C. E. LITTLE.

GOVERNING MECHANISM FOR TURBINES.

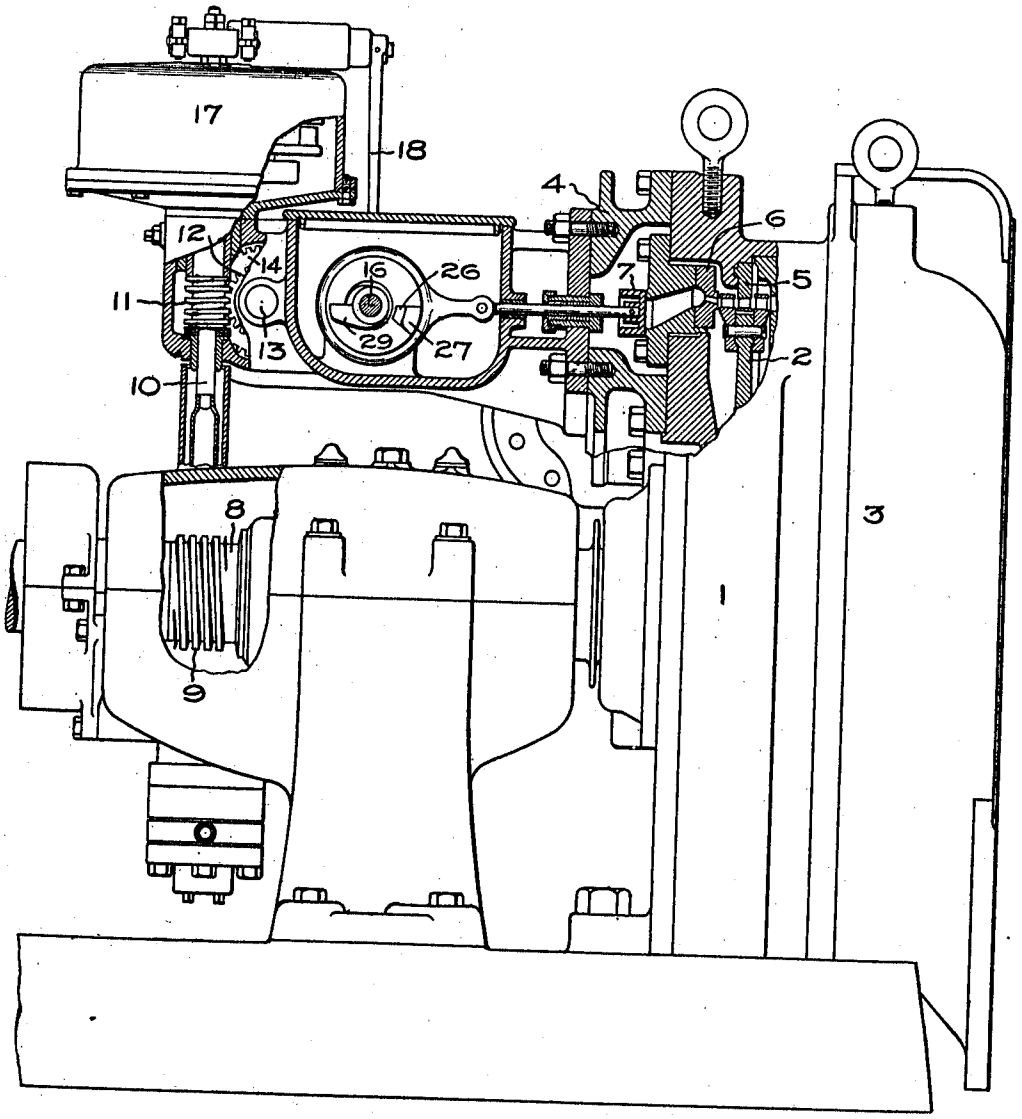
APPLICATION FILED MAY 18, 1908.

980,303.

Patented Jan. 3, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



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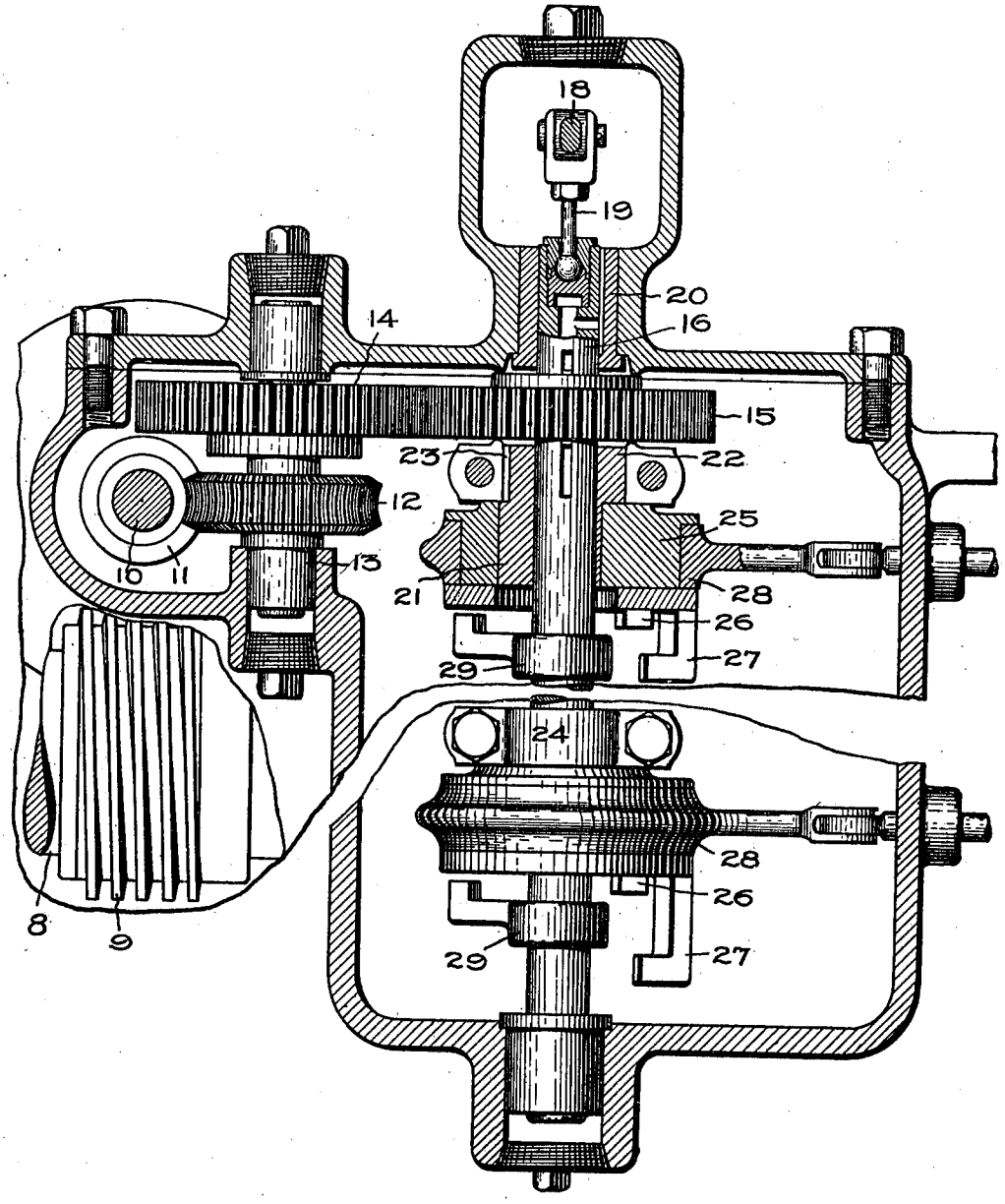
3 SHEETS—SHEET 2.

Fig. 2.



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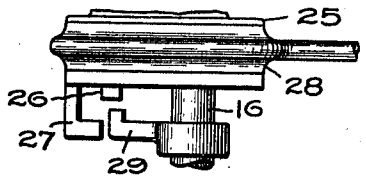
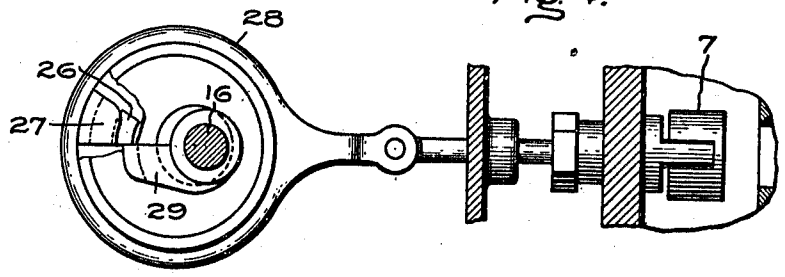


Fig. 5.

Fig. 4.



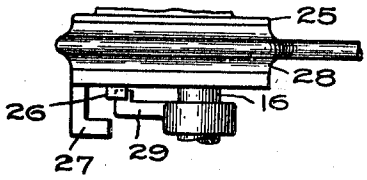
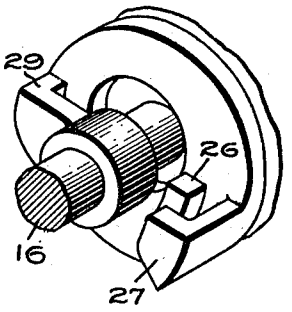


Fig. 6.

Fig. 3.



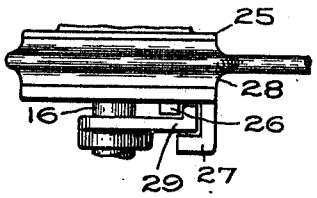
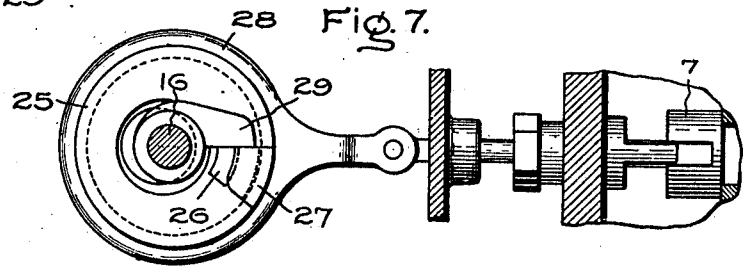


Fig. 8.

Fig. 7.



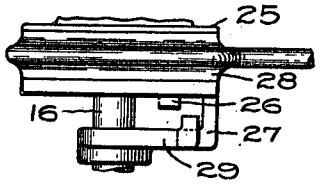


Fig. 9.

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UNITED STATES PATENT OFFICE.

CLARENCE E. LITTLE, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

GOVERNING MECHANISM FOR TURBINES.

980,303. Specification of Letters Patent. **Patented Jan. 3, 1911.**

Application filed May 18, 1908. Serial No. 433,344.

To all whom it may concern:

Be it known that I, CLARENCE E. LITTLE, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Governing Mechanisms for Elastic-Fluid Turbines, of which the following is a specification.

The present invention relates to governing mechanisms for elastic fluid turbines, and more especially to those intended for controlling the admission of steam or other elastic fluid to a turbine of the jet type, wherein the several jets are cut into and out of service successively as the demand for motive fluid increases or decreases.

The object of my invention is to provide a simple and inexpensive governing mechanism for effectively regulating a turbine of the character described, under changes in load.

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

In the accompanying drawings which illustrate one of the embodiments of my invention, Figure 1 is a view in side elevation, with certain of the parts broken away, of an impact turbine fitted with my improved governing mechanism; Fig. 2 is a horizontal section of the governing mechanism; Fig. 3 is a perspective view of one of the valve actuators; Fig. 4 is a detail side view showing one of the valves in the open position; Fig. 5 is a partial plan view showing a position of one of the actuating devices when the valve is open; Fig. 6 is a detail view showing the actuator in a position where it is about to start the closing movement of the valve; Fig. 7 is a detail view showing one of the valves in its closed position; Fig. 8 shows the relation of the parts when the valve is in the closed position; and Fig. 9 is a detail view showing the actuator in a position where it is about to open a valve.

1 indicates a turbine of any suitable construction, having one or more bucket wheels 2, inclosed in a casing 3 that is connected to a suitable source of motive fluid supply and to an exhaust conduit. It is provided with a valve chest 4 through which steam or other motive fluid is admitted. Between the rows of wheel buckets are intermediate buckets 5 for directing the passage of steam from one bucket wheel to the next. The stream is directed against the first wheel by means of a nozzle 6 containing a plurality of passages. These passages are controlled singly or in groups by separately actuated valves 7 located in the valve chest. The bucket wheels are mounted upon a shaft 8 which is provided with a worm 9 for driving the upright governor shaft 10. On the governor shaft is a worm 11 that meshes with and drives the worm wheel 12, the latter being mounted on a horizontal shaft 13.

Mounted on the shaft 13 is a gear 14 by means of which rotary motion is continuously imparted to the gear 15 that is splined on the shaft 16. This shaft, in addition to being continuously rotated, is subjected to endwise motion as the load changes due to the action of the speed governor 17. The movements of the governor weights are transmitted by the lever 18 to the rod 19, the latter being connected to the shaft 16 by a ball-and-socket joint which permits the shaft to rotate freely without affecting the position of the governor. The shaft 16 is mounted in suitable bearings 20 at each end, and surrounding the shaft with a small clearance are as many stationary eccentric sleeves 21 as there are nozzle valves. Each of these eccentric sleeves is provided with a cylindrical portion 22 that is secured in a support by a key 23 and a cap plate 24. Surrounding the eccentric portion of the sleeve is a disk or member 25 which for convenience is made in two parts. On one of the parts are two lugs or projections 26 and 27, the former being used for closing a valve and the latter for opening it. Surrounding the disk or member 25 is a strap 28 which is connected by a rod to one of the valves.

Rigidly mounted on the shaft 16 are as many actuators 29 as there are valves. Each actuator is so arranged as to engage either the lug 26 or the lug 27, depending upon the position of the shaft 16 as determined by the speed governor. In those cases where the speed of the shaft 16 is fairly high or where for any reason the shock of impact between the actuators and the lugs is greater than it should be, I may interpose yielding means between said parts to reduce the effects of the shocks.

In Fig. 4 one of the nozzle valves 7 is shown in the open position. The actuator 29 is supposed to be in the position shown in

Fig. 5, and its direction of motion is clockwise.

In Fig. 6 the parts are in the positions occupied when the valve is open and the actuator 29 is about to engage the lug 26 to close the valve. It will thus be seen that a half revolution of the actuator 29 and the disk or member 25 is sufficient to open the valve and release the lug, or to close the valve and release the lug. Owing to the fact that the lugs 26 and 27 are carried by a disk or member which is mounted on an eccentric, it follows that as the said member is rotated the distance between the lugs and the shaft axis changes. I utilize this feature to cause disengagement of the lugs and the actuator. For example, in Fig. 6 the actuator 29 is under the lug 26 and as it rotates it moves the disk or member 25 clockwise. As the disk rotates, the projections move to a position nearer the shaft axis until the active one (the closing projection in this case) passes out from underneath the end of the actuator to the position shown in Fig. 8. Under these conditions, the shaft and actuator are free to revolve without affecting the position of the valve. The same sort of action takes place with respect to the actuator 29 and the lug 27, only in this case the lug 27 gradually moves outward from under the actuator as the opening motion starts on the right-hand side of the shaft and the distance of the lug from the axis of the shaft gradually increases to a maximum at 180 degrees from the position shown when the parts are freed.

In Fig. 7 the valve 7 is shown in the closed position and the parts for actuating it are shown in a corresponding position.

In Fig. 9 the actuator 29 is shown in engagement with the lug 27 where it is in the act of opening a valve. Since it is necessary to actuate the valves successively, I change the lengths of the lugs 27 from the first to the last valve, or in other words, the axial separation between the lugs 26 and 27 increases from one end of the shaft 16 toward the other. By means of this arrangement, one actuator will open or close its valve as the case may be, and will remain idle while the succeeding actuators are performing their work one after the other.

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 governing mechanism, the combination of a valve, a shaft, a constantly rotating actuator fixed on the shaft, a valve operating means connected to and moving with the valve, a speed responsive device positively connected to the actuator for shifting the same in an axial direction to cause it to engage the valve operating means and open or close the valve, and a device for releasing the actuator when its work is performed.

2. In a governing mechanism, the combination of a valve, a shaft, a constantly rotating actuator fixed on the shaft which during a portion of a revolution opens the valve and during another portion of a revolution closes the valve, a member for transmitting motion from the actuator to the valve that is moved by said actuator in the same direction during both portions of the revolution, the parts being arranged to disengage at the end of each portion of the revolution, and a device for moving the actuator into a position to open the valve and into another position to close the valve.

3. In a governing mechanism, the combination of a valve, a shaft, an eccentric, a member connected to the valve and moved by the eccentric, a valve opening projection, a valve closing projection, both projections moving with the eccentric, an actuator fixed on and rotating with the shaft, and a governor for shifting the actuator in a direction to cause it to engage one projection or the other depending upon the load conditions.

4. In a governing mechanism, the combination of a valve, a shaft, a normally stationary member which has a long and a short projection, an actuator fixed on and moving with the shaft that engages a projection, moves it a certain distance and then releases it, and a governor which moves the shaft endwise to cause the actuator to engage a projection and move the member and the valve.

5. In a governing mechanism, the combination of a valve, a constantly rotating shaft, a member for moving the valve which is normally stationary but is mounted for rotation about an axis parallel to the axis of the shaft, a valve opening projection carried by the member for moving it through a part of a revolution, a valve closing projection carried by the member for moving it through another part of a revolution, an actuator mounted on the shaft which engages one projection at a time, moves the same through a part of a revolution and then disengages it, and a speed responsive device which moves the actuator into engagement with one projection or the other as the load changes and holds it in an inactive position when the speed remains unchanged.

6. In a governing mechanism, the combination of a valve, a constantly rotating shaft, a stationary eccentric sleeve, a disk surrounding the sleeve, projections thereon for

moving it about the sleeve, a device for communicating the motion of the disk to the valve, an actuator rotating with the shaft, and a governor for moving the actuator into engagement with one of said projections at a time for moving the disk.

7. In a governing mechanism, the combination of a valve, a shaft, a member for opening and closing the valve which moves in a plane perpendicular to the shaft, an actuating means that constantly moves in one direction, and which during substantially a half revolution engages and moves the said member and by the member is automatically disengaged at the end of its stroke, and a governor that controls the operation of the actuating means.

8. In a governing mechanism, the combination of a valve, a shaft, an actuator moved by the shaft in the path of a circle about a given axis, a member which is rotated by the actuator, a means for causing the path of the member to be eccentric to said axis, a means connected to the valve and moved by the member, the extent of movement being determined by the amount that the path of the member is eccentric to said axis, and a governor that determines the action of the actuator on the member.

9. In a governing mechanism, the combination of a plurality of successively acting valves, an actuator for each valve, a shaft upon which the actuators are fixed and which constantly rotates them, a normally stationary member for transmitting motion from each actuator to its corresponding valve, a governor, and means acted upon by the actuators to successively move the members to open and close the valves.

10. In a governing mechanism, the combination of a plurality of successively acting valves, an actuator for each valve, a shaft upon which the actuators are fixed and are constantly rotated by it, a member for each valve which transmits motion from an actuator to a valve, valve opening and closing projections carried by each member, the projections on the several members varying in length, and a load responsive device which moves the shaft and the actuators in a manner to cause the actuators to engage the said opening projections one after the other to open the valves and to engage the closing projections one after the other to close the valves.

11. In a governing mechanism, the combination of a valve, a constantly rotating shaft, a stationary eccentric sleeve adjacent said shaft, a disk rotatably mounted on the sleeve, means thereon for moving it about the sleeve, a device for transmitting motion from the disk to the valve to open and close said valve, an actuator rotating with the shaft, and a governor for controlling the action of the actuator on said means.

In witness whereof, I have hereunto set my hand this fifteenth day of May, 1908.

CLARENCE E. LITTLE.

Witnesses:
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CHARLES A. BARNARD.