latter is restrained from acting by the trigger 29. Various modifications of this will readily suggest themselves to those skilled in the art, and may be incorporated without departing from my invention.

For the purpose of illustration the valve is shown in elevation instead of in plan which would be the natural arrangement with the vertical governor shaft shown.

Attention is directed to the arrangement of the spring 13; since it forms an important feature of the invention. The pin 7 is threaded to the collar after which the inner end is upset to prevent it from working out. On the outer end of the pin is an adjustable nut 15 for varying the tension of the governor spring. It will thus be seen that the centrifugal effect due to the weight of the spring is taken care of by the collar on the shaft and not by the ring or weight member so that in balancing the latter the spring does not have to be considered. The spring is of the compression type so that if it breaks only the effect of one turn is lost and not the whole spring which would render the governor inoperative. In order to compensate for the weight of the pin, spring and adjusting nuts 15 and 16, the guide pin 6 is located diametrically opposite, and in addition I add metal either by making the collar

itself slightly heavier on the side opposite the spring, or the collar may be provided with screw-threaded holes to receive one or more plugs for balancing purposes. This construction also results in bringing the spring close to the shaft where the centrifugal effects thereof are minimized. With a construction of this kind the effects of centrifugal force on the turns of the spring act accumulatively; that is to say, the force due to one turn is transferred to the next and from that to the next succeeding turn and so on. This causes the larger part of the outer turn to rest against the washer 14 adjacent the nut 15, thereby causing the effect of a turn or a part of a turn to be lost. To overcome this I arrange the spring in such manner that the effect of the turns successively increase. This may be done in a variety of ways of which two are shown in Figs. 5 and 6. In the first-mentioned figure the turns are more widely separated at the outer than at the inner end. In the last-mentioned figure the same effect is obtained by making the spring conical. I may use round, square or other suitably shaped stock for this purpose. In Fig. 6 it will be seen that the washer under the adjusting screw is provided with a tongue which enters a groove in the bore of the spring-containing case. The washer is provided with a number of threaded holes. After the nut is adjusted a screw is inserted through the nut into the washer and the tongue on the latter will prevent the parts from turning accidentally and thereby changing the effective speed at which the governor operates.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

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

1. In a governor of the character described, the combination of a rotating shaft, a divided ring surrounding the shaft and eccentrically located with respect thereto, devices for uniting the parts of the ring, a spring for opposing the eccentric movement of the ring, and a guide for the ring.
2. In a governor of the character described, the combination of a shaft, a divided ring surrounding the shaft and forming the movable weight, means for uniting the parts of the ring, a guide-pin and spring mounted in one of said means, and a guide-pin mounted in the other of said means.
3. In a governor of the character described, the combination of a rotating shaft, a split collar mounted thereon and having holes therein, pins mounted in the holes which act as guides, one of said pins also acting as a fixed abutment for a spring, a divided ring surrounding the collar, spring and guide cases for uniting the parts of the ring, and a spring located within one of the cases, the said pins entering the cases.
4. In a governor of the character described, the combination of a shaft, a divided ring surrounding the shaft, which is eccentrically disposed with respect thereto, a spring case for uniting the adjacent ends of the parts of the ring, a guide case for uniting the other ends of the parts of the ring, a spring located within the spring case and as near to the axis of the shaft as possible to minimize the effects of centrifugal force, a means for adjusting the tension of the spring, and a guide-pin for the ring situated on the side of the shaft opposite the spring and entering the guide.

5. In a governing mechanism of the character described, the combination of a shaft, a divided ring surrounding the shaft and forming an eccentrically-disposed weight member, spring and guide cases oppositely located and having slotted lugs for uniting the parts of the ring, a guide-pin secured to and rotating with the shaft which enters one of the cases, a second pin also secured to the shaft and entering the other case, and a spring located in one of the cases and acting through the pin therein to oppose any increase in the eccentricity of the weight member.

6. In a governing mechanism, the combination of a shaft, a flanged collar mounted thereon, a divided ring eccentrically mounted with respect to the shaft, members for uniting the parts of the ring which are of substantially equal weights, guides for the ring formed on the collar, and a spring for opposing any increase in the eccentricity of the ring.

7. In a governor of the character described, the combination of a split ring eccentrically located with respect to the governor shaft, means for uniting the parts of the ring which are provided with projections that are adapted to be chipped off to balance the ring, and a spring for opposing the increase in eccentricity of the ring.

8. In a governor of the character described, the combination of a support driven by a shaft, a ring-shaped weight surrounding the shaft and divided into parts, cases for uniting the ring, guide-pins located in the cases, a spring located in one of the cases for opposing the tendency of the ring to move to an eccentric position with respect to the shaft axis, and a means for adjusting the tension of the spring located within the spring-containing case.

9. In a governor of the character described, the combination of a ring surrounding a shaft and eccentrically located with respect thereto, a spring opposing the tendency of the ring to assume a position of greater eccentricity, a pin which is carried by the shaft and enters the ring, a nut on the pin between the ring and the shaft which regulates the speed at which the ring becomes effective to perform work, and a second nut also on the pin for adjusting the effective action of the spring.

10. In a governor of the character described, the combination of a shaft, a divided ring eccentrically located with respect to the shaft, means uniting the parts of the ring, a spring opposing the tendency of the ring to as-

sume a position of greater eccentricity, and a pin carried by the shaft, which supports the spring and receives the stresses thereon due to centrifugal force.

11. In a governor of the character described, the combination of a shaft, a ring which surrounds the shaft and occupies an eccentric position, and a coiled spring which opposes the tendency of the ring to assume a position of greater eccentricity, the said spring being so constructed and arranged that the effective action of the turns increases from one end to the other.

12. In a governor of the character described, the combination of a shaft, a ring which surrounds the shaft and occupies an eccentric position, and a coiled spring which opposes the tendency of the ring to assume a position of greater eccentricity, the said spring having its turns more widely spaced at the outer than the inner end.

13. In a governing mechanism, the combination of a speed governor, a valve, an actuator for closing the valve, a device which normally prevents the actuator from acting, a means which tends at all times to move the device, and a rod in tension which holds the means from operating and is released by the speed-responsive device.

14. In a governing mechanism, the combination of a speed governor, a valve, an actuator therefor, means normally preventing the actuator from operating, a controlling mechanism for the actuator including a spring, a longitudinally movable rod and a lost-motion connection, a governor-actuated latch which releases said mechanism, and a means for holding the latch out of the path of the governor after the actuator is released.

15. In a governing mechanism, the combination of a governor, a valve, a weight for closing the valve, a latch restraining the weight, a spring acting through a lost motion to release the latch, a rod in tension and connecting means to hold the spring under stress, a trigger for releasing the rod and spring to permit the latter to work, a means actuated by the governor to release the trigger, and a device to keep the means out of the path of the governor after being struck thereby.

In witness whereof, I have hereunto set my hand this 28th day of November, 1906.

OSCAR JUNGREN.

Witnesses:

ALEX. F. MACDONALD,
BENJAMIN B. HULL.