C. B. REARICK.

ELASTIC FLUID TURBINE.

APPLICATION FILED DEC. 9, 1912.

1,069,177. Patented Aug. 5, 1913.

Fig. 1,

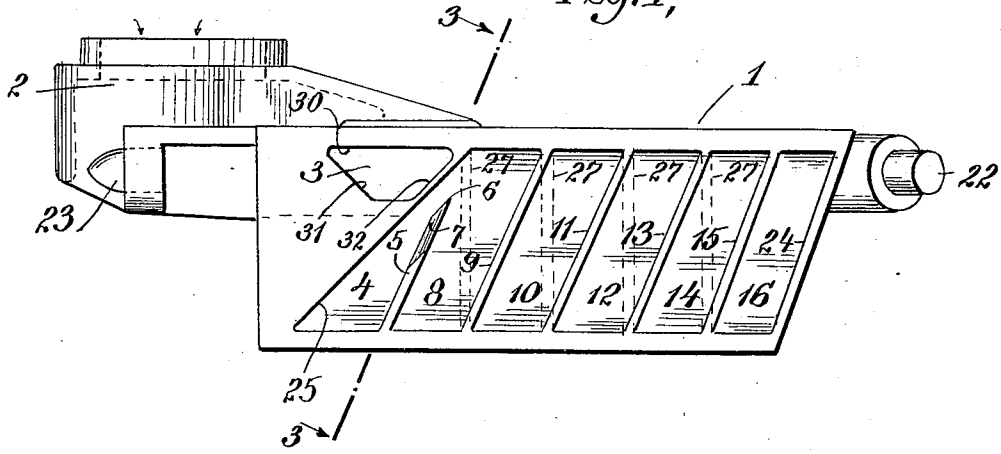


Fig. 2,

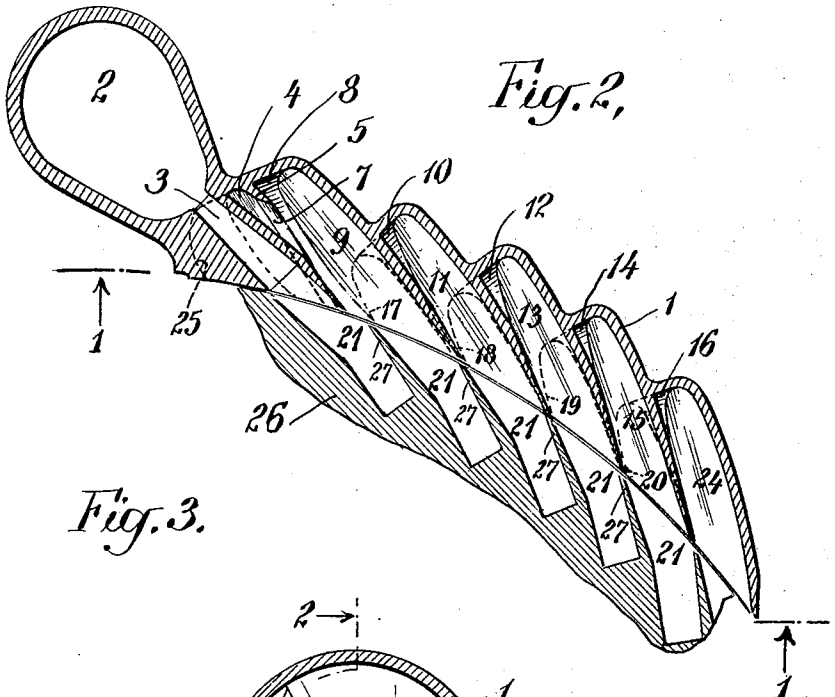
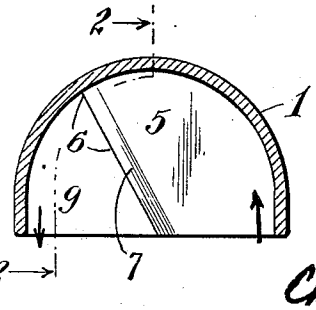


Fig. 3.



WITNESSES

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ELASTIC-FLUID TURBINE.

1,069,177. Specification of Letters Patent. Patented Aug. 5, 1913.

Application filed December 9, 1912. Serial No. 735,601.

To all whom it may concern:

Be it known that I, CHARLES BEMIS REARICK, a citizen of the United States, and resident of New London, in the county of New London, State of Connecticut, have made certain new and useful Inventions Relating to Elastic-Fluid Turbines, of which the following is a specification, taken in connection with the accompanying drawing, which forms part of the same.

This invention relates to return members especially adapted for use with spiral flow elastic fluid turbines, such as are described in my former Patent 1,003,203, of September 12, 1911, for instance, the trailing return passage being given a special construction so as to have a greater advancing angle than the other return passages and lead its steam into the forward return passage before re-entering the wheel.

In the illustrative embodiment of this invention shown in the drawing in a somewhat diagrammatic way, Figure 1 is a bottom view of the return member taken along the line 1—1 of Fig. 2. Fig. 2 is a longitudinal section through the injecting side of the return member taken substantially along the line 2—2 of Fig. 3; and Fig. 3 is a transverse sectional view taken along the line 3—3 of Fig. 1.

The return member may be formed of suitable material in any desired way, as for instance by casting the return member 1 integral with the supporting nozzle tube 2. In this way a series of these nozzle and return members may be conveniently mounted to coöperate with a turbine wheel as described in my former patent, proper alinement being readily secured if the connecting lug 22 on each of these members is brought into engagement with a coöperating alining hole 23 in the next member, thus holding the members in proper coöperation with the turbine wheel, such as 26, which may be formed with an annular series of stepped curved buckets 21 having the bucket partitions 27 between them.

The nozzle and return member may as indicated in Fig. 2 be formed with a suitably expanding injecting nozzle 3 arranged to receive steam or other elastic driving fluid from the nozzle tube 2 so as to inject it into the wheel buckets. This nozzle may with advantage be provided with a reduced rear portion and also with an angularly or otherwise reduced forward portion by forming these sides 31, 32 of the nozzle opening at a suitable angle to the outer side or edge 30 of the nozzle opening which is preferably substantially in line with the coöperating wheel buckets. The driving fluid after making a single pass through the wheel buckets enters the receiving side of the return passages so as to be guided around and again injected from the returning sides of these return passages so as to be passed through the wheel buckets the desired number of times before being finally released from the wheel. These return passages are preferably advancing so as to return the steam farther forward on the wheel than the point at which it was received from the wheel and as indicated in Fig. 1 each of the normal return passages 8, 10, 12, 14 and 16 of which any desired number may be formed in each return member is preferably arranged at such an advancing angle as to advance the steam to the extent of one wheel bucket before again returning it to the wheel. These return passages may be conveniently provided by casting or otherwise arranging suitable diaphragms such as 9, 11, 13, 15 and 24 in the return member so as to form a series of curved return passages in the return member 1 which guide the motive fluid gradually and with relatively slight frictional or eddy losses and finally again return or inject it into the wheel buckets. The shape of the curved bottoms of these illustrative return passages is shown in Fig. 3, the dotted lines 17, 18, 19 and 20 in the longitudinal sectional view showing how they may be arranged.

The trailing return passage 4 is preferably given a special shape and provided with a rear side 25 having a greater advancing angle than the other return passages so as to carry the steam or other motive fluid received in this trailing return passage farther ahead and bring it into the communicating forward return passage 8 before again injecting it into the wheel. Under normal conditions this trailing return passage receives the steam which enters the rearmost of the two receiving wheel buckets whenever one of the bucket partitions is moving across the injecting nozzle, the forward of these two buckets receiving steam

which enters the forward return passage 8 which thus receives a larger and more regular supply of the motive fluid which should be more accurately guided in returning it to the wheel buckets without unnecessary disturbance. For this reason the diaphragm 5 between this forward return passage 8 and the trailing return passage 4 is preferably provided with a forward face having substantially the normal advancing angle the same as the other diaphragms ahead of it while the rear face of this diaphragm 5 may be formed with a greater inclination in whole or in part as by forming it with a beveled edge 7 which may have a long inclination, this edge 6 preferably extending about two-thirds around the return passage toward its returning or injecting end. As indicated in Figs. 1 and 3, the steam somewhat irregularly entering the trailing return passage is thus guided forward at a greater angle than in the forward return passage and this trailing return passage communicates with the forward return passage at a point about two-thirds around toward its returning end at which point the curved bottoms of these return passages preferably form parts of the same curved guiding surface so that the steam from the trailing return passage unites with the steam in this forward return passage 8 before being again returned or injected into the wheel buckets. In case the amount of steam in this trailing return passage is momentarily greater than usual the stream of fluid naturally has a greater depth in passing through the constricted throat of this return passage which has a greater width toward the center of the return passage, as indicated in Fig. 1, so that this steam from the trailing return passage tends to pile up upon the stream of steam in the communicating forward return passage so as to be more or less arranged inside this curved stream of fluid again returned to the wheel buckets. The greater advance of a trailing return passage of this character seems especially effective in disposing of the rearwardly diverted steam or "backsplits" when a bucket partition is passing the nozzle and is especially adapted to work in coöperation with an injecting nozzle provided with a reduced rearward portion and also preferably with a reduced forwardly extending portion so as to have more or less angular or otherwise reduced ends as indicated in Fig. 1.

Having described this invention in connection with a number of illustrative embodiments, forms, proportions, numbers of parts, arrangements, materials and processes of manufacture, to the details of which disclosure the invention is not of course to be limited, what is claimed as new and what is desired to be secured by Letters Patent is set forth in the appended claims.

1. In elastic fluid turbines, a turbine wheel provided with partitions forming an annular series of lapping curved buckets, an integral nozzle and return member coöperating with said wheel buckets and comprising a supporting nozzle tube and connected nozzle having its outer edge coöperating with and substantially in line with the sides of said wheel buckets and having angularly reduced forward and rear portions, diaphragms in said member to form a series of curved return passages coöperating with said wheel buckets and each having an advancing angle so as to advance along the wheel to the extent of one wheel bucket and a trailing return passage having a rear side at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm having substantially the normal advancing angle and provided with a beveled edge extending about two-thirds around to the returning end of said return passage to form a constricted throat for said trailing return passage communicating with the forward return passage, said trailing return passage and said communicating forward return passage having common curved bottoms at their returning ends.

2. In elastic fluid turbines, a turbine wheel provided with partitions forming an annular series of lapping curved buckets, a nozzle and return member coöperating with said wheel buckets and comprising a nozzle having its outer edge coöperating with and substantially in line with the sides of said wheel buckets and having an angularly reduced forward portion, diaphragms in said member to form a series of curved return passages coöperating with said wheel buckets and each having an advancing angle so as to advance along the wheel to the extent of one wheel bucket and a trailing return passage having a rear side at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm having substantially the normal advancing angle and provided with a beveled edge extending at least as much as half way around to the returning end of said return passage to form a constricted throat for said trailing return passage communicating with the forward return passage, said trailing return passage and said communicating forward return passage having common curved bottoms at their returning ends.

3. In elastic fluid turbines, a turbine wheel provided with partitions forming an annular series of lapping curved buckets, a nozzle and return member coöperating with said wheel buckets and comprising a nozzle having its outer edge coöperating with and substantially in line with the sides of said wheel buckets and having a reduced for-

ward portion, diaphragms in said member to form a series of curved return passages coöperating with said wheel buckets and each having an advancing angle so as to advance along the wheel to the extent of one wheel bucket and a trailing return passage having a rear side at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm provided with an edge extending at least as much as half way around to the returning end of said return passage to form a constricted throat for said trailing return passage communicating with the forward return passage, said trailing return passage and said communicating forward return passage having common curved bottoms at their returning ends.

4. In elastic fluid turbines, a turbine wheel provided with partitions forming an annular series of lapping curved buckets, a nozzle and return member coöperating with said wheel buckets and comprising a nozzle having a reduced forward portion, diaphragms in said member to form a series of curved return passages coöperating with said wheel buckets and each having an advancing angle so as to advance along the wheel to the extent of one wheel bucket and a trailing return passage having a rear side at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm provided with an edge extending at least as much as half way around to the returning end of said return passage to form a constricted throat for said trailing return passage communicating with the forward return passage.

5. In elastic fluid turbines, a turbine wheel provided with partitions forming an annular series of lapping curved buckets, a return member coöperating with said wheel buckets and a nozzle having its outer edge coöperating with and substantially in line with the sides of said wheel buckets, diaphragms in said member to form a series of curved return members coöperating with said wheel buckets and each having an advancing angle so as to advance along the wheel to the extent of one wheel bucket and a trailing return passage having a rear side formed at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm having substantially the normal advancing angle and provided with a beveled edge extending about two-thirds around to the returning end of said return passage to form a constricted throat for said trailing return passage communicating with the forward return passage, said trailing return passage and said communicating forward return passage having common curved bottoms at their returning ends.

6. In elastic fluid turbines, a turbine wheel provided with partitions forming an annular series of lapping curved buckets, a return member coöperating with said wheel buckets and a nozzle, diaphragms in said member to form a series of curved return members coöperating with said wheel buckets and each having an advancing angle so as to advance along the wheel to the extent of one wheel bucket and a trailing return passage having a rear side formed at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm provided with a beveled edge extending about two-thirds around to the returning end of said return passage to form a constricted throat for said trailing return passage communicating with the forward return passage.

7. In elastic fluid turbines, a turbine wheel provided with partitions forming an annular series of lapping curved buckets, a return member coöperating with said wheel buckets and a nozzle, diaphragms in said member to form a series of curved return members coöperating with said wheel buckets and each having an advancing angle so as to advance along the wheel to the extent of one wheel bucket and a trailing return passage having a rear side formed at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm provided with an edge extending part way around to the returning end of said return passage to form a throat for said trailing return passage communicating with the forward return passage.

8. In elastic fluid turbines, a return member, coöperating diaphragms in said return member to form a series of curved return passages to coöperate with the wheel buckets and each having an advancing angle and a trailing return passage having a rear side at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm having substantially the normal advancing angle and provided with a beveled edge extending about two-thirds around to the returning end of said return passage to form a constricted angular sectioned throat for said trailing return passage communicating with the forward return passage, said trailing return passage and said communicating forward return passage having common curved bottoms at their returning ends.

9. In elastic fluid turbines, a return member, coöperating diaphragms in said return member to form a series of curved return passages to coöperate with the wheel buckets and each having an advancing angle and a trailing return passage having a rear side

at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm having substantially the normal advancing angle and provided with a beveled edge extending at least as much as half way around to the returning end of said return passage to form a constricted throat for said trailing return passage communicating with the forward return passage, said trailing return passage and said communicating forward return passage having common curved bottoms at their returning ends.

10. In elastic fluid turbines, a return member, coöperating diaphragms in said return member to form a series of curved return passages to coöperate with the wheel buckets and a trailing return passage having a rear side at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm provided with an edge extending at least as much as half way around to the returning end of said return passage to form a throat for said trailing return passage communicating with the forward return passage.

11. In elastic fluid turbines, a return member, coöperating diaphragms in said return member to form a series of curved return passages to coöperate with the wheel buckets and a trailing return passage having a rear side at a greater advancing angle than the communicating forward return passage and having a forward side formed of a diaphragm provided with an edge extending only part way around to the returning end of said return passage to form a throat for said trailing return passage communicating with the forward return passage.

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Witnesses:
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HARRY G. DUNCAN.