J. H. DORAN.

GOVERNOR.

APPLICATION FILED AUG. 8, 1919.

1,411,991. Patented Apr. 4, 1922.

Fig. 1.

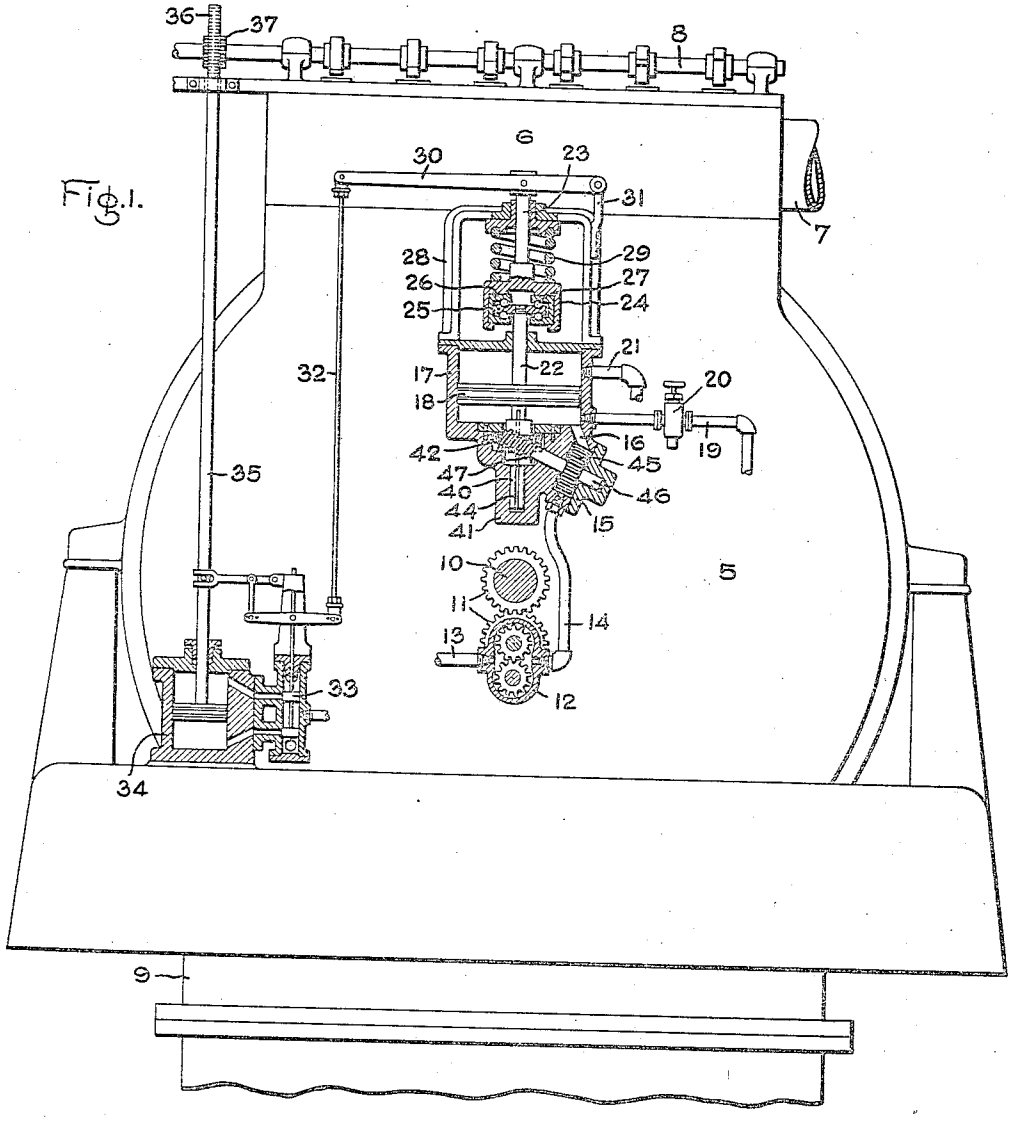
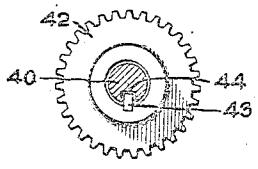


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN H. DORAN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

GOVERNOR.

1,411,991. Specification of Letters Patent. Patented Apr. 4, 1922.

Application filed August 8, 1919. Serial No. 316,227.

To all whom it may concern:

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

The present invention relates to governors such as are used to regulate the admission of elastic fluid to a prime mover, and has for its object to provide an improved structure and arrangement in an apparatus of this character.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the drawing, Fig. 1 is a diagrammatic view showing my improved governor mechanism applied to a steam turbine, although it will be understood that this is only one form of prime mover in connection with which my governor may be advantageously utilized, and Fig. 2 is a sectional view of a detail.

Referring to the drawing, 5 indicates an elastic fluid turbine upon which is mounted a valve chest 6 to which motive fluid is fed by a conduit 7. In valve chest 6 is a suitable valve mechanism controlled by turning movements of a shaft 8. The valve chest mechanism indicated is one of a well-known type and is shown only by way of example, it being understood that any suitable type of valve mechanism may be utilized. 9 indicates the exhaust outlet of the turbine which may be connected with a condenser in the usual manner, and 10 indicates the shaft of the turbine.

Driven from shaft 10 of the turbine by means of a suitable gearing 11 is a pump means 12 which may be of any suitable type which will produce on its discharge side a pressure proportional to the speed at which it is run. In the present instance a form of gear pump is shown. Connected with the suction side of gear pump 12 is a suction conduit 13 which may draw its supply of fluid, such as oil, from a tank or other source of supply (not shown). The delivery side of pump 12 is connected by a discharge conduit 14 to the lower side of a housing 15, the upper side of which is connected by a passage 16 to a cylinder 17. In cylinder 17 is a piston 18 which makes a fairly close fit with cylinder 17, and which forms a movable abutment against which fluid from the delivery side of pump 12 acts, it being clear that the delivery side of the pump is connected with the cylinder space directly below piston 18 through discharge conduit 14, casing 15, and passage 16. Leading from the cylinder space below piston 18 is a discharge pipe 19 in which is arranged a regulating valve 20 and leading from the cylinder space above piston 18 is a suitable overflow pipe 21. Discharge pipe 19 and overflow pipe 21 may lead to any suitable point such as for example the tank from which suction conduit 13 leads. Connected with piston 18 is a stem comprising two parts 22 and 23 which are connected together by a suitable coupling 24 whereby the one part of the stem may rotate relatively to the other part. In the present instance the stem part 22 has on its upper end a disk 25 which rotates in a housing 26, carried by the lower end of stem part 23. Between disk 25 and the walls of housing 26 are arranged suitable ball bearings 27. This gives practically a frictionless coupling which while it will transmit vertical movements, will at the same time permit relative rotary movements of the two stem parts. Mounted on cylinder 17 is a U-shaped frame 28 through which the upper end of stem part 23 projects and arranged between the upper part of frame 28 and housing 26 is a spring 29 which opposes upward movements of piston 18. The outer end of stem part 23 is connected to a lever 30, one end of which is pivoted to an arm 31 on frame 28 and the other end of which is connected by a link 32 to the pilot valve 33 of a servo motor 34. The stem 35 of the servo motor is provided with a rack 36 on its upper end which meshes with a pinion 37 on shaft 8. By this means oscillating movements may be given to shaft 8 to actuate the valve mechanism contained in valve chest 6. The connections between link 32, stem 35 and the servo motor are shown as comprising a usual and well-known form of follow-up device, the operation of which is well understood.

Depending from the lower side of piston 18 is a stem 40 which moves in a head 41, formed integral with cylinder 17. Connected with stem 40 and suitably located in head 41 is a worm gear 42, the connection being such that the stem can slide vertically

through the gear but must turn with it. To this end the worm gear 42 fits loosely on stem 40 as is shown in Fig. 2 and the two are connected together by a spline 43 which moves in a slot 44 in stem 40. In housing 15 is arranged a wheel 45 which may be of the general nature of a turbine wheel or vane wheel and which is adapted to be rotated by fluid passing from discharge conduit 14 through housing 15 and passage 16 to cylinder 17. Wheel 45 is mounted on a shaft 46 journaled in suitable bearings in housing 15 and on its end is provided with a worm 47 which engages with worm wheel 42 on stem 40. It will thus be seen that the turning of wheel 45 transmits rotary movements to piston 18 so that the same will be slowly and continuously rotated.

In operation the prime mover drives the gear pump 12 at a speed proportional to the speed of the prime mover and this produces on the discharge side of pump 12 a pressure which is also proportional to the speed of or the load on the prime mover. Fluid from the discharge side of pump 12 is conveyed by conduit 14 through housing 15 and passage 16 to the cylinder space beneath piston 18 and produces a pressure beneath piston 18 which will also be proportional to the speed of or the load on the prime mover. The pressure on piston 18 will move the same vertically against the action of spring 29 until a point of equilibrium is reached where the spring pressure just balances the fluid pressure. This will give a certain definite setting to the valve mechanism in the steam chest 6. If now the speed of the prime mover increases then the delivery pressure from gear pump 12 will increase with the result that piston 18 will be moved upward which movement will be transmitted to lever 30, causing the left hand end thereof to move upward; such upward movement of the left hand end of lever 30 will raise pilot valve 33 which will cause the servo motor to operate the valve mechanism contained in steam chest 6 so as to diminish the supply of elastic fluid to the prime mover and bring the speed back to normal. On the other hand if the speed of the prime mover decreases then the pressure on the delivery side of pump 12 decreases with the effect that spring 29 will force downward piston 18, thus lowering the left hand end of lever 30 which will operate through servo motor 34 to actuate the valve mechanism to increase the amount of elastic fluid admitted to the prime mover so as to bring the speed back to normal. Regulating valve 20 in discharge pipe 19 is set to permit the desired amount of leakage from beneath the piston 18 so there will be a continuous flow of fluid and such fluid as leaks past piston 18 will be led away by overflow pipe 21.

As already stated, stem 40 moves freely vertically through worm wheel 42 and such worm wheel is continuously rotated by the wheel 45 which is actuated by the fluid supplied to cylinder 17. By this arrangement piston 18 is kept in continuous rotation which overcomes the possibility of its sticking and also reduces the friction between piston 18 and the cylinder wall 17 to a minimum. The governor is thus rendered very sensitive and sure in its operation.

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 in only illustrative and that the invention may 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 governing mechanism, the combination of a cylinder member, a piston member therein, a conduit for supplying fluid under pressure to the cylinder member for moving one of said members axially relatively to the other, means for rotating one of said members relatively to the other to prevent sticking, a stem connected to the axially movable member, and a valve gear operated by said stem.

2. The combination with a prime mover, of a governing mechanism therefor comprising a cylinder member, a piston member, means for supplying fluid pressure to the cylinder member to move one of said members axially relatively to the other to perform the governing work, the pressure supplied being proportional to the speed of the prime mover, and means actuated by the fluid supplied to the cylinder member for turning one of said members relatively to the other to prevent sticking.

3. The combination with a prime mover of a governing mechanism therefor comprising a cylinder, a piston therein, means for supplying fluid pressure to the cylinder to move the piston, the pressure supplied being proportional to the speed of the prime mover, yielding means opposing the movement of such piston, and means actuated by the fluid supplied to the cylinder for rotating the piston to prevent it from sticking.

4. The combination with a prime mover having a valve mechanism, of a governing mechanism comprising a cylinder member and a piston member one of which moves in an axial direction relatively to the other to perform the governing work, means connecting the movable member to the valve mechanism, means actuated by the prime mover for creating a fluid pressure proportional to the speed of the prime mover, said fluid pressure being applied to said cylinder member to move the movable member in the

one direction, and means for turning one of said members relatively to each other to prevent them from sticking.

5. The combination with a prime mover having a valve mechanism, of a governing mechanism therefor comprising a cylinder, a piston therein, means connecting the piston to the valve mechanism to move the same, pump means actuated by the prime mover for supplying a fluid pressure to the cylinder on one side of the piston proportional to the speed of the prime mover, and means actuated by the fluid so supplied for rotating the piston in the cylinder to prevent it from sticking.

6. The combination with a prime mover having a valve mechanism, of means for regulating it comprising a cylinder, a piston therein, means connecting the piston to the valve mechanism, means driven by the prime mover for supplying a fluid to said cylinder on one side of the piston at a pressure proportional to the speed of the prime mover, a member located in the path of flow of said fluid and rotated thereby, and means connecting said rotating member to the piston to rotate such piston.

7. The combination with a prime mover having a valve mechanism, of means for regulating it comprising a cylinder, a piston therein, means connecting the piston to the valve mechanism, pump means driven by the prime mover, a conduit connecting the delivery side of said pump means to the cylinder on one side of said piston, a regulable discharge passage leading from said cylinder, a wheel member in said conduit which is rotated by the flow of fluid therethrough, and means connecting said wheel to the piston to rotate the piston.

In witness whereof, I have hereunto set my hand this 7th day of August, 1919.

JOHN H. DORAN.