No. 747,523. PATENTED DEC. 22, 1903.

J. WILKINSON.

ELASTIC FLUID TURBINE WHEEL.

APPLICATION FILED SEPT. 15, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 2.

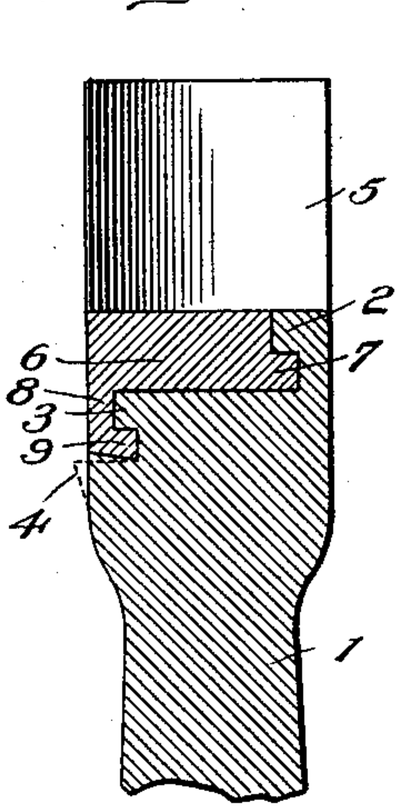


Fig. 1.

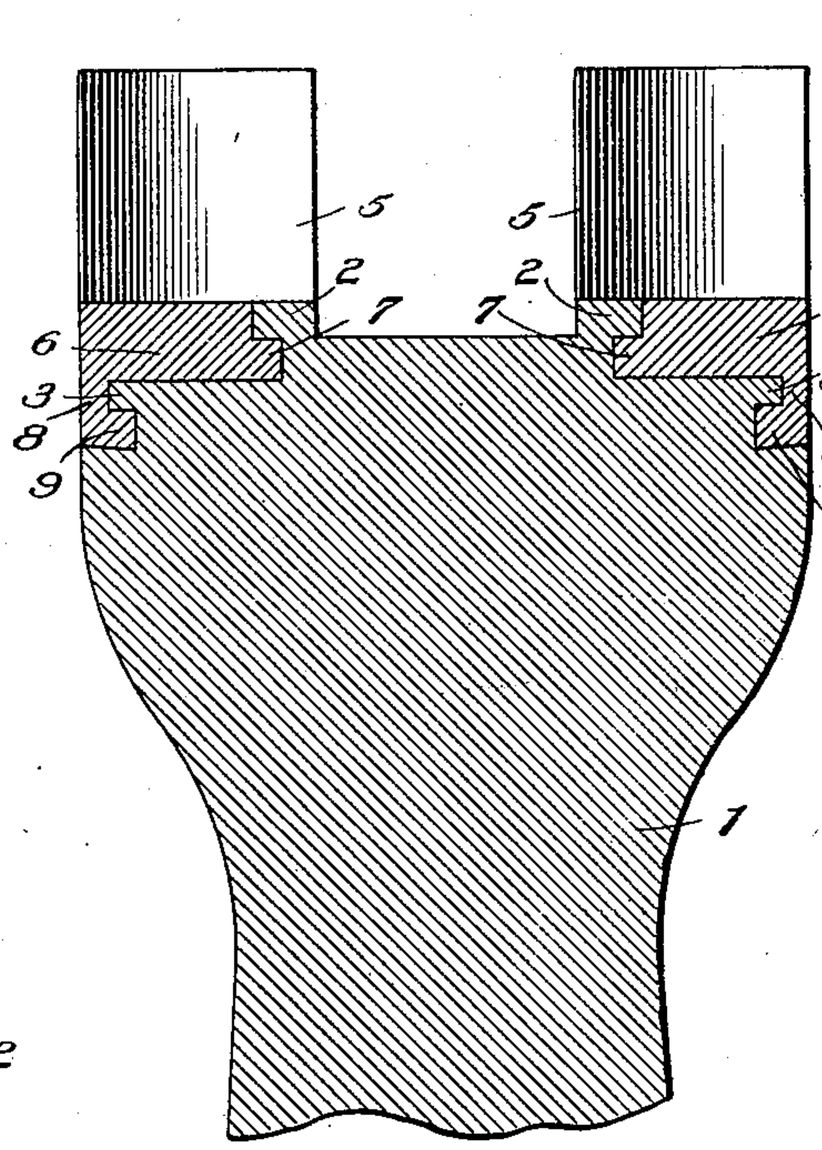


Fig. 3.

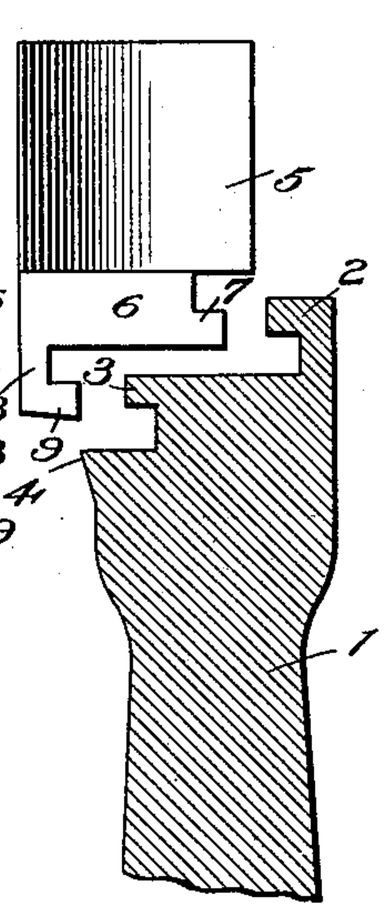


Fig. 5.

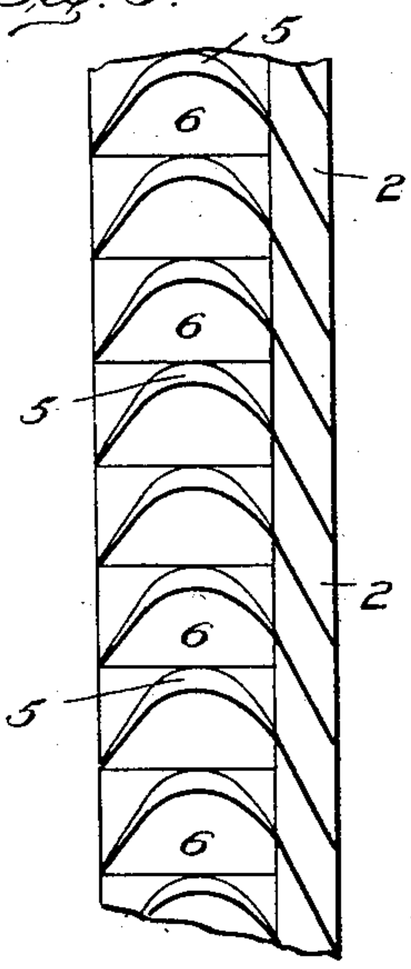
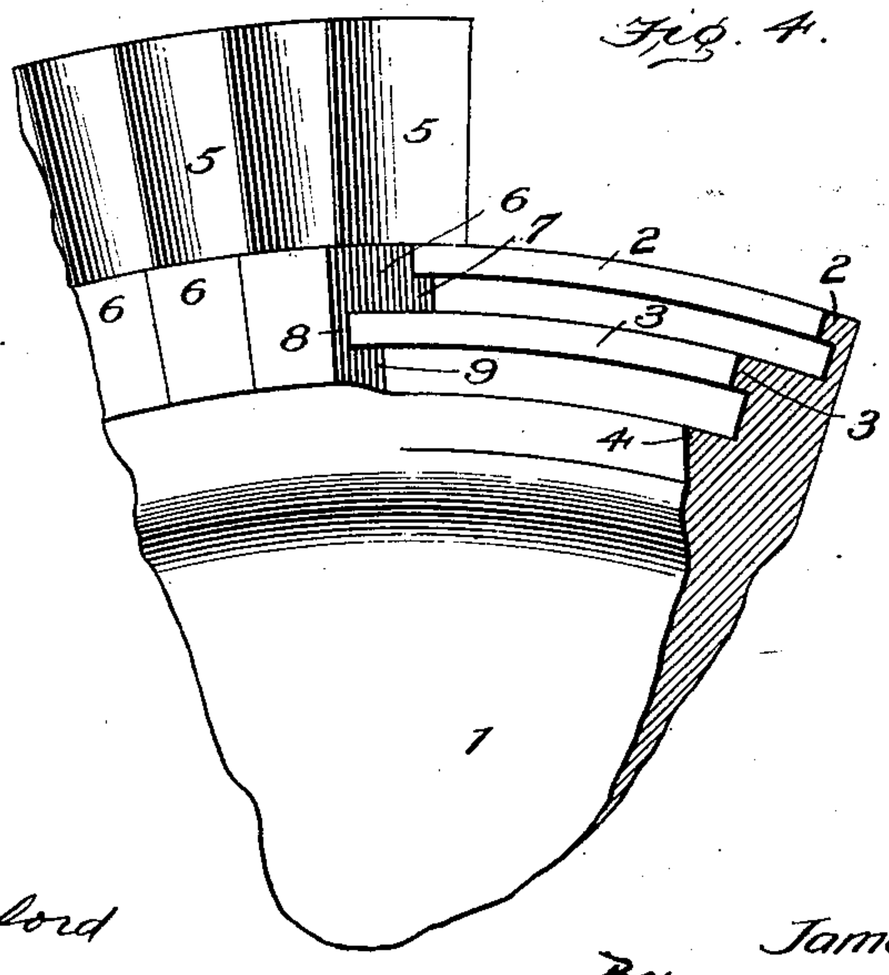


Fig. 6.

Fig. 4.



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ELASTIC FLUID TURBINE WHEEL.

APPLICATION FILED SEPT. 15, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 7

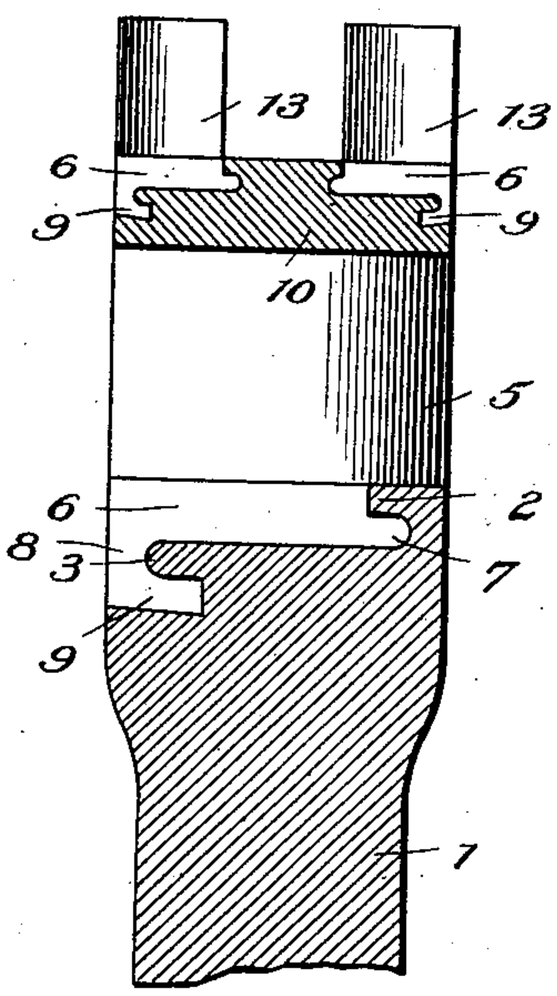


Fig. 9.

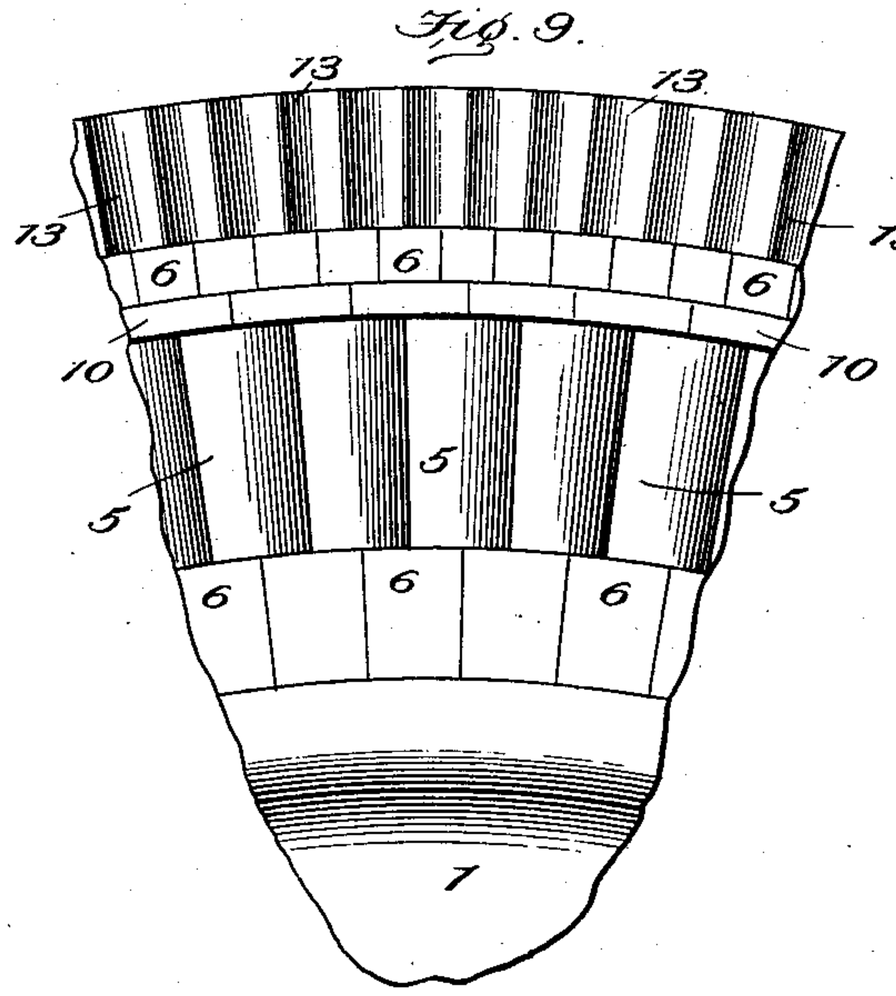


Fig. 8.

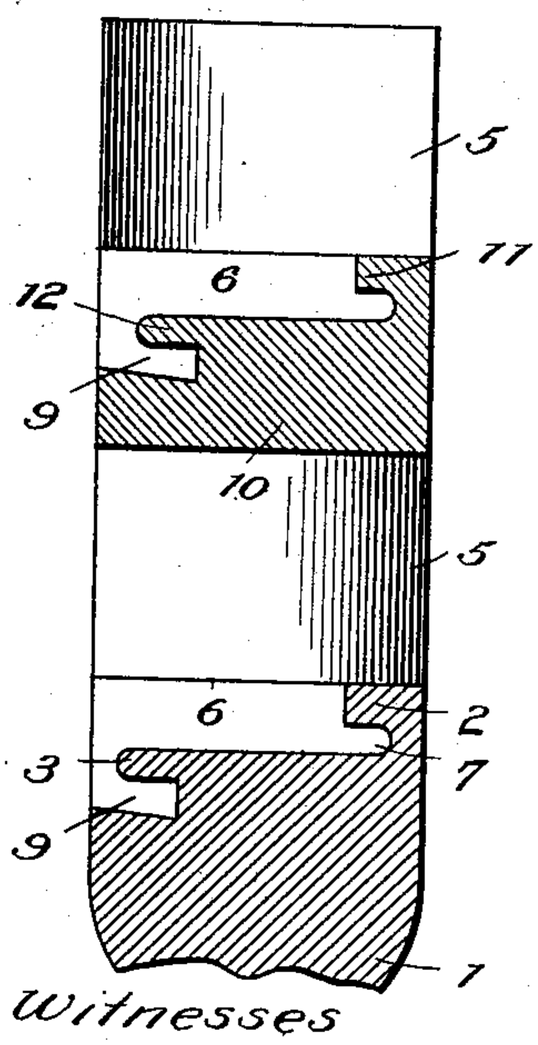
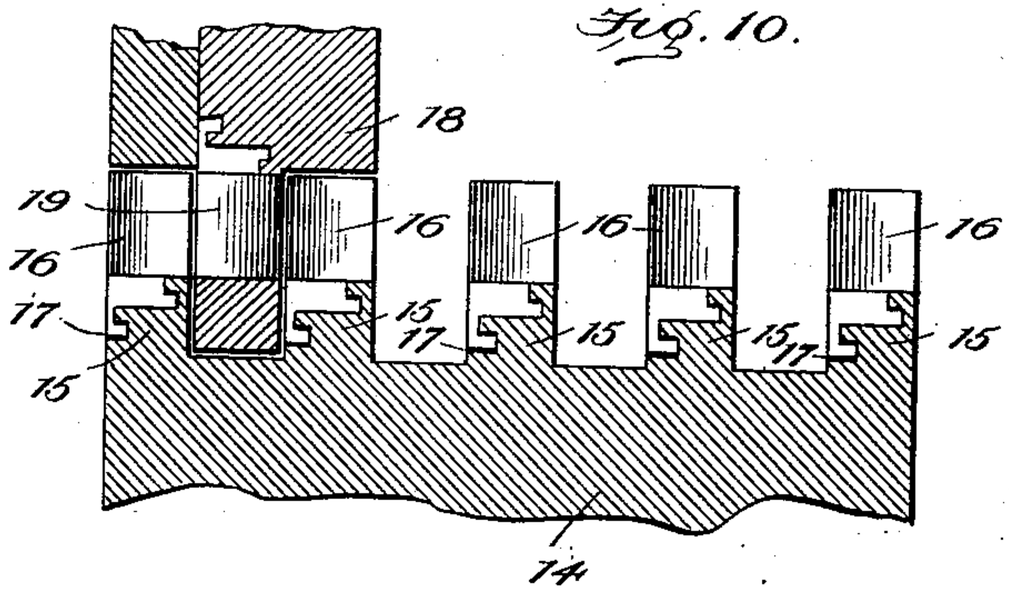


Fig. 10.



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No. 747,523. Patented December 22, 1903.

UNITED STATES PATENT OFFICE.

JAMES WILKINSON, OF BIRMINGHAM, ALABAMA, ASSIGNOR TO THE WILKINSON STEAM TURBINE COMPANY, A CORPORATION OF ALABAMA.

ELASTIC-FLUID-TURBINE WHEEL.

SPECIFICATION forming part of Letters Patent No. 747,523, dated December 22, 1903.

Application filed September 15, 1903. Serial No. 173,339. (No model.)

To all whom it may concern:

Be it known that I, JAMES WILKINSON, a citizen of the United States, residing at No. 1212 North Seventeenth street, Birmingham, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Elastic-Fluid-Turbine Wheels, of which the following is a specification.

My invention relates to improvements in the construction of bucket-wheels for elastic-fluid turbines, and has for its object to construct the wheels in such a manner that the buckets can be securely and permanently calked or brazed in place therein.

My invention further comprises improvements in the construction of bucket-wheels having two or more radially-disposed rows of peripheral vanes arranged for the purpose of reversing the direction of rotation of the wheel.

It is a further object of my invention to provide a bucket-wheel with a plurality of rows of peripheral buckets at different radial distances from the center and to mount the outer row or rows of buckets on the head-blocks of the inner row and at break-joint with said blocks. I may also provide the wheel with two or more rows of smaller buckets at the same radial distance from the center and mount them on the head-blocks of the inner or full-speed row of buckets with a view to enabling the wheel to be driven at a fractional speed either in a forward or reversed direction, according to the relative disposition of the outer to the inner rows of buckets.

These and other improvements are more particularly set forth and described hereinafter, and pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is a partial sectional view of a bucket-wheel having its rim reversely recessed on each side to receive a double row of buckets. Fig. 2 is a similar section of a wheel provided with a single row of buckets, showing the position of the locking-lip in dotted lines before it has been calked or swaged to engage the wedge-shaped inner face of each bucket's base-block. Fig. 3 shows the construction of parts preparatory to assembling the buckets in the wheel. Fig. 4 is a perspective view showing the buckets seated in the wheel, and Fig 5 is a top plan view of the same. Fig. 6 is a detailed view of a single bucket. Figs. 7 and 8 illustrate the manner of mounting half and full speed rows of reversing-vanes upon the head-blocks of the inner row. Fig. 9 illustrates the manner of mounting the outer row of buckets at break-joint with the head-blocks of the inner row. Fig. 10 illustrates the inner row of vanes mounted upon a drum and within the sections of the casing.

Similar reference-numerals refer to the same parts.

The bucket-wheel 1 is provided at one side of its rim with a circumferential undercut shoulder 2 and at the other side with an undercut channel leaving a shoulder 3, forming a continuation of the peripheral rim, and a shoulder 4, whose outer edge projects from the side surface of the rim to form a calking-lip. The bucket 5 has an integral base-block 6, having a lower flattened surface which rests upon the periphery of the rim, and a shoulder 7, which engages the undercut flange 2 and the depending flange 8. This lower flange 8 has integral with its lower edge a wedge-shaped block 9, having a flattened upper surface to engage the shoulder 3, formed by the undercut side channel of the rim. This wedge-shaped block has a squared inner end which abuts against the inner side of the channel, from which point its lower surface tapers upwardly and outwardly, so that it leaves a space between it and the shoulder 4, substantially as indicated by the dotted lines of Fig. 2. To securely lock the bucket in place, it is only necessary to calk or swage the outwardly-projecting portion or calking-lip of the shoulder 4 until it engages the wedge-surface of the block 9, and thus prevent the bucket being removed by slipping it sidewise from the rim. When the bucket is thus held against sidewise movement, it is obvious that the shoulders 2 and 3 securely hold it against out-

ward movement and will further lock it securely in place. By enlarging the rim and reversely channeling it, as shown in Fig. 1, a double row of buckets may be used, in which case it will be noted that the base-blocks for one row will be oppositely disposed to the base-blocks of the other row of buckets. In applying this method of locking the buckets in position to wheels having two or more concentric rows of buckets at different radial distances from the center of the wheel I first secure the buckets of the inner row to the rim of the wheel in the manner just described, and I provide them with head-blocks 10, constructed and arranged to abut against each other, so that they form a continuous rim. In this manner these bucket-compartments are closed around the circumference of the row and the buckets themselves braced together at their outer ends, so that the greatest compactness and strength is secured. This outer rim formed of the head-blocks will be provided with an undercut shoulder 11, an undercut channel leaving a shoulder 12, and a calking-lip, which correspond with the same parts of the wheel-rim, as seen in Fig. 8, or I may provide a double row of bucket-channels for half-speed buckets 13, as seen in Fig. 7, and these buckets may be disposed in the same direction as the full-speed buckets 5 to give a full and half-speed forward drive for the wheel, or they may be oppositely disposed, so that the wheel can reverse at half-speed. The buckets, being of the same construction as in Figs. 1 and 6, will be inserted in the manner described by setting up the lip 4 against their wedged blocks 9 to form a dovetail joint. The outer row of buckets 5 in Fig. 8 will be oppositely disposed on their base-blocks to the inner row to form a reversing wheel. To increase the strength of the wheel and further brace the several rows of buckets together, I mount these outer buckets at break-joints with the head-blocks 10 of the inner row. This construction is illustrated in Fig. 9, where a row of reversing half-speed buckets 13 are shown mounted in said head-blocks at break-joints therewith. In these latter views I may form the shoulders 2 and 11 of the rim and 7 and 9 of the base-blocks with round ends, and the channels will be correspondingly rounded to receive them.

In Fig. 10 I show a drum 14, provided with a plurality of annular shoulders 15, which may be recessed in the same manner as the rims of the bucket-wheel, and buckets 16 may be mounted therein in the manner hereinbefore described. The calked dovetail joint, however, may be dispensed with and the block 9 formed with a flat under face, which makes a parallel joint with the shoulder 2, in which case there will be no projecting lip. These parts will then be brazed together, as indicated by the heavy lines 17, in any desired manner. A section of the shell of case 18 is shown recessed in the same manner as the shoulder 15, and the row of stationary guides 19 are securely mounted therein.

The method of brazing the buckets to the rim may be used throughout the constructions shown in the several figures and will hold the buckets securely in the rim, for the major part of the strain will be against the shoulders 2 and 3, and it is only necessary to prevent the sidewise movement of the buckets to disengage their base-blocks from said shoulders. When the head of shoulder 4 has been swaged into place to lock the bucket, it lies flush with the side of the rim, so that the contour of the wheel is not effected thereby.

If desired, the reversing-buckets forming the outer row in Fig. 8 may be provided with head-blocks and half-speed reversing-buckets mounted thereon in the manner shown in Fig. 7, or any of the several arrangements may be used disclosed in an application filed by me the 31st of July, 1903, Serial No. 167,733.

The full-speed reversing-buckets (shown in Fig. 8) will be mounted at break joints with the blocks 10 in the same manner that the small buckets 13 are in Fig. 9, with the exception that there will be the same number of buckets in each row.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an elastic-fluid turbine, an element having a circumferential row of buckets around its periphery, and a row of bucket elements jointed to said first-mentioned row.

2. In an elastic-fluid turbine, a rotating element having a circumferential row of buckets around its periphery, and a row of bucket elements severally jointed to the outer ends of the buckets of said first-mentioned row.

3. In an elastic-fluid turbine, a rotating element, a circumferential row of buckets around its periphery whose outer ends form a sectional rim, and a row of buckets mounted on said rim at break-joints with the sections thereof.

4. In an elastic-fluid turbine, a rotating element, a circumferential row of buckets around its periphery, head-blocks on the outer ends of said buckets, and buckets jointed to said head-blocks.

5. In an elastic-fluid turbine, a rotating element, a circumferential row of buckets around its periphery, spacer head-blocks on the outer ends of said buckets which abut and form a continuous rim, and a row of buckets mounted at break-joints on said sectional rim.

6. In an elastic-fluid turbine, a rotating element, a bucket element mounted thereon comprising a base-block, a concavo-convex body, a head-block integral therewith, and a concavo-convex body permanently jointed to said head-block.

7. In an elastic-fluid turbine, a rotating ele-

ment, a circumferential row of buckets around its periphery, and a row of individual buckets oppositely disposed to said first-mentioned buckets and permanently jointed thereto.

8. In an elastic-fluid turbine, a rotating element, a row of buckets peripherally mounted thereon, and a row of buckets severally joined and secured to said first-mentioned row and of different dimensions therefrom.

9. In an elastic-fluid turbine, a rotating element, a row of full-speed buckets peripherally mounted thereon, and rows of fractional-speed buckets mounted on said full-speed buckets.

10. In an elastic-fluid turbine, a rotating element, a row of buckets peripherally mounted thereon and having head-blocks and a row of buckets having base-blocks mounted at break-joints on said head-blocks.

11. In an elastic-fluid turbine, an element in which a row of buckets is mounted, annular undercut shoulders disposed around said element in different circumferential and transverse planes, and a row of buckets having base extensions provided with shoulders engaging said undercut shoulders of the element, and means to prevent the disengagement of said shoulders.

12. In an elastic-fluid turbine, an element having a bucket-supporting portion formed with a peripheral main bearing-surface, an annular shoulder around one side of said portion overhanging said surface, and an annular channel around the other side of said portion, and a row of buckets seated on said surface which are shouldered to lock under said overhanging shoulder, and have shouldered flanges engaging within said channel, and means to lock said flanges in said channel.

13. In an elastic-fluid turbine, a bucket-wheel having a circumferential rim channeled to form a plurality of undercut shoulders and an annular side calking-lip, a row of buckets having base portions shouldered to engage said undercut shoulders and adapted to be held against disengagement therefrom by calking said lip against them.

14. In an elastic-fluid turbine, a bucket-wheel having a circumferential rim with an overhanging shoulder around one side and an undercut channel disposed around the other, a row of buckets having shouldered base portions engaging said shoulder of the rim, and wedge-shaped projections entering said undercut channel and a lip around said rim adapted to lock said buckets in place by being calked against said wedge-shaped projection.

15. In an elastic-fluid turbine, a bucket-wheel whose rim is circumferentially channeled at one side to provide shoulders at different radial distances from the center, an inner annular shoulder formed with a calking-lip around its outer edge, an undercut intermediate shoulder and an undercut peripheral shoulder, said shoulders being arranged one above the other, and a row of buckets having base portions adapted to engage said undercut shoulders and to be engaged in turn by said lip to prevent a sidewise movement of said bucket to disengage it from said shoulders.

16. In an elastic-fluid turbine, a bucket-bearing element peripherally shouldered, a channel in the shouldered portion and a channel in the shoulder, said channels opening toward the same side of said element, buckets adapted to engage said channeled portions and means to retain said parts in engagement.

17. In an elastic-fluid turbine, an element having a bucket-supporting portion provided with retaining-shoulders, buckets engaging said shoulders and a side calking-lip adapted to be forced into engagement with one or more of said buckets to lock them in said supporting portion.

18. In an elastic-fluid turbine, a vane-bearing element, a row of peripheral vane elements mounted thereon, and a plurality of vanes mounted on said vane elements and arranged in successive rows in the line of the flow of the fluid to fractionally abstract its velocity.

19. In an elastic-fluid turbine, an element having a circumferential row of buckets, and a series of bucket elements severally jointed and secured to the buckets of said row.

20. In a turbine, a rotary element, a row of peripheral buckets carried thereby, and a plurality of single-bucket elements jointed to the buckets of said row.

21. In an elastic-fluid turbine, an element having a circumferential row of buckets, and a plurality of buckets superimposed upon and severally connected to the buckets of said row.

22. In an elastic-fluid turbine, a rotating element, a row of buckets peripherally disposed around said element and provided with portions adapted to engage a second row of buckets and means to secure said rows together.

23. In a turbine, a rotating element, a row of peripheral buckets carried thereby and having shouldered ends, buckets adapted to engage said shouldered ends and means to secure them thereto.

24. In a turbine, a rotating element, a bucket carried thereby, a head-block therefor having an engaging projection, and a bucket engaging said projection and secured to said first-mentioned bucket.

25. In a turbine, a rotating element, a bucket carried thereby and provided with a head-block, retaining means on said head-block, and a second bucket secured in position by said means.

26. In an elastic-fluid turbine, a rotating

element, a row of buckets peripherally disposed around said element and provided with head-blocks which abut and form a sectional rim, said rim being provided with means to secure thereto a second row of buckets.

27. In an elastic-fluid turbine, a bucket-carrying element, a row of full-speed buckets peripherally mounted thereon, and two or more rows of fractional-speed buckets mounted on head-blocks carried by said first-mentioned row of buckets.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES WILKINSON.

Witnesses:
NOMIE WELSH,
H. M. HARTON.