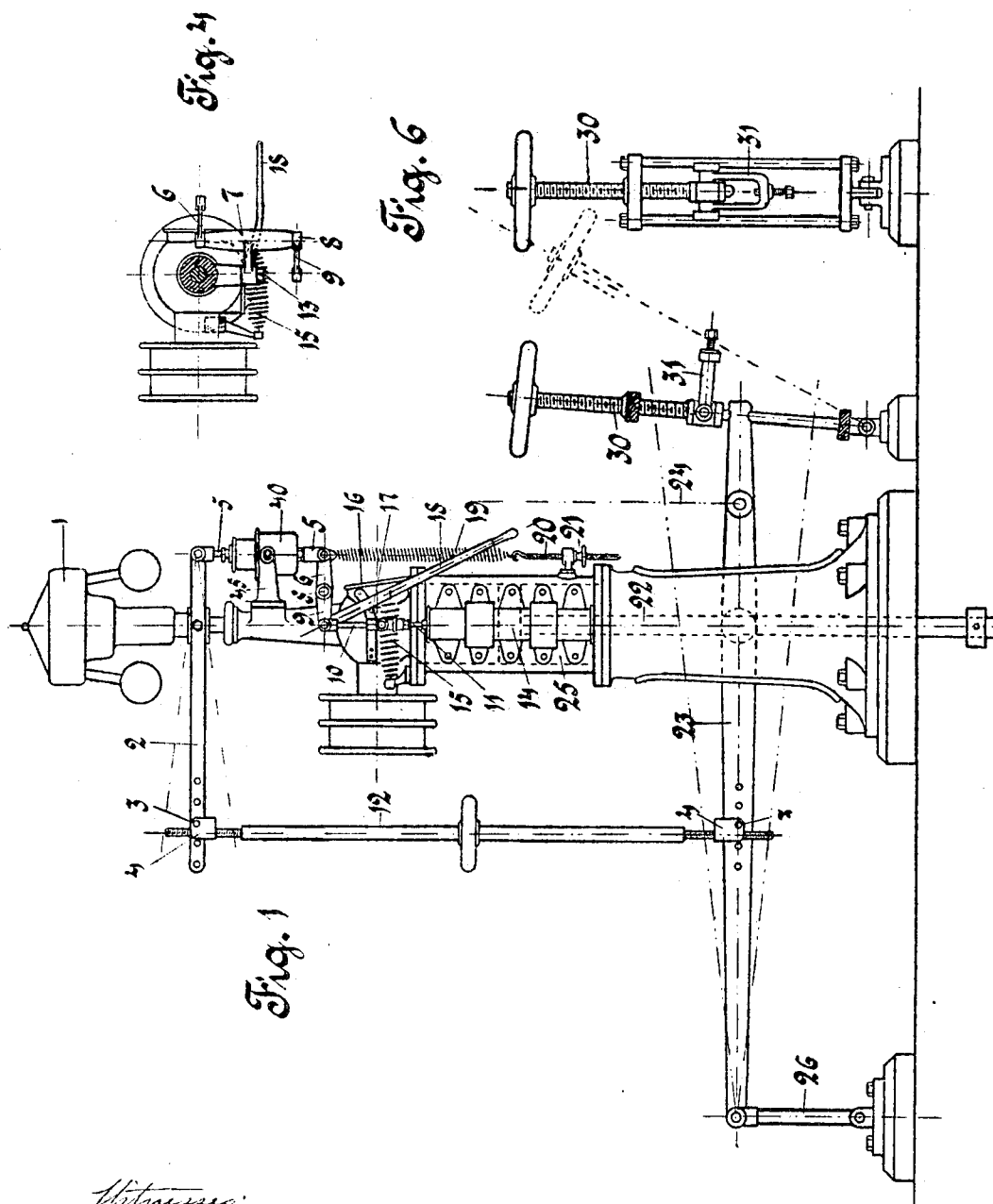


A. JOHNSON.

## HYDRAULIC REGULATOR FOR MOTORS.

APPLICATION FILED MAY 12, 1904.

**4 SHEETS-SHEET 1.**



Witnesses:

B. C. Rust:

H. E. L. Hancock.

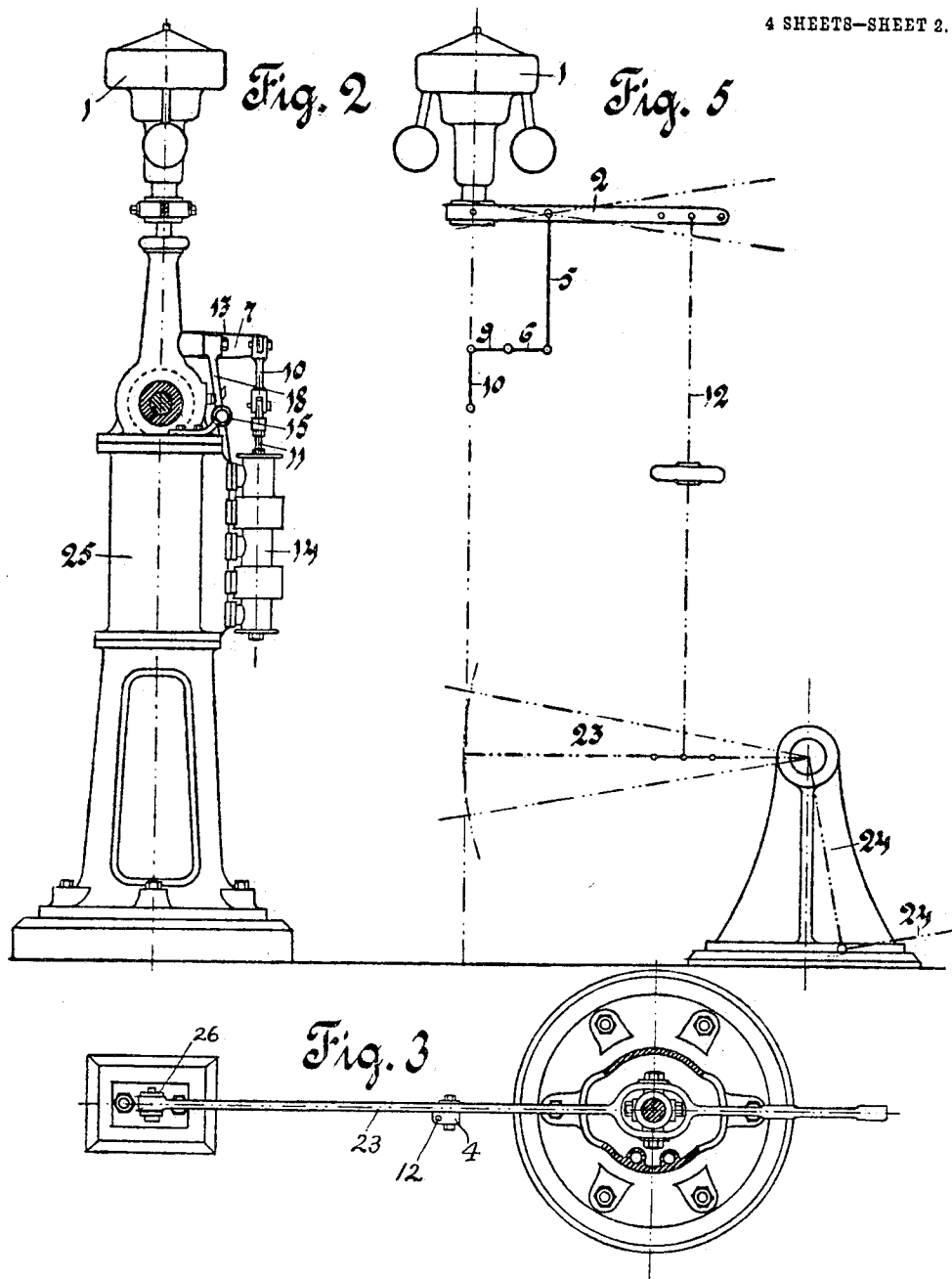
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HYDRAULIC REGULATOR FOR MOTORS.

APPLICATION FILED MAY 12, 1904.

4 SHEETS—SHEET 2.

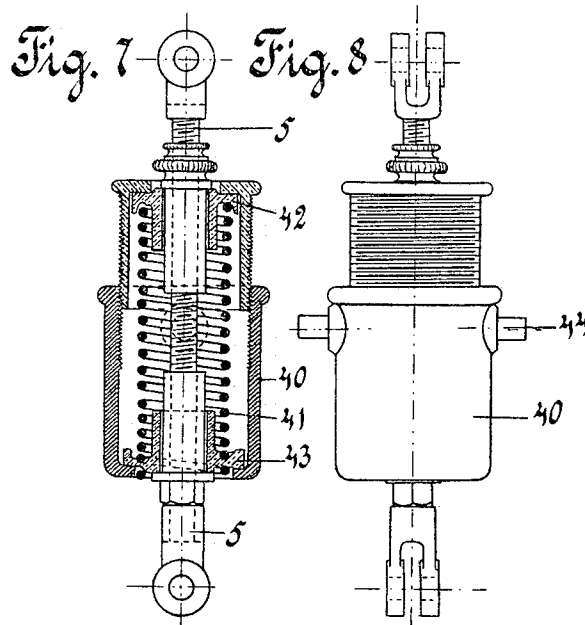
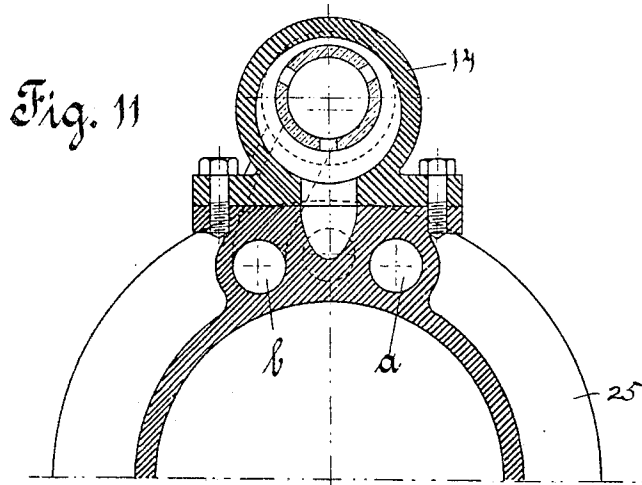


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HYDRAULIC REGULATOR FOR MOTORS.  
APPLICATION FILED MAY 12, 1904.

4 SHEETS—SHEET 3.



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No. 799,236.

PATENTED SEPT. 12, 1905.

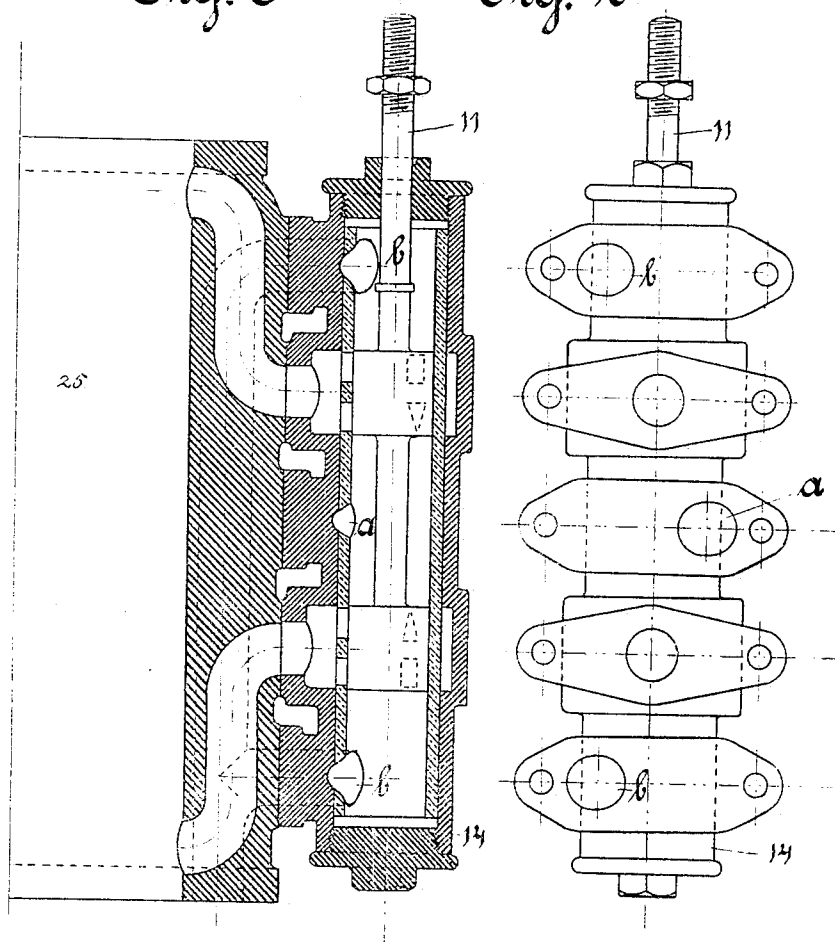
A. JOHNSON.  
HYDRAULIC REGULATOR FOR MOTORS.

APPLICATION FILED MAY 12, 1904.

4 SHEETS—SHEET 4.

Fig. 9

Fig. 10



Witnesses:

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A. E. Hansmann.

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# UNITED STATES PATENT OFFICE.

ARVID JOHNSON, OF SUNDSVALL, SWEDEN.

## HYDRAULIC REGULATOR FOR MOTORS.

No. 789,236.

Specification of Letters Patent.

Patented Sept. 12, 1905.

Application filed May 12, 1904. Serial No. 207,655.

*To all whom it may concern:*

Be it known that I, ARVID JOHNSON, a subject of the King of Sweden and Norway, residing at Sundsvall, Sweden, have invented certain new and useful Improvements in Hydraulic Regulators for Motors, of which the following is a specification.

The present invention relates to an automatic hydraulic governor for motor-engines.

The invention is described with reference to the annexed drawings, in which the complete arrangement of a governor for turbine water-wheels is shown according to the present invention.

Figure 1 is a side view of the complete governor. Fig. 2 is an end view of same. Fig. 3 is a plan section through the bottom frame, also showing the lower connecting-rod and its connection with the piston-rod of the governor. Fig. 4 is a plan view showing how the piston-rod of the valve-cylinder is connected to the connecting-rods and to the handle used in starting or stopping the turbine. Fig. 5 shows a modified arrangement of the connecting-rods, the inlets to the pressure-cylinder being arranged opposite to the arrangement in Fig. 1. Fig. 6 is a starting device for hand-power when accumulator is used to provide the necessary pressure when there is no other natural pressure. The starting device is then used to start the turbine, and thereby also the accumulator. Figs. 7 and 8 are section and side view, respectively, of a spring-brake. Figs. 9, 10, and 11 show a constructional form of the valve-cylinder in vertical section with half the pressure-cylinder, a side view, and a plan section drawn to an enlarged scale with inlet for the pressure medium at *a* and outlet for the same when used at *b*.

25 is the cylinder in which the pressure medium by the piston and piston-rod 22 and connecting-rods 23 and 24 transfers the power to the starting device of the turbine.

14 is the valve-cylinder (distributing-cylinder) by means of the valves in which the pressure medium is caused to act on the top or the bottom side of the piston in the cylinder 25.

11 is the valve-rod on which both pistons for the cylinder-ports are fixed. This valve-rod is by a link 10 connected to a lever 9, which in turn through a spindle 8, journaled in a movable bracket 7, is connected to a lever 6, which by the link 5 is connected to the rod 2, actuated by the governor-sleeve. The rod 2 is by the right-and-left-hand-threaded rod 12 connected to the rod 23, which in turn is mov-

ably connected to the piston-rod 22 for the cylinder 25, and the end of the rod 23 is journaled at the upper end of a movable link 26. On turning the rod 12 the distance between the rods 2 and 23 may be lengthened or shortened, whereby the rod 2 may be adjusted in the desired position by the different positions of the rod 23—that is to say, by the different adjustments of the inlet to the turbine.

19 is a spiral spring which through the link 5 is connected to the rod 2. The tension of this spring may be adjusted by the screw 20 and nut 21, whereby the governor may be loaded more or less and whereby the speed of the turbine may be adjusted as desired. This may be effected at any time and when the turbine is at work, a circumstance of very great importance in practice. The spiral spring is placed in the center line of the link 5 or, which is the same, in the center line of the piston-rod 11. By this arrangement any undesirable influence on the governor is avoided, the link 5 by the normal position of the governor always being at the same level by the different adjustments of the inlet to the turbine.

40 is a spring-brake attached to the link 5, which is equivalent to its being attached to the piston-rod 11 or link 10, where it also might be placed. The spring-brake is shown in normal position and is supported by the pivots 44, which are journaled in long holes movably connected to the bracket 45; but when the pendulum-governor is lifted the rod 2 turns on the stud 3 in the nut 4 and lifts the link 5, which again carries the piece 43 with it and compresses the spring 41, the piece 43 being arranged within the casing 40, which is constructed in such a manner that the effective length of the spring may be lengthened or shortened. When, for instance, the pendulum-governor is lowered, the link 5 will also be lowered, carrying with it the piece 42 downward, and the spring 41 will also in this case be compressed. This spring-brake prevents the so-called "overgoverning" of the governor, the valve being prevented from being lifted too high, and the brake always tends to bring the piston-rod 11 of the valve-cylinder to normal position, in which position the mechanism for regulating the supply to the turbine cannot be moved either for opening or for shut-off. The purpose of replacing the ordinary oil-brake with a spring-brake 40 is to provide for an arrangement by which it is possible during the working of the turbine, by adjusting the tension of the spring or its

length, or both, to change the character of the pendulum-governor.

The bracket 7, carrying the stud 8, is arranged so that it can swing on a fixed stud 13 and is connected to a hand-lever 18, which normally bears against a lug 17 on a spring 16. If this spring be drawn aside, so that the hand-lever 18 is freed from the lug 17, the hand-lever will under the action of a spiral spring 15 be drawn inward. The bracket 7 will thereby be swung on the stud 13, whereby the outer end with the stud 8 will be lowered. This again causes the lever 9, connected to the link 10, to be lowered, the outer end 15 6 of the lever being stationary. The link 10 and the piston-rod 11 connected thereto will move downward and change the supply of pressure medium to the cylinder 25 for stopping the turbine, although the pendulum-governor is in the same position. This is of very great importance. If a string or the like is fixed to the spring 16 and the string is brought through the factory-rooms, the turbine may be stopped instantly in case of accident or the 25 like on pulling the string independent of the position of the pendulum-governor. By this arrangement the turbine may also be started or stopped by hand by the movement of the hand-lever 18.

30 The screw device 30 is used only when there is not sufficient water-pressure, and for obtaining of the necessary pressure an accumulator driven direct from the turbine is used. If the turbine has been stopped so long that 35 there is not sufficient pressure on the accumulator, the screw device is used for starting the turbine, and this device is arranged in such a manner that when the accumulator has been used for a period sufficiently long to give the 40 necessary pressure for the governor and the governor commences to effect the opening of the supply to the turbine the screw device automatically is thrown aside in order not to prevent the work of the governor.

45 The sleeve 31 is connected with a threaded rod 30, and said sleeve and rod are mounted in a swinging or pivotally-mounted frame, as shown in Figs. 1 and 6. If it is desired to actuate the lever 23 to start the turbine by 50 the hand device, the latter is turned on its pivot into the position shown in full lines in Fig. 1, where the lower end of the screw 30 engages a groove or recess in the upper edge of lever 23. By turning the screw 30 the lever 23 can be moved as required, and when 55 the turbine has attained such a speed as to render the governor 1 operative to cause a further depression of the end of lever 23 adjacent the connection 24 said lever will be 60 disengaged from the screw 30 and the swinging frame supporting the latter will move outward and downward into the position represented by dotted lines in Fig. 1—that is, while the hand-actuated device is adapted to start 65 the turbine it will be automatically disen-

gaged from the starting-lever as soon as the automatic governor becomes operative.

The governor acts in the following manner: The rod 23 is when the governor is in its normal position connected to the supply 70 mechanism of the turbine by an arrangement—for instance, the rod 24. If the turbine runs too fast, the pendulum-governor is lifted to a certain height in proportion to the speed, (in which position the governor remains until the 75 speed is changed,) whereby the rod 2 follows the movement of the governor and turns on the stud 3, at the same time carrying with it the link 5 upward. The link 5 moves the link 10, and thereby the piston-rod 11, downward and opens for the pressure medium to the under side of the piston, the piston and its rod, and the rod 23 being moved upward. The rod 23 and rod 2 being connected by the 85 right and left threaded rod 12, the movement is transmitted from the rod 23 to the rod 2, link 5, and link 10, whereby also the piston-rod 11 of the valve-cylinder will be returned to its normal position. The governing is stopped automatically, and this occurs 90 although the governor has not got into any new position. It will be obvious that this is of great importance specially for preventing the so-called "overgoverning."

I claim—

1. In a hydraulic governor for turbines, the combination of a pressure-cylinder, a piston in said cylinder adapted to be connected with the means for supplying fluid to the turbine, a centrifugal governor connected with the 100 turbine, a lever connected with the piston in the pressure-cylinder, a lever connected with the centrifugal governor, connections between said levers, a valve mechanism for controlling the supply of fluid to the pressure-cylinder, and connections between said valve mechanism and the lever connected with the centrifugal governor, substantially as described. 105

2. In a hydraulic governor for turbines, the combination of a pressure-cylinder, a piston 110 in said cylinder adapted to be connected with the means for supplying fluid to the turbine, valve mechanism controlling the supply of fluid to the pressure-cylinder and adapted to be automatically operated by variations in the 115 speed of the turbine, and means acting independently of those aforesaid for automatically returning said valve mechanism to normal position after every such operation.

3. In a hydraulic governor for turbines, the combination of a pressure-cylinder, a piston 120 in said cylinder adapted to be connected with the means for supplying fluid to the turbine, valve mechanism controlling the supply of fluid to the pressure-cylinder, a centrifugal 125 governor adapted to be driven from the turbine and connected with said valve mechanism of the pressure-cylinder, and means for automatically restoring said valve mechanism to normal position after each actuation there- 130

of by said centrifugal governor independent of any movement of said centrifugal governor.

4. In a hydraulic governor for turbines, the combination of a pressure-cylinder, a piston  
5 in said cylinder adapted to be connected with the means for supplying fluid to the turbine, valve mechanism controlling the supply of fluid to the pressure-cylinder, a centrifugal  
10 governor adapted to be driven from the turbine, and connections between said centrifugal governor and the valve mechanism for regulating the supply of fluid to the pressure-cylinder, said connections including a spring  
15 which prevents undue movement of the valve mechanism and assists in holding said mechanism in its normal position.

5. In a hydraulic governor for turbines, the combination of a pressure-cylinder, a piston  
20 in said cylinder adapted to be connected with the means for supplying fluid to the turbine, valve mechanism controlling the supply of fluid to the pressure-cylinder, a centrifugal  
25 governor to be driven from the turbine, a spring connected with said governor, and means for varying the tension of said spring at any time.

6. The combination with means for supplying fluid under pressure to a turbine, of a lever for operating said means, manually-operable  
30 means for moving said lever, means controlled by the speed of the turbine for automatically moving said lever, and means for automatically disconnecting said manually-operable means from the lever when the turbine  
35 has acquired speed enough to render the automatic governor operative.

7. In a hydraulic governor for turbines, the combination of a pressure-cylinder, a piston  
40 in said cylinder adapted to actuate means controlling the supply of fluid to the turbine, valve mechanism controlling the supply of

fluid to the pressure-cylinder, a centrifugal governor adapted to be driven from the turbine, connections between said centrifugal governor and the said valve mechanism of the  
45 pressure-cylinder, and manually-controlled devices for adjusting said connections, substantially as and for the purpose described.

8. In a hydraulic governor for turbines, the combination of a pressure-cylinder, a piston  
50 in said cylinder adapted to actuate means controlling the supply of fluid to the turbine, valve mechanism controlling the supply of fluid to the pressure-cylinder, a centrifugal governor adapted to be driven from the turbine, and connected with said valve mechanism  
55 of the pressure-cylinder, and manually-controlled means for operating said valve mechanism independently of said centrifugal governor.

9. In a hydraulic governor for turbines, the combination of a pressure-cylinder, a piston  
60 in said cylinder adapted to actuate means controlling the supply of fluid to the turbine, valve mechanism controlling the supply of fluid to the pressure-cylinder, a centrifugal governor adapted to be driven from the turbine, connections between said centrifugal  
65 governor and the said valve mechanism of the pressure-cylinder, a lever adapted to operate said valve mechanism independently of the centrifugal governor, means normally acting  
70 on said lever to cause it to operate the said valve mechanism, and a removable stop adapted to prevent such movement of said lever.

75 In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARVID JOHNSON.

Witnesses:

AXEL PETERS,  
CHARLES ERICSSON.