No. 822,267. PATENTED JUNE 5, 1906.

D. C. GARROWAY.

TURBINE.

APPLICATION FILED OCT. 7, 1905.

2 SHEETS—SHEET 1.

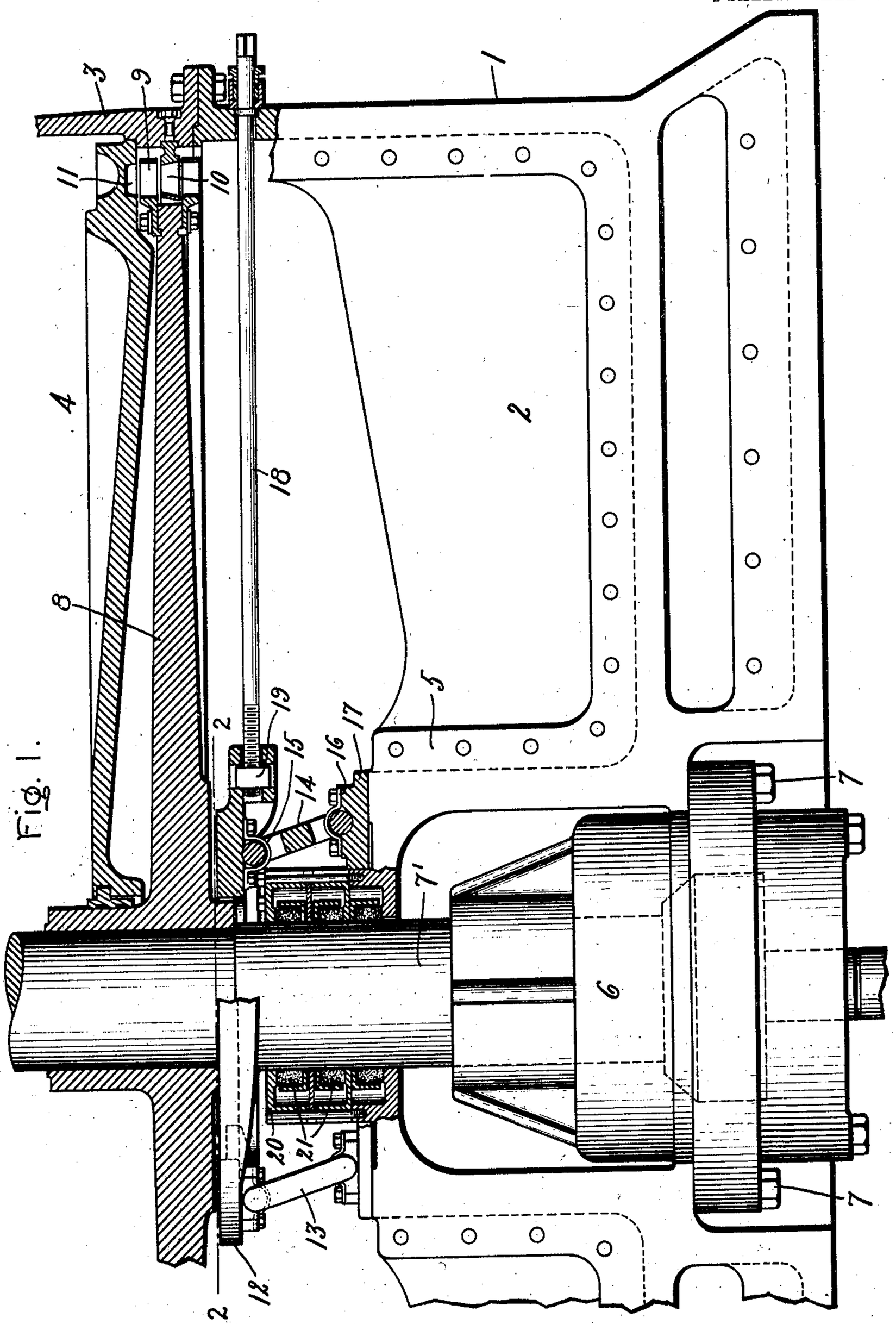

Fig. 1.

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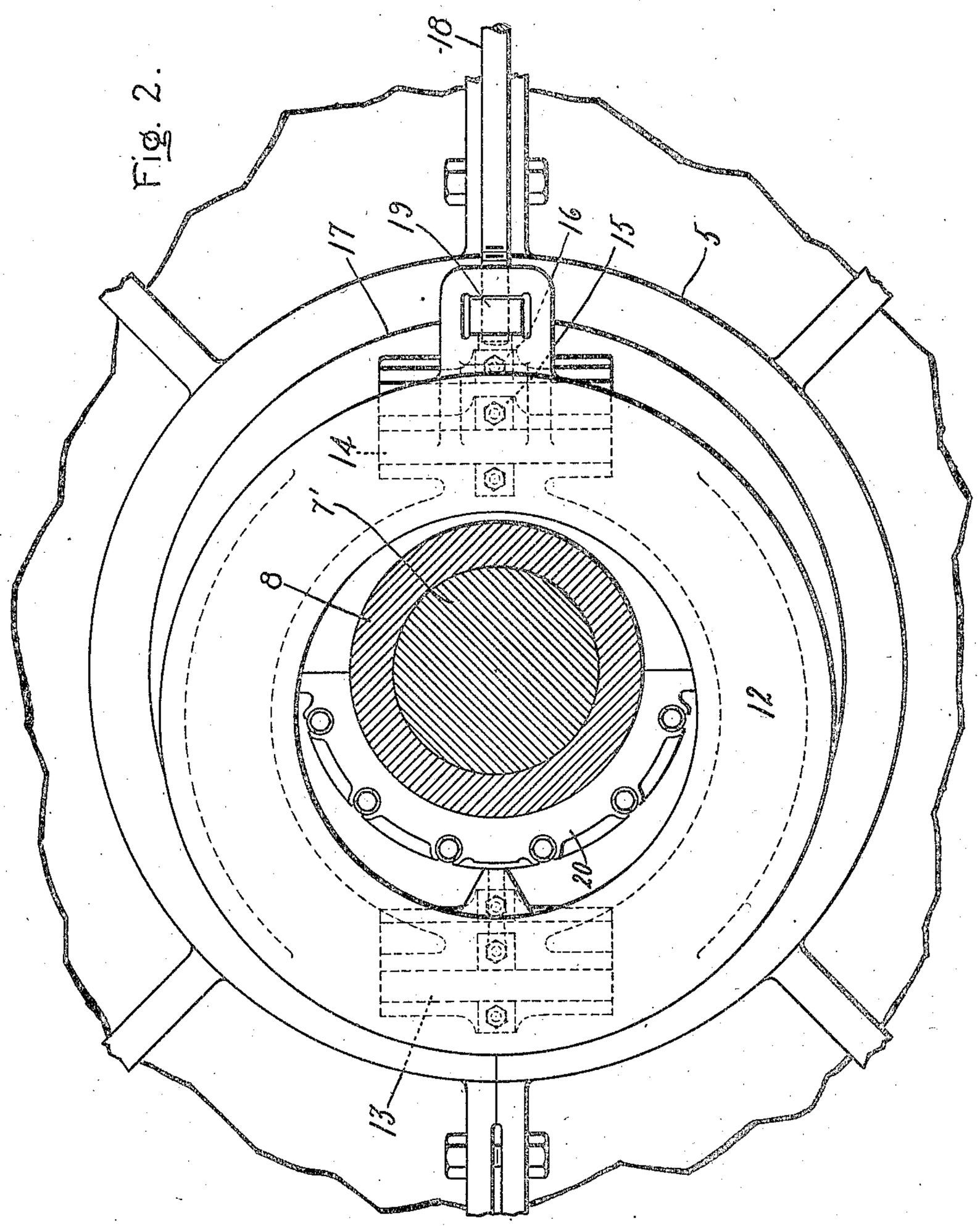
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

DAVID C. GARROWAY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TURBINE.

No. 822,267. Specification of Letters Patent. Patented June 5, 1906.

Application filed October 7, 1905. Serial No. 281,779.

To all whom it may concern:

Be it known that I, DAVID C. GARROWAY, a subject of the King of Great Britain, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Turbines, of which the following is a specification.

The present invention has for its object to provide a simple and effective mechanism for holding up the turbine wheel or wheels and other rotating parts of a vertical-shaft turbine or turbine-generator while the step-bearing is being removed or replaced.

In the accompanying drawings, which illustrate one embodiment of my invention, Figure 1 is a partial vertical section of a turbine of the Curtis type; and Fig. 2 is a view, partly in plan and partly in section, taken on line 2 2 of Fig. 1.

1 represents the base of the turbine, which contains a chamber 2, that is connected to a condenser. Mounted on the base is a cylindrical wheel-casing 3, which is or may be common to all the stages of the turbine. The casing is provided with internal shoulders for supporting the diaphragms 4, these diaphragms being located between adjacent wheels. The base of the turbine is provided with an inset 5, containing the step-bearing 6, the latter being removably secured to the base by the bolts 7. The bearing comprises the usual lower stationary block and the upper movable block attached to the lower end of the main shaft 7'. Since the internal construction of the step-bearing has no particular relation to the present invention, it will not be further alluded to.

Mounted on the main shaft are as many bucket-wheels 8 as there are stages of expansion. Secured to the wheel at points adjacent to the periphery are rows of buckets 9, and situated between the wheel-buckets with small clearances are more or less complete rows of intermediate buckets 10. The construction of all of the stages is similar, so that further description on this point is unnecessary.

Steam or other elastic fluid is admitted to the bucket-wheels by sectionalized nozzles 11, that may be expanding or non-expanding in character.

It is evident from the foregoing that if the step-bearing were removed without first blocking up the wheels the wheel-buckets would engage with the intermediate buckets and injure them. In some cases the construction is such that the intermediate buckets would be unable to sustain the weight of the moving structure. In some machines the weight of the revolving structure is over sixty tons. This will give a fair idea of the necessity of providing a suitable means for supporting the wheels.

12 represents a cast-metal ring having a finished upper surface that is adapted for engagement with a corresponding surface on the under side of the low-pressure wheel. This ring normally occupies a position eccentric to the axis of the shaft. It is supported in place by two or more links 13 and 14, which are of sufficient length, measured in a direction at right angles to the shaft, or are suitably arranged to prevent the ring from tilting. The links are provided with upper and lower well-rounded ends and are secured in place by straps 15 and 16, the former being secured to the supporting-ring and the latter to the plate 17, mounted on top of the inset. The links 13 and 14 are normally inclined somewhat to the shaft-axis and constitute, in effect, a toggle, so that when the ring is moved bodily to the right they will at the same time impart to it a slight vertical movement, sufficient to cause engagement with the under side of the lowest wheel-bucket.

In order to move the supporting-ring from a non-concentric toward or to a concentric position with respect to the shaft, a rod 18 is provided, having on its inner end a screw-thread that enters a nut 19, carried by a projection on the supporting-ring and held against turning. The opposite end of the rod passes through a suitable stuffing-box and is squared to receive a socket-wrench. By rotating the rod 18 clockwise the supporting-ring 12 will be moved bodily to the right until it engages the wheel. Preferably at this time the links will stand almost if not entirely vertically, and thus relieve the strain on the rod to a very large degree. When the supporting-ring engages the wheel, the step-bearing 6 can be removed wholly or in part, and the weight of the moving structure will be supported by the inset 5 through the toggle-links 13 and 14. After the bearing has been finally adjusted in place the rod 18 is rotated anticlockwise, which causes the supporting-ring 12 to move to the left and at the

same time downwardly and out of engagement with the wheel. After this is done the turbine is free to operate as usual.

Surrounding the shaft and mounted on the inset is a casing 20, containing packing-rings 21 to prevent air from leaking into the chamber in the base and to prevent steam from escaping to atmosphere.

In addition to using the ring 12 as a device for supporting the bucket-wheels it can in case of emergency be used as a braking device to stop the wheels from rotating—as, for example, when the steam is shut off and the lubricator-pressure is still on the step-bearing. I may depend upon the character of the links to restrain the ring against rotation, or additional means may be provided for this purpose.

The ring is preferably made in a single piece for strength; but it can be made in two or more pieces and suitably connected, if desired. I find it preferable to support the wheels at every point; but, if desired, the supporting-rings may engage the wheel at a limited number of points.

One of the features of advantage in the present construction resides in the fact that the ring-adjusting means is outside of the casing and it is unnecessary to disturb any portion of the turbine when it becomes necessary to work on the step-bearing. Again, the arrangement of the parts is such that the load on the adjusting-rod is small.

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. A turbine comprising a casing, a revolving element and a step-bearing, in combination with a ring whose axis is normally eccentric to that of the revolving element, for supporting said element when the step-bearing is removed, and means controllable from a point outside of the casing for moving the ring toward a concentric position and into engagement with the revolving element.

2. A turbine comprising a casing, a revolving element and a step-bearing for supporting the revolving element, in combination with a ring for supporting the revolving element when the step-bearing is removed, toggle-links for supporting the ring, and a means controllable from the outside of the casing for moving the ring horizontally and vertically to engage the revolving element.

3. A turbine comprising a casing, a revolving element, and a step-bearing for supporting the revolving element, in combination with a means for supporting the revolving element when the step-bearing is removed, comprising a ring eccentrically located with respect to the shaft, toggle-links for supporting the ring, and a means for straightening the toggle-links and at the same time moving the ring toward a concentric position with respect to the shaft-axis.

4. A turbine comprising a casing, a rotating element, a shaft therefor, and a step-bearing for supporting the shaft, in combination with a supporting-ring normally occupying a position eccentric with respect to the shaft, toggle-links for supporting the ring that are located on opposite sides of the shaft, and a rod extending through the casing by means of which the toggle-links can be straightened.

5. A turbine comprising a casing having a base with an inset formed thereon, a vertical shaft for supporting the revolving element, and a step-bearing therefor which is secured to the base, in combination with a supporting device adapted to be moved into engagement with the revolving element, toggle-links for supporting the device, which in turn are supported by the inset, and a means extending to the outside of the casing for straightening the toggle-links.

6. A turbine comprising a casing, a revolving element, and a step-bearing for supporting the revolving element, in combination with a means for supporting the revolving element when the step-bearing is removed, comprising a device situated below the revolving element and toggle-links situated below said device and supported by the casing, and means for moving the said device into engagement with the revolving element by moving the toggle-links.

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

DAVID C. GARROWAY.

Witnesses:
BENJAMIN B. HULL,
WILLIAM G. RUSS.