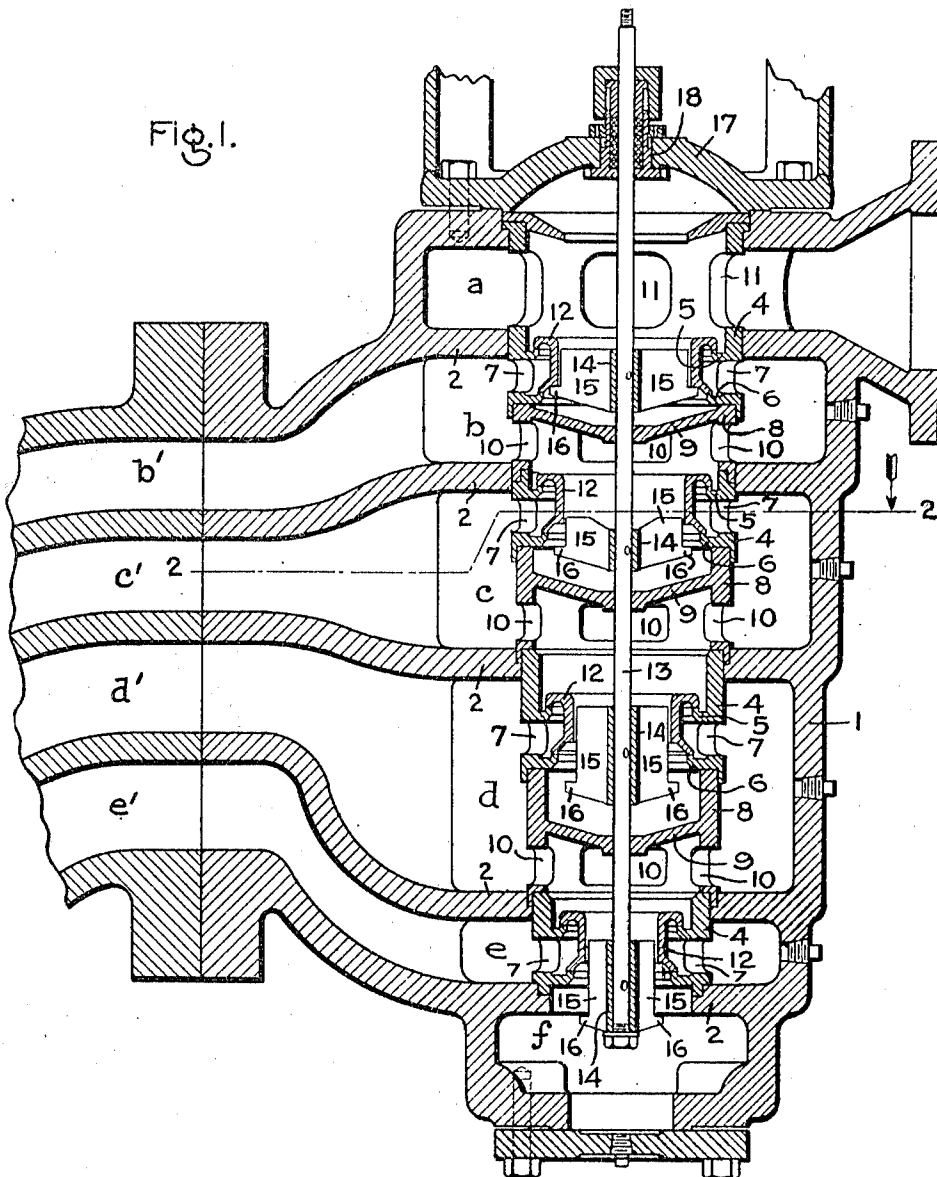


R. H. RICE.
VALVE FOR TURBINES.
APPLICATION FILED NOV. 9, 1912.

1,061,690.

Patented May 13, 1913.

2 SHEETS-SHEET 1.



Witnesses:

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Inventor,

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by *Alfred S. Davis*
Att'y.

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Fig. 2.

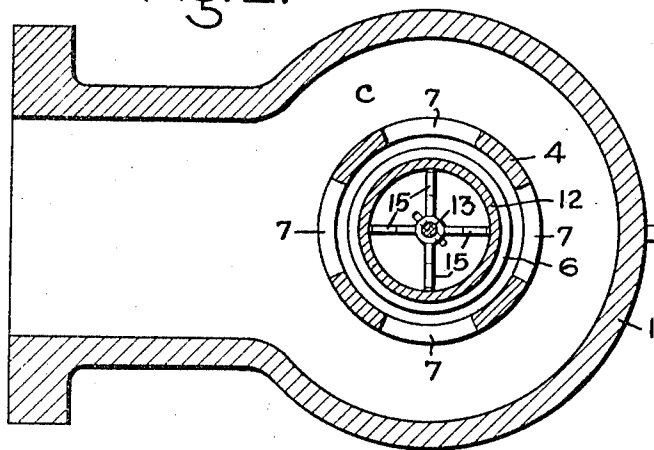
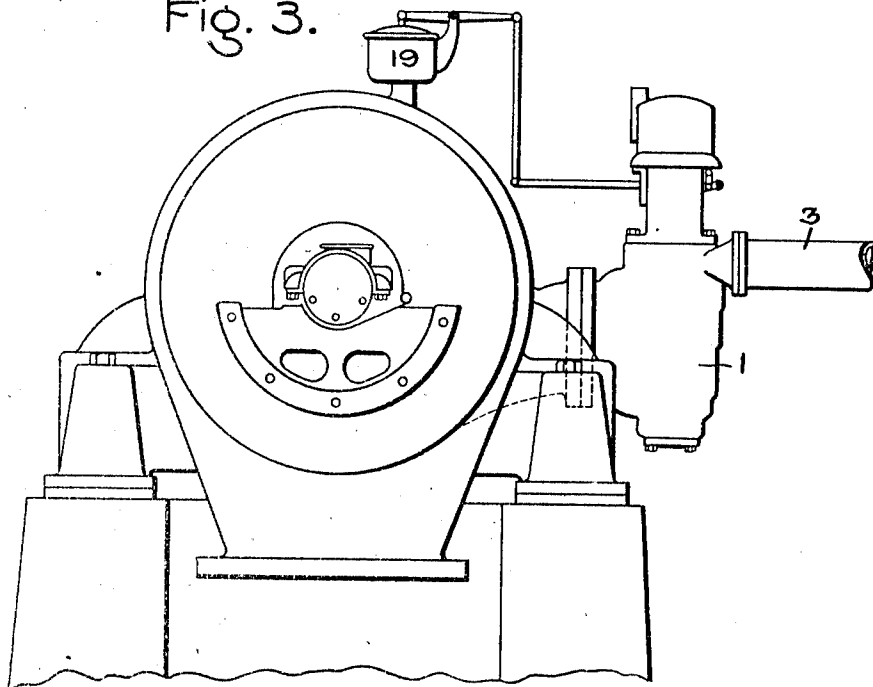


Fig. 3.



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UNITED STATES PATENT OFFICE.

RICHARD H. RICE, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

VALVE FOR TURBINES.

1,061,690.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed November 9, 1912. Serial No. 730,326.

To all whom it may concern:

Be it known that I, RICHARD H. RICE, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Valves for Turbines, of which the following is a specification.

This invention relates to elastic fluid turbines, and its object is to provide a simple and efficient valve gear for admitting motive fluid to the nozzles or fluid passages of such a machine. It is customary to provide a plurality of nozzles or groups thereof, each nozzle or group being provided with its individual admission valve. The valve gear is so arranged that the speed governor will open said valves in succession, so that the demand for steam to carry a varying load will be taken care of by the opening and closing of the proper number of valves. In a prior Patent No. 801,399, dated October 10, 1905, I have shown a construction in which a lever is arranged to actuate a series of valves placed side by side and each receiving steam from a common steam chest so that all are subjected to the same initial pressure. There are some drawbacks in such an arrangement, among which may be mentioned the liability of the valves to leak through improper care or faulty workmanship, which entails a dead loss of motive fluid.

The present invention is designed to prevent this waste, by so arranging the valves that the steam flows through them in series, only one valve being subjected to the initial pressure under any condition of operation. If steam leaks past this valve it goes to the next nozzle and is not wholly wasted. I arrange the valves in a vertical tier, strung loosely on a common stem, on which are secured lifters so spaced that they pick up the valves in succession as the stem is pulled up by the speed governor. Each valve as it opens admits steam to its own nozzle or group thereof, and also to a chamber above the next valve in the series, so that when the governor proceeds to lift said latter valve steam will instantly flow to the next nozzle, and so on.

In the accompanying drawings, Figure 1 is a vertical section of my improved valve gear. Fig. 2 is a cross-section, on the line 2-2, Fig. 1, and Fig. 3 is an end elevation

of a horizontal turbine equipped with said valve gear.

The valve casing is a shell 1 having a plurality of partitions 2, dividing it into chambers *a*, *b*, *c*, etc. each leading to its respective nozzle or group thereof. A steam main 3 is connected with the first chamber *a*. In each partition is an opening into which is fitted a bushing 4 provided with two internal valve-seats 5, 6, one above the other, the lower one being of smaller diameter than the upper one. The bushing depends into the chamber next below the partition in which it is inserted and contains one or more ports 7 between the seats 5, 6. Rising from the partition next below is a cylinder 8 having a diaphragm 9 and one or more ports 10 below the same. The cylinder is preferably separate from the bushing, and its upper and lower ends are suitably interlocked with the ends of the adjacent bushings, being slightly smaller in diameter than the one above and larger than the one below. The upper bushing extends up through the chamber *a* and has ports 11. In the chamber *c* the ported cylinder is omitted, the bushing extending down to the partition 12. An annular double seated valve rests on the seats 5, 6 in each bushing. The area of the upper seat on the valve is slightly larger than that of the lower seat, so that there is a small unbalanced pressure tending to seat the valve positively. A valve stem 13 passes centrally through the tier of valves, bushings, ported cylinders and their diaphragms. Where the stem goes through a diaphragm the joint may be suitably packed, if desired.

On the stem are secured a plurality of valve lifters, each consisting preferably of a sleeve 14 fitting said stem and having radial wings 15 sliding freely through the annular valve, each wing having a lip 16 to engage the lower edge of the valve. The lifters are so positioned on the stem that they engage with their valves in succession, the upper valve lifting first.

The reason for making the bushings or cylinders progressively decreasing in diameter from one end to the other of the tier is to enable them to be readily assembled or taken out, each one passing easily through the openings in the partitions above it, and all being accessible when the cap 17 of the

casing is taken off. The valves, also, can drop down through all the bushings to the ones designed to receive them respectively. The stem 13 is provided with a stuffing box 5 18 where it passes through said cap.

The steam entering the chamber *a* flows through the ports 11 and fills the space inside the upper valve 12 and above the diaphragm 9. As soon as the governor lifts 10 this upper valve, the steam flows through the ports 7 in the bushing 4 into the chamber *b* and the passage *b'* leading to the first nozzle or group of nozzles. It also passes by way of the ports 10 into the space above 15 the next lower valve, which thus becomes subjected to boiler pressure. This valve, however, is the only one thus subjected, so that leakage, if any, is restricted to one valve. The same thing holds true as the 20 valves are successively lifted by the governor 19.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together 25 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 30 means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. The combination with a casing having a plurality of partitions dividing into chambers, of a plurality of annular valves controlling openings in said partitions, a steam supply pipe opening into an end chamber, means for lifting said valves in succession, and means whereby the steam can pass 40 through one valve after another in series, as they are successively opened.

2. The combination with a valve casing

having a plurality of partitions dividing it into chambers and containing alined openings, of a ported bushing for said opening 45 in each chamber, having seats for a double valve, and a ported cylinder below said bushing provided with a diaphragm.

3. The combination with a valve casing having a plurality of partitions containing 50 openings progressively decreasing in diameter, of bushings fitting respective openings and having interior valve seats, ports in said bushings between said seats, and a ported cylinder extending from each bushing to the 55 opening in the next partition below, and provided with a diaphragm above its ports.

4. The combination with a valve casing having a plurality of partitions containing openings progressively decreasing in diameter, of a tier of ported bushings in said 60 openings provided with valve seats above and below said ports, annular valves on said seats, ported cylinders below said bushings provided with diaphragms, and a stem for 65 operating said valves.

5. The combination with a valve casing having a plurality of partitions containing openings progressively decreasing in diameter, of a tier of ported bushings in said 70 openings provided with valve seats above and below said ports, annular valves on said seats, ported cylinders below said bushings provided with diaphragms, a stem for operating said valves, and valve lifters on said 75 stem positioned to act on said valves in succession.

In witness whereof, I have hereunto set my hand this sixth day of November, 1912.

RICHARD H. RICE.

Witnesses:

JOHN A. McMANUS, Jr.,
FRANK G. HATTIE.