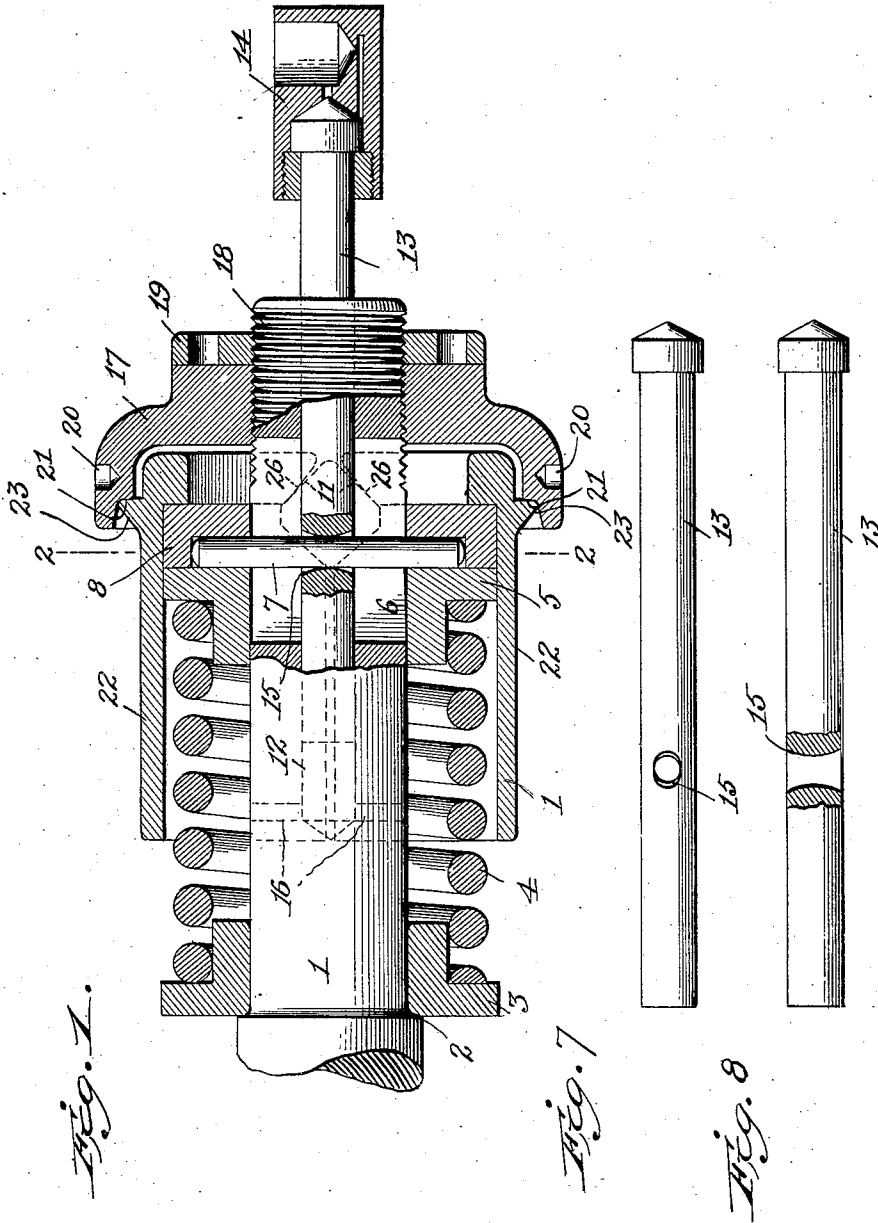


C. V. KERR.
SPEED GOVERNOR.
APPLICATION FILED APR. 9, 1906.

2 SHEETS—SHEET 1.

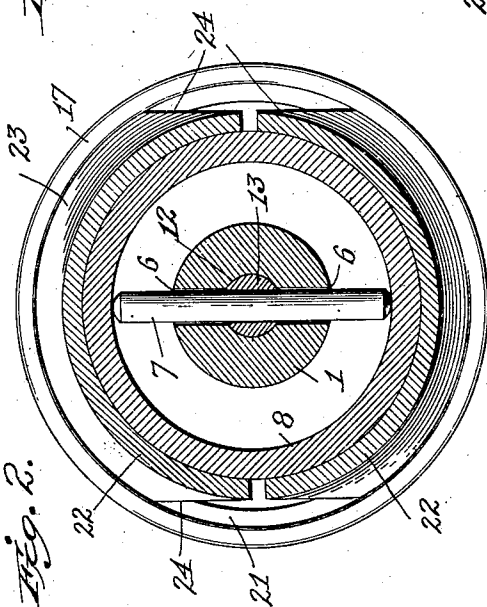
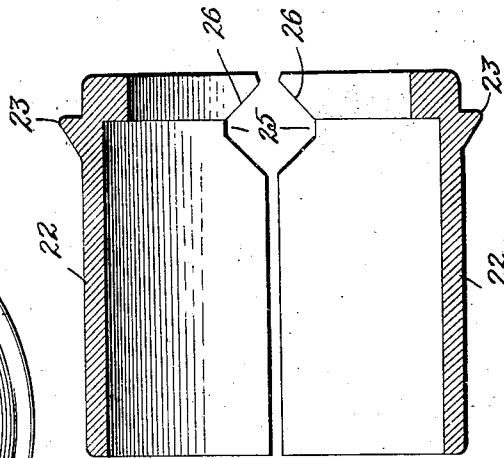
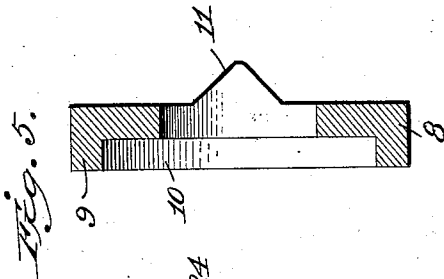
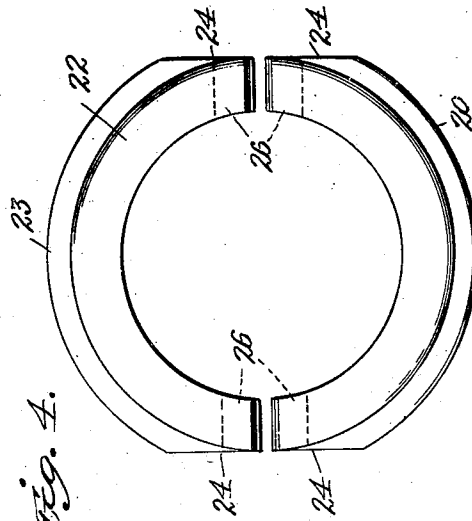
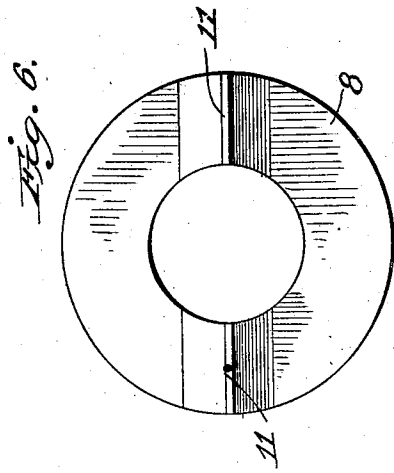


Witnesses
Edwin L. Jewell
J. R. Martin.

Inventor
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 By *W. C. Schornborn*
 Attorney

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2 SHEETS—SHEET 2.



Witnesses
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Fig. 3.

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UNITED STATES PATENT OFFICE.

CHARLES V. KERR, OF WELLSVILLE, NEW YORK, ASSIGNOR TO KERR
TURBINE COMPANY, OF WELLSVILLE, NEW YORK, A CORPORATION
OF NEW YORK.

SPEED-GOVERNOR.

No. 852,882.

Specification of Letters Patent.

Patented May 7, 1907.

Application filed April 9, 1906. Serial No. 310 730.

To all whom it may concern:

Be it known that I, CHARLES V. KERR, a citizen of the United States, residing at Wellsville, in the county of Allegany and State of New York, have invented certain new and useful Improvements in High-Speed Governors for Steam-Turbines, of which the following is a specification.

My invention relates to automatic governing mechanism for engines, and more especially to those intended for use with elastic fluid turbines, as shown, for example, in my Patent No. 798,105, dated Aug. 29, 1905, and a modification of the structural features and relative arrangements of the form of governor shown in my prior patent No. 801,322, dated October 10, 1905.

The objects of my invention are to construct an automatic governor for elastic fluid turbines in which the running parts are in perfect balance and the arrangements of bearings for the centrifugal weights and the cooperating parts of the governor are such as to form at all times a pure rolling contact on the line joining the centers of motion of the centrifugal weights. Other evident advantages of construction and relation of the parts comprising the device whereby a governor is provided which has great durability and at the same time reliability, in that the parts are entirely free from sticking, and most sensitive in its operation.

The invention consists of features of construction and relation of elements which will be hereinafter more particularly described and pointed out in the appended claims.

In the accompanying two sheets of drawing, in which similar reference characters indicate the same parts in the several views, Figure 1 is a view of the outer end of the turbine shaft, showing in longitudinal section the improved form of governor. Fig. 2 is a transverse section on line 2—2 of Fig. 1. Fig. 3 is a central longitudinal section of the centrifugal weight halves detached from the turbine shaft. Fig. 4 is an end view of the centrifugal weight below looking from the right of Fig. 3. Fig. 5 is a central longitudinal section of the outer collar which cooperates with the centrifugal weight halves. Fig. 6 is an end view of the collar shown in Fig. 5. Figs. 7 and 8 are views of the governor spindle which is inserted in the central core of the turbine shaft.

Referring to Fig. 1 of the drawings, 1 represents the outer end of a shaft to which is attached, on the section within the casing, the rotor element of the turbine (not shown, as it forms no essential part of the present invention). Said shaft end is preferably turned down so as to form an inner flange or offset 2, against which abuts the collar 3, forming an inner stop for a spring 4. Inserted over the end and surrounding the shaft 1 is a coil-spring 4, which has its inner end seated against the stop collar 3 and its outer end abutting against an outer collar 5 movable on the shaft 1. These two collars 3 and 5 are preferably constructed and arranged with flanges or circular extensions so that the coil spring 4 is firmly supported between them and entirely free from the shaft and capable of being compressed when the collar 5 is moved toward the collar 3, as clearly shown in Fig. 1. 6 is a transverse radial slot near the outer end of the shaft of such a width as to receive a spindle pin 7 and of a length to permit the pin 7 to have sufficient movement when acted upon during the action of the centrifugal weights to be hereinafter described. Said pin 7 is of such a length that its ends project through the outer edges of the slot 6 of shaft 1 and bear against the outer side of the movable collar 5. Another movable collar 8 is slipped over the end of the shaft, having on its inner side a peripheral flange 9, thereby forming a central cup-shaped section 10 of the same diameter as the length of the pin 7, while the outer side of the collar 8 is provided with V-shaped radial extensions 11 (see Figs. 5 and 6) which form inclined cam bearing or rolling contact surfaces with the centrifugal weight halves to be presently described. 12 is a spindle hole in the axis of the shaft in which snugly and slidingly fits the governor spindle 13. Said spindle 13 extends a short distance from the end of the shaft and has its outer end provided with any suitable means 14 for connecting it with the levers or arms which control the position of the valve for regulating the admission of the motive fluid, — as indicated, for example, in my former patent No. 801,322, dated October 10, 1905, — which means forms no essential part of my present improvements. 15 is a hole in the governor spindle 13 and is of such a diameter and position as to receive the spindle pin 7,

passing through the radial slot 6 in the shaft 1. 16 are small holes drilled at right angles to the axis of the shaft which connect the bottom of the governor spindle hole 12 with the outside for the purpose of relieving the air cushion which would otherwise form at the bottom of the hole 12 when the governor spindle 13 is reciprocated back and forth during the operation of the governor. 17 is an adjustable governor cup which is firmly secured to the end of the shaft by engaging the screw threads 18 at the outer end of shaft 1. 19 is any suitable lock nut for securely locking said governor cup 17 to the shaft after it has been properly adjusted for the conditions under which the turbine is desired to be operated; and 20 are small holes drilled in the governor cup near its periphery, which are adapted to be engaged by a spanner or other suitable tool for the purpose of adjusting the governor cup after being unlocked on the threads 18. 21 is a circular flange or shoulder on the innerside and near the outer edges of the governor cup 17. 22, 22 are the governor weight halves, each of which is semi-circular in cross section and provided with an outer peripheral extension or flange 23, which is cut away on diametrically opposite sides at 24, as will be more clearly seen and understood by reference to Figs. 2 and 4. At the end of each of the governor weight halves having the extension 23 a U-shaped section 25 is cut away, whereby is formed on each of the governor weights, and at diametrically opposite sides, a cam surface 26 which is adapted to bear on the V-shaped projections or inclined cam bearing surfaces 11 on the governor collar 8.

By referring to Fig. 1, it will be seen that the governor weight halves, constructed as above explained, are arranged and adjusted between the collar 8 and the cup 17, so that the peripheral extensions or flanges 23 have a bearing on the circular shoulder 21 on the inner side of the cup 17, and the cam surfaces 26 on the V-shaped projections or cam bearing surfaces 11 of collar 8. Said cam surfaces 26, and the cam bearing surfaces 11, are laid out geometrically in order to get a pure rolling contact on the collar 8 as the governor weights fly out or return during the operation of the governor. The kinematic condition for pure rolling contact which is vital to the sensitive running of the governor requires that the points of contact between the cam surfaces 26 and the cam bearing surfaces 11 should always be on a line joining the centers of motion of the moving parts, which condition is most efficiently carried out in the present improved governor and forms one of the most important features of this invention.

The manner of assembling the various parts of the governor is by first slipping over the reduced outer end of the shaft 1 the collar 3 until it rests or abuts against the offset 2;

then the coil spring 4 is slipped on, followed by the collar 5, when these parts will assume the positions indicated in Fig. 1. After the collar 5 is placed in position, the governor spindle 13 is inserted in the spindle hole 12 in the axis of the shaft and so adjusted that its hole 15 registers with the radial slot 6 in the end of the shaft, when the spindle pin 7 may be readily inserted. After this the movable collar 8 is placed in position, followed by the governor weight halves 22, 22, which are held by hand in such a position as to surround the collar 8, and have their cam surfaces 26 rest against the inclined bearing surfaces 11 of said collar 8. While the governor weight halves 22, 22 are so held in position, the governor cup 17 is then screwed up on the threads 18 by means of a spanner tool engaging the holes 20, until the shoulder 21 engages the semi-circular extension or flange 23 on each of the governor weight halves 22. The governor cup is then screwed up and by means of the construction and relative arrangement of the foregoing described parts, the extension of the coil-spring 4 is reduced by being compressed between the fixed collar 3 and the movable collar 5. After the spring 4 is sufficiently compressed to correspond to the required force to regulate and resist the flying out of the governor weights when under centrifugal action due to the rapid rotation of the shaft, the nut lock 19 is screwed in position to firmly lock and hold the cup in its adjusted position and retain the rapidly revolving governor parts on the shaft.

The operation of my invention is as follows: Assuming the parts to be arranged and adjusted in the position indicated in Fig. 1, the shaft 1 being rapidly rotated by the action of the motive fluid on the rotor element of the turbine (not shown) the centrifugal force acts on the governor weight halves 22 and throws them out and causes their outer flanges 23 to react against the fixed cup 17 and their cam surfaces 26 to press against the inclined bearing surfaces 11 and force the movable collar 8, pin 7, collar 5, and governor spindle 13 toward the left against the action of the coil spring 4. The cam surfaces 26 and bearing surfaces 11 are at such an angle to each other and kinematically related so as to be in pure rolling contact at all positions of the governor weight halves and corresponding adjustment of the movable collar 8. It will also be seen that by having the flattened sides or cut away sections 24, 24 on the outer flanges 23 of the governor weight halves 22, 22, the friction between the shoulder 21 of cup 17 and the flanges 23 is entirely eliminated, which would necessarily follow should such flanges extend entirely around the said weights.

The movements of the governor spindle as above controlled by the action of the governor weights can be connected by any suit-

able and well known means to a governor valve which regulates the motive fluid to the turbine, as shown, for example, in my former patent No. 801,322, or other expedients, as will be readily suggested to those skilled in the art, such means forming no essential feature of my present invention.

From the foregoing description of the structural features, mode of assembling the different parts, and manner of operation, it will be readily seen I have devised a turbine governor in which all the parts are in perfect running balance, free from sticking while in operation, and the controlling elements of the governor moving and acting with a minimum amount of friction. Furthermore, the parts of the governor are as few as possible and can be readily assembled on the end of the shaft or disconnected therefrom with the use of only a single tool.

Various changes may be made in the specific construction of the governor and its mode of attaching to the end of the shaft, and while I have shown my preferred form, I do not care to limit myself to the specific arrangements, as they could be modified in many ways without departing from the spirit of my invention and accomplish the same results.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent is as follows:—

1. A governor for turbines or the like comprising a rotary shaft, a fixed and a longitudinally movable collar surrounding the shaft, a spring interposed between the fixed and movable collars, an axial socket in the outer end of the shaft, a governor spindle loosely seated in the socket and adapted to receive motion from the movable collar, a governor cup mounted on the end of the shaft, and centrifugal governor weight halves abutting against the cup and transmitting their motion to the movable collar and governor spindle.

2. A governor for turbines or the like comprising a rotary shaft, a longitudinally movable collar surrounding the shaft, a spring reacting against the movable collar, an axial socket in the rotary shaft, a governor spindle loosely seated in the socket and adapted to receive motion from the movable collar, a governor cup mounted on the end of the shaft, and centrifugal governor weight halves abutting against the cup and having a rolling contact bearing with the movable collar for transmitting their motion to the movable collar and governor spindle.

3. A governor for turbines or the like comprising a rotary shaft, a fixed and a longitudinally movable collar surrounding the shaft, a coil spring surrounding the shaft interposed between the fixed and movable collars, an axial socket in the outer end of the shaft, a governor spindle loosely seated in the socket

and adapted to receive motion from the movable collar, a governor cup mounted on the end of the shaft, and centrifugal governor weight halves abutting against the cup and transmitting their motion to the movable collar and governor spindle.

4. A governor for turbines or the like comprising a rotary shaft, a fixed and a longitudinally movable collar surrounding the shaft, a coil spring surrounding the shaft reacting against the fixed and movable collars, an axial socket in the rotary shaft, a governor spindle loosely seated in the socket and adapted to receive motion from the movable collar, a governor cup mounted on the end of the shaft, and centrifugal governor weight halves abutting against the cup and having a rolling contact bearing with the movable collar for transmitting their motion to the movable collar and governor spindle.

5. A governor for turbines or the like comprising a rotary shaft having a slot therein, a fixed and a longitudinally movable collar surrounding the shaft, a spring interposed between the fixed and movable collars, an axial socket in the outer end of the shaft, a governor spindle loosely seated in the socket, a spindle pin passing through and sliding in said slot of the shaft and transmitting the movement of the movable collar to the governor spindle, a governor cup mounted on the end of the shaft, and centrifugal governor weight halves abutting against the cup and transmitting their motion to the movable collar and governor spindle.

6. A governor for turbines or the like comprising a rotary shaft having a slot therein, a fixed and a movable longitudinal collar surrounding the shaft, a coiled spring surrounding the shaft and reacting against the fixed and movable collars, an axial socket in the rotary shaft, a governor spindle loosely seated in the socket, a spindle pin passing through and sliding in said slot of the shaft and transmitting the movement of the movable collar to the governor spindle, a governor cup mounted on the end of the shaft, and centrifugal governor weight halves abutting against the cup and having a rolling contact bearing with the movable collar for transmitting their motion to the movable collar and governor spindle.

7. A governor for turbines or the like comprising a rotary shaft having an axial socket, a fixed and a longitudinally movable collar surrounding the shaft, a coiled spring surrounding the shaft and interposed between the fixed and movable collars, a governor spindle loosely seated in the axial socket of the shaft and adapted to receive motion from the movable collar, a governor cup mounted on the end of the shaft and provided with an annular shoulder, and centrifugal governor weight halves each having a section of an annular projection thereon

abutting against opposite portions of the annular shoulder of the cup and having a rolling contact bearing with the movable collar for transmitting the motion of the governor weight halves to the movable collar and governor spindle.

8. A governor for turbines or the like comprising a rotary shaft having an axial socket, a fixed and a longitudinally movable collar surrounding the shaft, a coil spring surrounding the shaft and acting against the fixed and movable collars, a governor spindle loosely seated in the socket of the shaft, a spindle pin connected with the governor spindle and adapted to receive motion from the movable collar, a governor cup mounted on the end of the shaft and provided with an annular shoulder, and centrifugal governor weight halves each having a section of an annular projection thereon abutting against opposite portions of the annular shoulder of the cup and having a rolling contact bearing with the movable collar for transmitting the motion of the governor weight halves to the movable collar and governor spindle.

9. A governor for turbines or the like comprising a rotary shaft having a slot therein, a fixed and a longitudinally movable collar surrounding the shaft, said movable collar having a V-shaped bearing projection on opposite sides of the shaft, a spring interposed between the fixed and movable collars, an axial socket in the outer end of the shaft, a governor spindle loosely seated in the socket, a spindle pin passing through and sliding in said slot of the shaft and transmitting the

movement of the movable collar to the governor spindle, a governor cup mounted on the end of the shaft, and centrifugal governor weight halves each having an outer section abutting against the cup, and also with inner opposite rolling contact surfaces bearing against the V-shaped projections on the movable collar.

10. A governor for turbines or the like comprising a rotary shaft having a slot therein, a fixed and a movable longitudinal collar surrounding the shaft, said movable collar having a V-shaped bearing projection on opposite sides of the shaft, a coiled spring surrounding the shaft and reacting against the fixed and movable collars, an axial socket in the rotary shaft, a governor spindle loosely seated in the socket, a spindle pin passing through and sliding in said slot of the shaft and transmitting the movement of the movable collar to the governor spindle, a governor cup mounted on the end of the shaft, and centrifugal governor weight halves each having an outer section abutting against the cup and also with inner opposite rolling contact surfaces bearing against the V-shaped projections of the movable collar for transmitting their motion to the movable collar and governor spindle.

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

CHARLES V. KERR.

Witnesses:

A. S. McCLURE,
G. B. ROUTH, Jr.