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J. C. & H. A. PRESCOTT.

SHAFT FOR TURBINES.

APPLICATION FILED SEPT. 25, 1905.

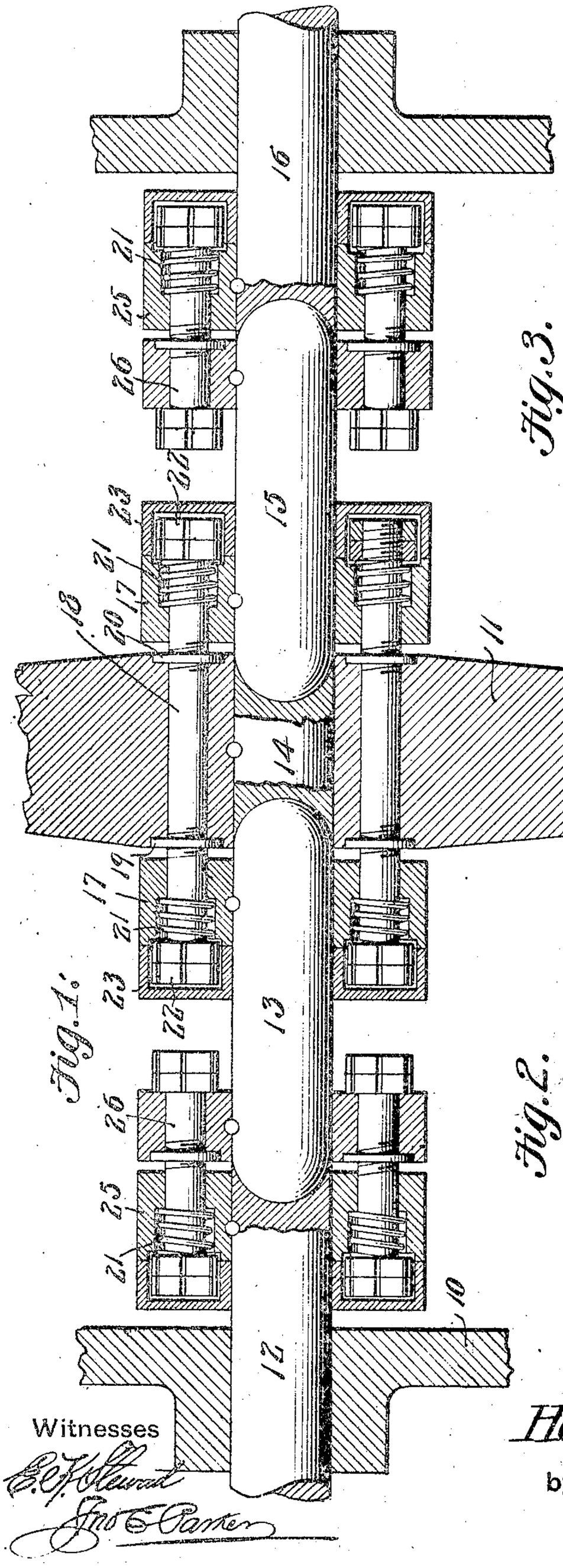

Fig. 1.

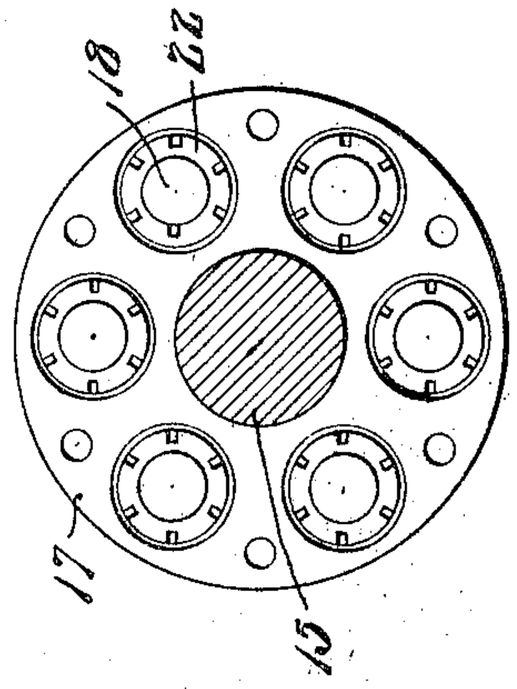

Fig. 3.

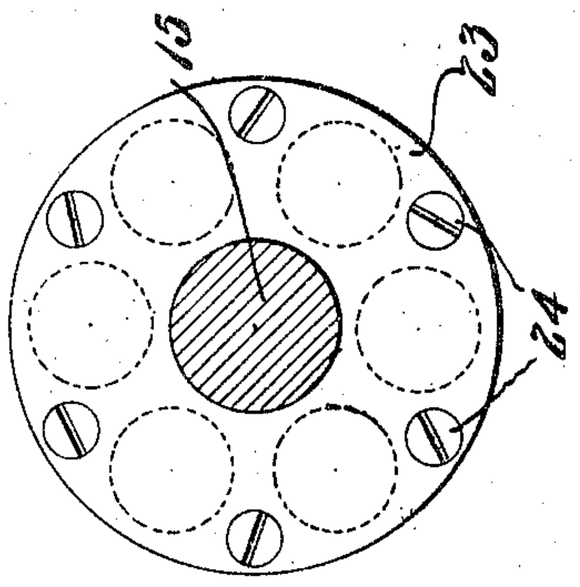

Fig. 2.

Witnesses

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UNITED STATES PATENT OFFICE.

JAMES C. PRESCOTT AND HENRY A. PRESCOTT, OF PHILADELPHIA, PENNSYLVANIA.

SHAFT FOR TURBINES.

No. 823,826. Specification of Letters Patent. Patented Aug. 14, 1906.

Application filed September 25, 1905. Serial No. 280,014.

To all whom it may concern:

Be it known that we, JAMES C. PRESCOTT and HENRY A. PRESCOTT, citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Shaft for Turbines, of which the following is a specification.

This invention relates to elastic-fluid turbines, and has for its principal object to provide for the mounting of the turbine-disk in such manner as to insure perfectly-free rotation of the disk, the disk being allowed to seek its own center of movement.

A further object of the invention is to so mount the turbine-disk as to permit its rotation with the least resistance and to compensate for any imperfections in the construction of the disk, its mounting or adjustments, so that the weight of the disk will be evenly distributed from an axis of rotation which the disk automatically assumes.

A still further object of the invention is to mount a turbine-disk on a freely-revoluble flexible shaft, so arranged as to absorb the vibratory movement of the disk and to transmit to the main power-shaft a regular uniform movement free from vibration.

A still further object of the invention is to provide a novel form of flexible shaft formed of a plurality of yieldably-connected sections having cushioning members for absorbing shock and vibration.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a vertical section of a turbine-engine having its revoluble disk mounted in accordance with the invention. Figs. 2 and 3 are detail views of the shaft connections.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In elastic-fluid turbines as ordinarily constructed the turbine-disks are rigidly secured to their carrying-shafts, and it is frequently found that owing to some imperfections in construction or adjustment there is greater weight at one portion of the disk than at another, or that the disk is subjected to stress at one point greater than at another, so that there is a tendency to vibrate which if not absorbed will be transmitted to the shaft and through the shaft to the remaining portion of the machine, this being a common and troublesome feature of all high-speed turbines, especially when used in the propulsion of vessels or for the driving of small machinery.

In carrying out the present invention the turbine-disk is mounted on a shaft of such construction that the disk is allowed to seek its own center of rotation and all vibration is absorbed in the shaft and shaft connections, so that steady and uniform movement is transmitted to the driving-shaft.

The cylinder or engine casing 10 may be of any ordinary construction, and arranged within it is a turbine-disk 11, having suitable pockets arranged at or near its periphery, any suitable means being employed for directing a jet or jets of fluid under pressure against said pockets.

The cylinder or casing is provided with bearings for the end portions of a shaft, which in the present instance is formed of five sections 12, 13, 14, 15, and 16, the central section 14 carrying the turbine-disk and the latter being keyed or otherwise rigidly secured to said shaft-section.

The section 14 of the shaft is provided with semicircular recesses forming sockets for the reception of the rounded ends of the shaft-sections 13 and 15, and the outer ends of said shaft-sections 13 and 15 are also rounded and fit within sockets formed in the adjacent ends of the shaft-sections 12 and 16. One or both of these latter shaft-sections may be continued out beyond the head of the cylinder and connected in any suitable manner to the mechanism to be operated.

Secured to each of the shaft-sections 13 and 15 at a point adjacent to the turbine-disk 11 is a collar 17, and these collars, as well as the turbine-disk 11, are provided with openings for the passage of bolts 18, six of such bolts being employed in the present instance. On each bolt is a fixed flange or collar 19, that

seats within a recess formed in one side of the turbine-disk, and a second collar or nut 20 is screwed on a threaded portion of the bolt and clamps rigidly against the inner wall of a second recess formed on the opposite side of the turbine-disk, so that the central portion of the bolt is rigidly clamped to the disk, while its opposite ends are arranged to work freely in the openings formed in the collars 17. The collar-openings are counterbored at their outer ends to form pockets for the reception of helical compression-springs 21, and the outer ends of the bolts are threaded for the reception of nuts 22, by which the stress of the springs may be adjusted, these nuts being preferably provided with circular peripheries having notches for the reception of a spanner-wrench. The nuts and springs are protected by a housing-sleeve 23, one of which is fitted on each shaft-section 13 and 15, these sleeves having pockets for the reception of the nuts and being held to the collar 17 by suitable screws 24.

Secured rigidly to the outer end of each of the shaft-sections 13 and 15 is a collar 25, having openings for the passage of a bolt 26, said bolt having a rigid collar 27, that is seated in a small recess formed in the outer face of the collar, while nuts 28, arranged in the threaded end of the bolt, serve to firmly clamp the latter to the collar.

To each of the shaft-sections 12 and 16 is secured a collar 17, having bolt-receiving openings, and to this collar is secured a housing-sleeve 23 of the type previously described, the bolts 26 extending through the openings formed in the collar and being provided with compression-springs 21, of the same character as those employed at the inner end of the shaft-sections 13 and 15.

The construction is such that when the disk is rotated its periphery will tend at first to describe a circle of a diameter greater than the diameter of the disk; but as the rotation continues the centrifugal force will be balanced and the disk will seek its true center of gravity and will thereafter revolve steadily around an axis which may or may not be in the plane of the axis of the shaft-sections 12 and 16. Any vibration of the disk due to any defect in construction or to the uneven distribution of the propelling force will be taken up by the springs 21, all shocks and vibration being absorbed and the movement transmitted to the shaft-sections 12 and 16 being smooth, regular, and uniform, so that the machinery will be driven at regular speed and without any vibration whatever.

Having thus described the invention, what is claimed is—

1. In an elastic-fluid turbine, a turbine-disk, a disk-carrying shaft formed of a number of sections having interfitting end members, the end sections being arranged in fixed bearings, and connecting means arranged between said sections and including spring-pressed bolts that tend to maintain the sections in alinement.

2. In an elastic-fluid turbine, a turbine-disk, a sectional shaft having interfitting end portions arranged to permit free play of the sections, the turbine-disk being secured to the central section, and the end sections being arranged to revolve in fixed bearings, intermediate sections, collars carried thereby and yieldably connected to the turbine-disk, and yieldably-connected collars carried by the intermediate and the end sections of the shaft.

3. In an elastic-fluid turbine, a cylinder, a shaft including end sections, a central section, and intermediate sections, the latter being disposed between the central section and the end sections, all of said sections having interfitting ball-and-socket connections, a turbine-disk secured to the central section, bolts rigidly secured to the turbine-disk and having their opposite ends projecting from the sides of the disk, collars clamped to the inner ends of the intermediate shaft-sections and provided with openings for the passage of said bolts, springs surrounding the end portions of said bolts, nuts arranged on the threaded ends of the bolts and serving to adjust the stress of the springs, housing-sleeves connected to the collars and serving to house and protect the nuts and springs, collars rigidly secured to the outer ends of the intermediate sections, bolts projecting from said collars, sleeves secured to the end sections of the shaft and provided with openings for the passage of the bolts, springs surrounding the latter bolts, nuts arranged on said bolts and serving to adjust the spring, housing-sleeves for protecting the nuts and springs, and bearings for the support of the end sections of the shaft.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

JAMES C. PRESCOTT.
HENRY A. PRESCOTT.

Witnesses:
JNO. E. PARKER.
JNO. S. APPLEMAN.