No. 883,905. PATENTED APR. 7, 1908.

M. M. PEARSON.

ELASTIC FLUID TURBINE.

APPLICATION FILED OCT. 7, 1905.

Fig. 1.

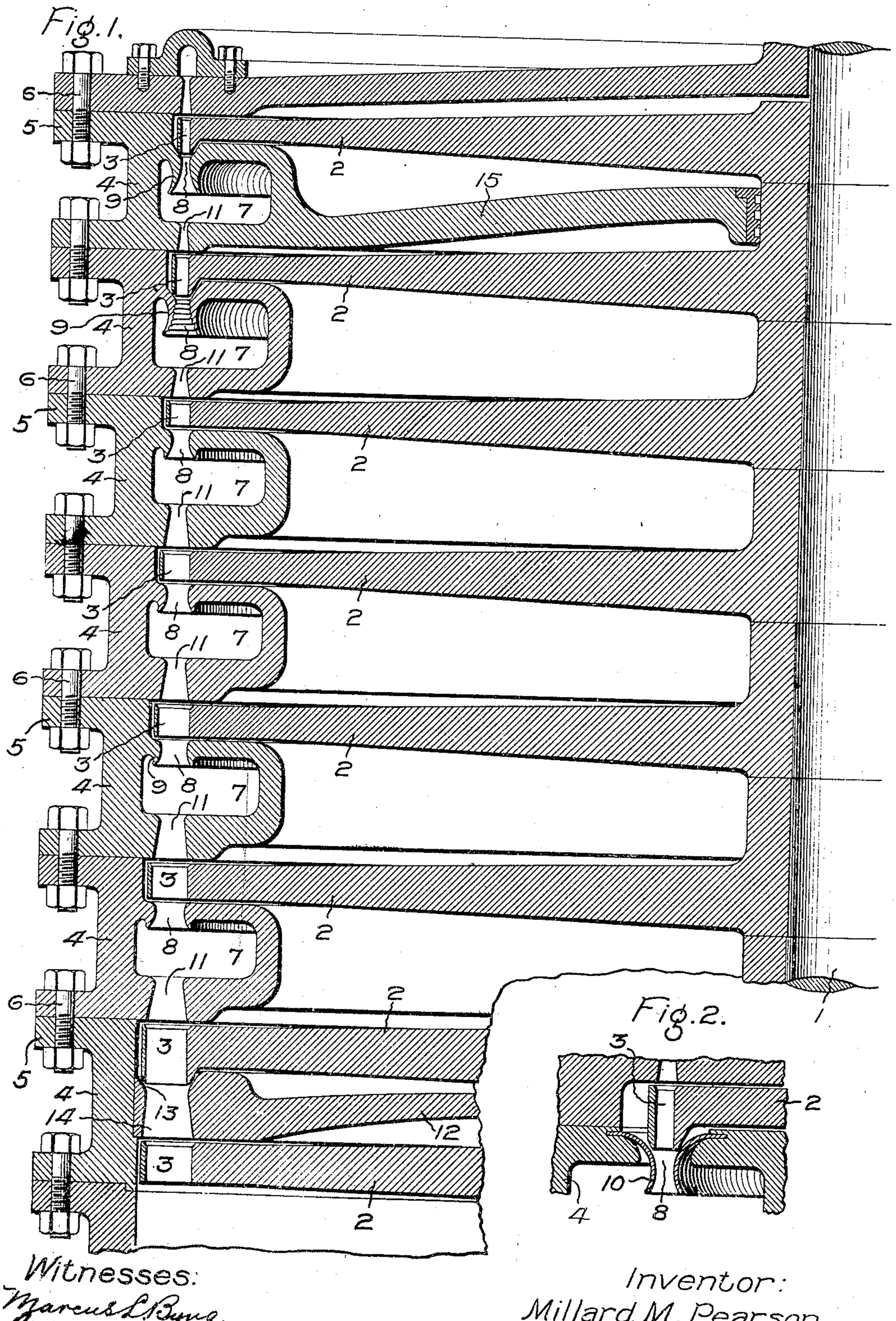


Fig. 2.




Witnesses:

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# UNITED STATES PATENT OFFICE.

MILLARD M. PEARSON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## ELASTIC-FLUID TURBINE.

No. 883,905. Specification of Letters Patent. Patented April 7, 1908.

Application filed October 7, 1905. Serial No. 281,780.

*To all whom it may concern:*

Be it known that I, MILLARD M. PEARSON, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to engines actuated by elastic fluid pressure, and has especial reference to steam or gas turbines.

A well-known type of steam turbine comprises a plurality of bucket-wheels mounted on a shaft and inclosed in a casing. If the machine has more than one stage, the stages are separated by stationary diaphragms extending from the wall of the casing to the shaft. Owing to the necessary clearances between the revolving buckets and the stationary nozzles and intermediates, there is more or less spill or leakage of steam into the chamber or chambers in which the wheels are located, and this gives rise to certain rotation losses, besides heating the shaft and bearings and causing a further loss by radiation of heat from these parts. My invention aims to prevent these losses, besides attaining other advantages which will be pointed out hereinafter.

The invention consists in providing means whereby the flow of the motive fluid through the buckets will exhaust or suck out from the casing all the air and leakage fluid, and set up and maintain a vacuum in said casing. The result is that the motive fluid is not subjected to opposition in passing into and out of the buckets; there is no loss by leakage between the diaphragms and the shaft; the radiation of heat is less; the condense vacuum is better, and the bucket-wheels are relieved from all friction.

In carrying out the idea, I provide stationary elements between the bucket-wheels, containing passageways to receive the motive fluid flowing from the buckets of one wheel and discharge it against the buckets of the next wheel. These passageways are preferably enlarged between their inlet and discharge, so as to form chambers or receivers, which tend to steady the discharge of the motive fluid therefrom. These receivers are annular, and are preferably cast integral with the casing-sections. The inlet end of the passageway is so shaped that the jets of motive fluid flowing into it exert an ejector effect upon the contents of the casing, and not only suck out all the fluid that may have leaked into the casing, but also the air as well, so that a vacuum is soon established.

In the accompanying drawing, Figure 1 is a longitudinal section of one side of a turbine embodying my invention; and Fig. 2 shows in section a modified inlet seat for a receiver.

The shaft 1 carries a plurality of wheels 2 provided with peripheral buckets 3 of the parallel-flow type. The casing is composed of a tier of annular sections 4 having flanges 5 fastened together by bolts 6. Between several of the pairs of wheels is an annular chamber or receiver 7, preferably cast integral with the corresponding casing-section, and having in its top an inlet slot or slots 8 concentric with the shaft 1 and registering with the buckets 3.

In a partial injection machine the slots will not be continuous but will extend along only a portion of the receiver. Where it is desired to utilize the entire circumference of the wheel, the slot may be continuous; but in such case the receiver must be provided at intervals with transverse strengthening ribs or webs, as will be apparent to any one skilled in the art.

Inside the receivers are flanges 9 running along each side of the slot and forming a spout through which the motive fluid enters the receiver on leaving the buckets. The sides of the spout are convex, so that a somewhat contracted throat is formed, narrower than the buckets, in order that the motive fluid may completely fill the spout and be carried well into the receivers. This produces an ejector effect on the air and leakage fluid in the casing, exhausting it therefrom into the receiver. To emphasize this effect, the buckets may be lengthened transverse of the wheel, so as to project into the slot, as shown on the upper two and lower wheels in Fig. 1 and the wheel in Fig. 2. With this form of bucket, the unslotted portions of the receiver are suitably grooved to permit the wheel to revolve. The contracted throat of the spout also prevents any back-flow of the motive fluid; and to guard against this more

effectually, the inner surface of the spout may be serrated, as shown in the second spout from the top in Fig. 1.

Fig. 2 shows a mode of constructing the spout by shaping rings 10 of brass or phosphor bronze so that they are curved in cross-section, and then suitably securing them to the edges of the slot.

In the bottom of each receiver is a set of discharge nozzles 11, either of the expanding or non-expanding type, which deliver the motive fluid to the buckets of the next wheel below. If desired, the receiver chamber may be omitted, and the nozzles combined with the ejector passages, the resulting passageway being formed in the ordinary diaphragm; as shown at the lower part of Fig. 1, where the diaphragm 12 is provided with a passage-way whose upper part 13 has curved walls to form the contracted ejector passage, while its lower part 14 is shaped to form an expanding or non-expanding nozzle discharging against the buckets of the next wheel. This diaphragm is shown as separate from the casing section; but it may be integral therewith, like the upper diaphragm 15.

According to 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 an elastic-fluid turbine, the combination with a casing, of a shaft, bucket-wheels mounted thereon, stationary elements between said wheels having passageways for the motive fluid, and a means having a contracted throat so that the said motive fluid flowing from said buckets into said passages will create a vacuum in said casing.

2. In an elastic-fluid turbine, the combination with a casing, of a shaft, bucket-wheels mounted thereon, and stationary elements between said wheels having ejector passages with contracted throats coöperating with the buckets on said wheels to create a vacuum in said casing.

3. In an elastic-fluid turbine, the combination with the casing, of a shaft, bucket-wheels mounted thereon, receivers for the motive fluid leaving the wheels, and a passage having a contracted throat whereby said fluid flowing into said receivers will create a vacuum in said casing.

4. In an elastic-fluid turbine, the combination with a casing, of a shaft, bucket-wheels mounted thereon, and stationary elements with contracted throats between said wheels having passageways for the motive fluid, the inlet portion of said passageways showing convex sides when cut on radial planes.

5. In an elastic-fluid turbine, the combination with a casing, of a shaft, bucket-wheels mounted thereon, and stationary elements between said wheels having passageways for the motive fluid, the inlet portion of said passageways showing convex sides when cut on radial planes, and the outlet portion constituting nozzles to discharge the motive fluid against the next wheel.

6. In an elastic-fluid turbine, the combination with a casing, of a shaft, bucket-wheels mounted thereon, receivers between said wheels having inlet slots in their tops registering with said buckets and having convex sides, and nozzles in the bottoms of said receivers.

7. In an elastic-fluid turbine, the combination with a casing, of a shaft, a plurality of bucket-wheels mounted thereon, a receiver between each pair of wheels, having an inlet slot in its top and nozzles in its bottom, and flanges along each side of said slot projecting into said receiver.

8. In an elastic-fluid turbine, the combination with a casing, of a shaft, a plurality of bucket-wheels mounted thereon, a receiver between each pair of wheels, having a slot in its top and nozzles in its bottom, said slot having flanges forming a contracted throat.

9. In an elastic-fluid turbine, the combination with the casing and bucket-wheels, of annular receivers for the motive fluid having inlet slots in their tops, and rings curved in cross-section and located in said slots.

10. In an elastic-fluid turbine, the combination with a sectional casing and the bucket-wheels, of annular receivers for the motive fluid cast integral with the casing-sections and having inlet slots and delivery nozzles.

11. In an elastic-fluid turbine, a casing section having integral therewith a receiver and a diaphragm, said receiver having inlet slots and discharge nozzles opposite to each other.

12. In an elastic-fluid turbine, a casing section having integral therewith a receiver provided in its top with one or more inlet slots, and in its bottom with one or more discharge nozzles.

13. In an elastic-fluid turbine, a casing section having integral therewith a receiver provided in its top with one or more slots forming ejector passages, and in its bottom with one or more discharge nozzles.

In witness whereof, I have hereunto set my hand this 6th day of October, 1905.

MILLARD M. PEARSON.

Witnesses:
ALEX. F. MACDONALD,
GENEVIEVE HAYNES.