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STAGE VALVE FOR TURBINES.

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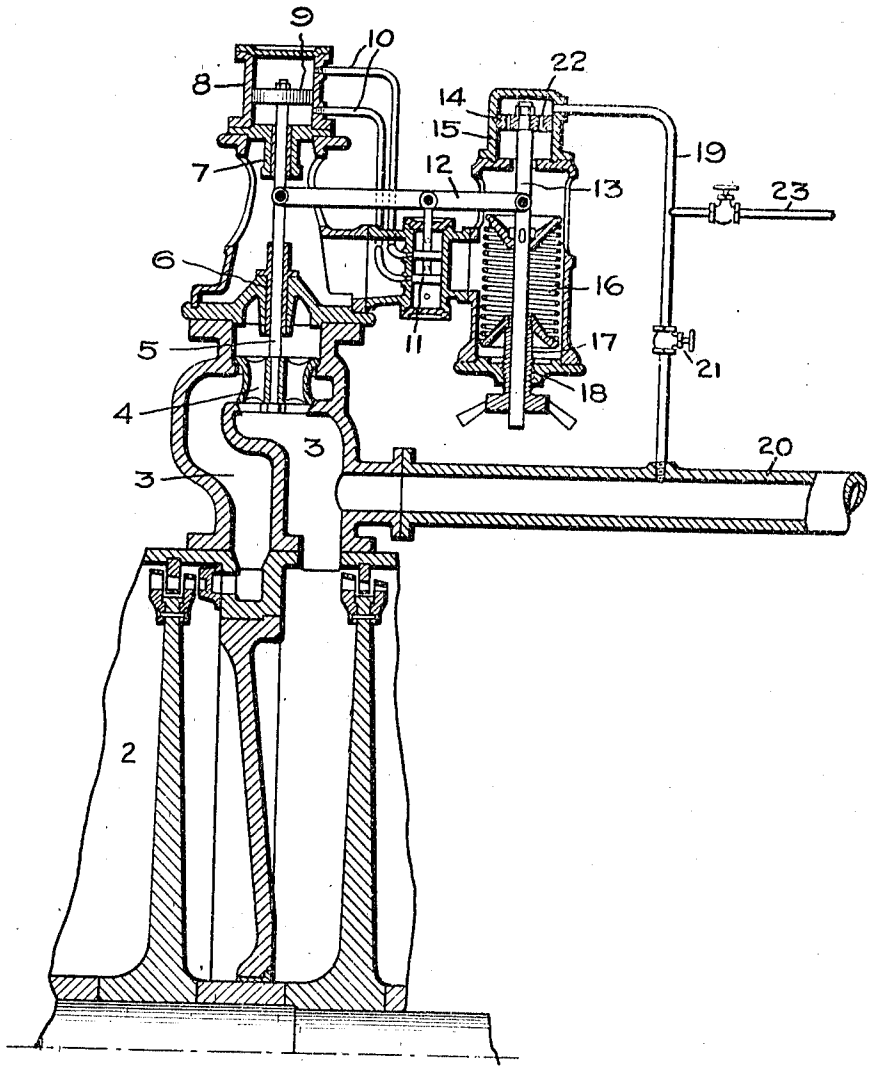
Patented Mar. 19, 1912.

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# UNITED STATES PATENT OFFICE.

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## STAGE-VALVE FOR TURBINES.

1,020,705. Specification of Letters Patent. **Patented Mar. 19, 1912.**

Application filed September 13, 1911. Serial No. 649,009.

*To all whom it may concern:*

Be it known that I, WALTER KIESER, a citizen of Switzerland, residing at Charlottenburg, Germany, have invented certain new and useful Improvements in Stage-Valves for Steam-Turbines Supplying Steam for Industrial Purposes, of which the following is a specification.

This invention relates to steam power plants in which steam at relatively low pressure is derived from the prime mover to supply heating apparatus of various kinds. Since this particular demand for steam may vary between wide limits, it is customary to provide automatic governing mechanism which will supplement the usual speed governor, in order to enable the prime mover to handle its load effectively without interfering with or being disturbed by the changes in the demand by the auxiliary devices for low pressure steam. Assuming that the prime mover is a multistage turbine, the conduit for supplying low pressure steam to the auxiliary devices is tapped into the casing of said turbine in a region where the desired pressure prevails. One or more stage valves are also provided which under the control of suitable regulating mechanism automatically decrease the effective outlet for steam from said region when the pressure therein tends to fall, and vice versa, the regulating mechanism being responsive to variations in pressure in the said region or in the conduit leading therefrom. It is customary to let this pressure act upon a movable abutment sustained yieldingly by an adjustable spring. To obtain the proper sensitiveness of control, this spring should be light, with only small variations of stroke for the regulating member. But when the pressure of the steam used in the auxiliaries is high, a weak spring must be of considerable length in order to give the proper reaction when the tension is adjusted.

My invention aims to avoid this difficulty by providing means for effecting a reduction in the pressure acting to operate the regulating valve, so that the spring is subjected to lower compression values, and thus a comparatively short light spring can be used. The pressure-reducing device I prefer is a throttling valve, located in the branch pipe conveying the conduit pressure to the movable abutment of the regulating valve.

The accompanying drawing is a diagrammatic representation in section of one form of my invention.

Between the stages 1 and 2 of a steam turbine is a connecting passage 3 containing a controlling valve 4. The stem 5 of this valve passes through a packed bushing 6 and a stuffing box 7 into a cylinder 8 where it is attached to a piston 9, said cylinder and piston constituting a motor for opening and closing the valve 4. Pipes 10 convey operative fluid to the cylinder above and below said piston, the flow of said fluid being controlled by a small pilot valve 11. Fluid under pressure is admitted to and exhausted from the casing of this valve in the ordinary manner. When the pilot valve is depressed, the piston 9 is forced up and opens the stage valve 4, and vice versa. The stem of the pilot valve is pivoted to a floating lever 12 fulcrumed at one end on the stem 5 of the stage valve, and at the other end on the rod 13 attached to a movable abutment such as the piston 14 in the cylinder 15. A light helical spring 16 abuts at one end against a collar on the rod 13 and at the other end on a screw 17 adjustably in a stationary nut 18. The lower side of the piston 14 is exposed to atmospheric pressure. The upper end of the cylinder 15 is connected by a pipe 19 with the conduit 20 which leads from the passage 3, in advance of the stage valve 4, to the auxiliary devices. In the pipe 19 is a pressure-reducing device, such as the throttling valve 21. The piston 14 is provided with small holes 22, and in addition thereto or in lieu thereof a valved branch pipe 23 leads from the pipe 19 to the atmosphere.

The pressure in the cylinder 15 is balanced by the spring 16 under normal conditions, and the stage valve 4 is held closed; but when the demand of the auxiliaries for steam becomes less and therefore the pressure in the conduit and the cylinder 15 rises, the stage valve is opened, and steam is admitted to the second stage of the turbine, so that the pressure drop between stages is kept nearly constant. By means of the floating lever 12, the valve 11 is returned to its mid-position after each actuation by the piston 14. If the pipe 19 were closed, the pressure in it and in the cylinder 15 would tend to become equalized with that in the conduit 20, owing to the gradual flow

of steam through the throttling device 21. To prevent this, release devices, consisting of the holes 22 in the piston or the valve in the open pipe 23, or both, are so related to the throttling device that the pressure in the cylinder 14 is always maintained at a given ratio to that in the conduit, irrespective of fluctuations in the conduit pressure. The light spring insures a quick response to such fluctuations, so that the motor acts promptly to open or close the stage valve 4.

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. The combination with a multi-stage turbine having a conduit leading from an intermediate stage for supplying auxiliary devices, of an automatic stage valve responsive to pressure changes in said conduit and comprising a movable abutment, a pipe conveying pressure from said conduit to said abutment, and pressure-reducing means connected with said pipe.

2. The combination with a multi-stage turbine, of a conduit conveying steam from between certain of said stages, a valve controlling the passage of steam from one stage to another, a motor for actuating the valve, a spring-actuated abutment controlling said motor, a pipe conveying pressure from said conduit to said abutment, and a throttling device in said pipe.

3. The combination with a multi-stage turbine, of a conduit conveying steam from between certain of said stages, a valve controlling the passage of steam from one stage to another, a motor for actuating the valve, a spring-actuated abutment controlling said motor, a pipe conveying pressure from said conduit to said abutment, a throttling device in said pipe, and means for relieving said pipe to prevent an accumulation of pressure fluid.

4. The combination with a multi-stage turbine, of a conduit conveying steam from between certain of said stages, a valve controlling the passage of steam from one stage to another, a motor for actuating the valve, a spring-actuated abutment controlling said motor, a pipe conveying pressure from said conduit to said abutment, a throttling device in said pipe, and openings to the atmosphere for relieving said pipe of an accumulation of pressure.

In witness whereof, I have hereunto set my hand.

WALTER KIESER.

Witnesses:
BERNHARD RUHNOW,
HERMANN HILLE.