(No Model.)

J. M. FINCH.

UPRIGHT SHAFT SUPPORT AND STEP RELIEVER.

No. 251,104. Patented Dec. 20, 1881.

FIG. III

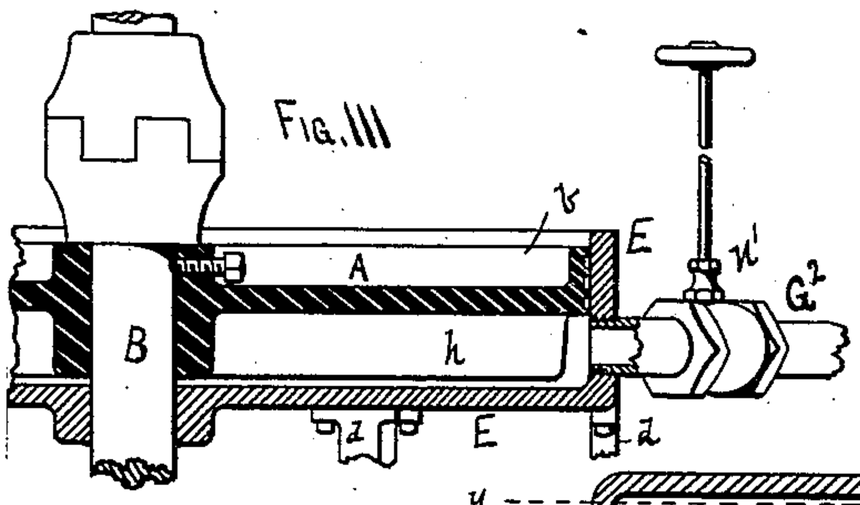


FIG. I

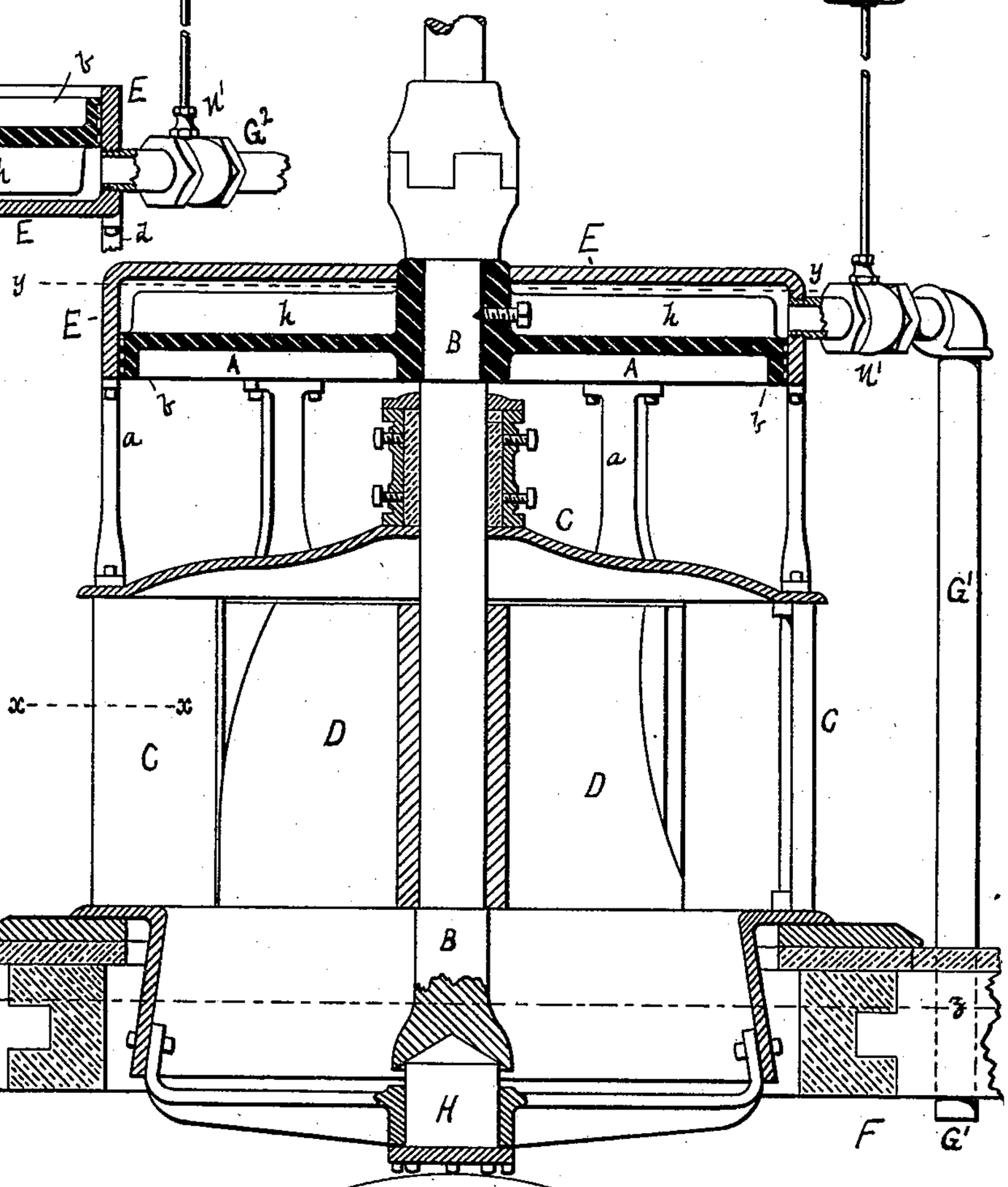
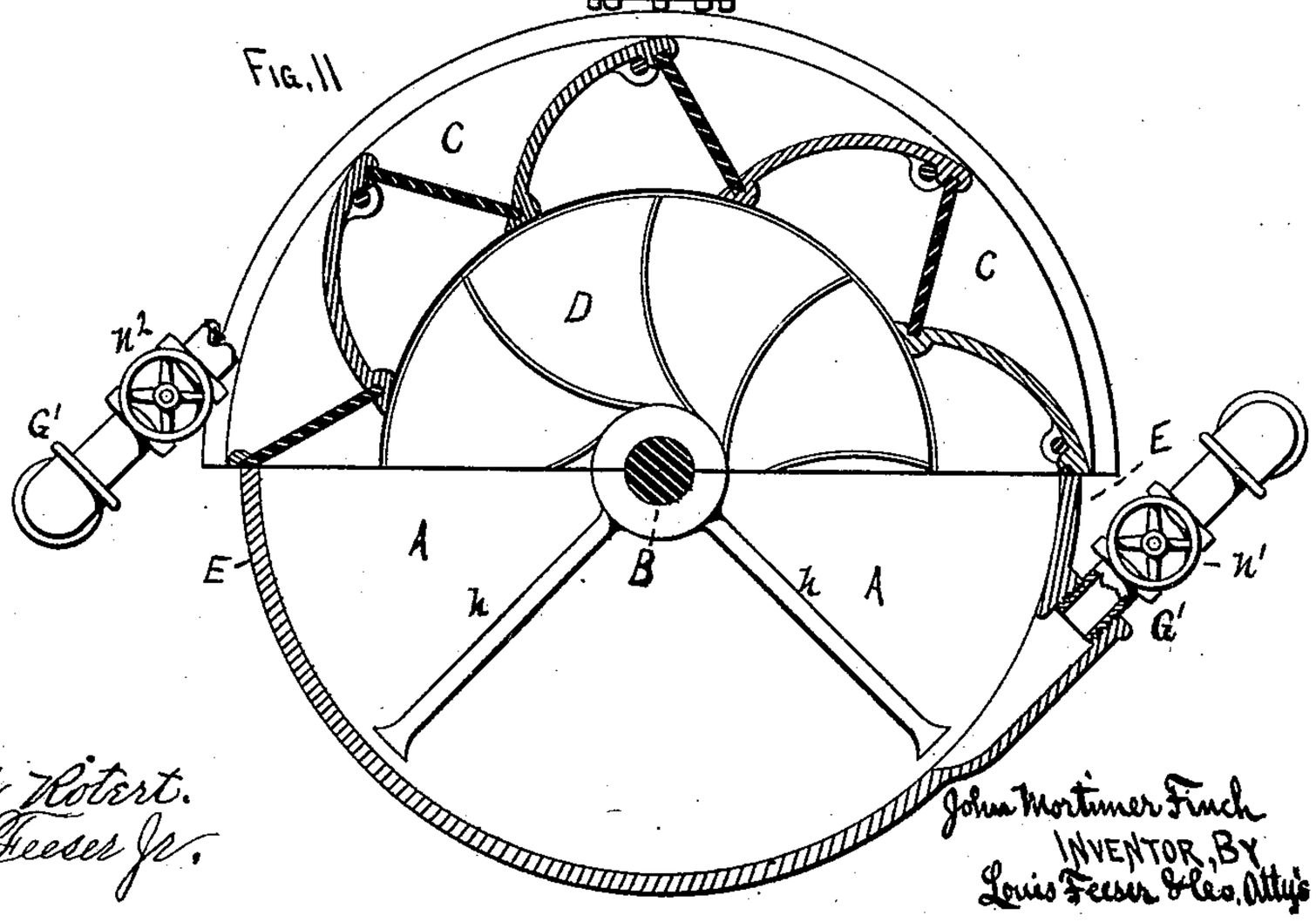


FIG. II



WITNESSES,
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UNITED STATES PATENT OFFICE.

JOHN M. FINCH, OF MINNEAPOLIS, MINNESOTA.

UPRIGHT-SHAFT SUPPORT AND STEP-RELIEVER.

SPECIFICATION forming part of Letters Patent No. 251,104, dated December 20, 1881.

Application filed July 29, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN MORTIMER FINCH, a citizen of the United States, and a resident of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Upright-Shaft Supports and Step-Relievers, of which the following is a specification.

This invention relates to upright shafting of all kinds; and it consists in a plate or disk connected to and revolving with the shaft, and adapted to be acted upon by water or other liquid to support the shaft and form a liquid cushion or bearing, whereby the downward pressure is removed from the step, as hereinafter set forth. I attain these objects by the use of the mechanism illustrated by the accompanying drawings, in which—

Figure 1 is a sectional elevation of the shaft, &c., of a water-wheel, showing the manner of applying the invention thereto; and Fig. 2 is a plan view of the same, the lower half in section on the line *x x* and the upper half in section on the line *y y* of Fig. 1. Fig. 3 is a sectional elevation of a portion of an upright shaft of the ordinary pattern, showing the variations necessary to apply my invention thereto.

To relieve the downward pressure on the step of perpendicular shafting, especially in turbine water-wheels, is the object of my invention.

In carrying out my invention I make use of a circular disk or plate, A, attached to the shaft B, so that it will revolve with it. When applied to turbine water-wheels this plate is placed above the casing C of the wheel D, as shown, while an open-bottomed and closed-top drum, E, is attached rigidly to the casing C by standards *a*, and in the lower part of which drum the plate A revolves. The edge of the plate A is provided with a downwardly-projecting rim, *b*, in which water-packing grooves are cut, so that the water from the flume will not leak through into the drum, except in a small quantity.

G′ G′ are pipes leading from the drum E downward into the tail-race F, the lower end of the pipes opening below the lowest possible line of the water in the tail-race, so that any water that may leak upward into the drum E will be drawn off, (*z z*, Fig. 1, indicating the water-line in the tail-race,) so that no impediment will exist in the drum E above the plate A to prevent the latter being lifted by the pressure of the water in the flume, and thus raise the shaft B and remove the pressure from the step H. Wings *h* upon the upper side of the plate A will also assist in discharging the water by driving it into the pipes G′, they being arranged to enter the drum at a tangent, as shown in Fig. 2, to facilitate this action. The pipes G′ will be made large enough to draw the water off much faster than it leaks in; hence the drum E is certain to be kept free from water. By this arrangement it will be seen I utilize the ordinary water-supply in the flume to support the shaft, while in Fig. 3, which represents the invention applied to an ordinary upright shaft, the drum E is reversed and secured in any manner by standards *d* in a fixed position, and a supply of water forced in between it and the plate A by a pipe, G^2, with sufficient pressure to support the shaft and relieve the step. By this means the whole weight of the shaft and the machinery attached to it is borne by the liquid cushion. Very little friction occurs between the plate A and the liquid, as can be readily illustrated by the ease with which large floating bodies may be moved in water; hence an almost frictionless bearing is obtained for the shaft. Little or no friction occurs between the plate A and drum E, as the packing need not be water-tight, as the exhaust-pipes G′ will carry off the water as fast as it accumulates, and the pressure-pipe G^2 will replenish any leakage when used as in Fig. 3.

The device may be applied in the shape of a long drum, with an open top reaching above the surface of the water of the flume or an encircling reservoir; but I prefer it arranged as shown.

The ordinary hydrant-pressure of twenty-five to thirty-five pounds to the square inch, acting upon the plate A in Fig. 3, is sufficient to support a shaft carrying six tons of weight, so that no expensive pumping machinery is necessary.

Valves n' n^2 will be arranged in the pipes G′ G^2 to regulate the flow of water. Alcohol, glycerine, or other non-freezing liquid may be used in cold weather.

What I claim as new is—

1. The combination, with an upright shaft and its step, of a disk or pla'e connected with the shaft, so as to turn therewith, and provided with a peripheral projecting rim having water-packing grooves therein, a casing or drum encircling the said disk, so as to leave a chamber between the surfaces of the drum and disk, means for supplying a liquid to the disk, so as to raise the shaft from its step, and means for withdrawing from the disk the surplus liquid, substantially as set forth.

2. A device adapted to be applied to turbine water-wheels and other objects having upright shafting, for the purpose of relieving the friction between the shafting and its step, consisting of a drum or casing, a disk or plate fitting within said casing or drum, so as to form a chamber between the two, and adapted to be secured to an upright shaft, said plate being provided with a peripheral rim having water-packing grooves, wings for facilitating the withdrawal of liquid from between the disk and drum, and means for supplying and withdrawing the liquid to and from the face of the disk, substantially as and for the purpose specified.

3. The combination, with an upright shaft and its step, of a disk or plate connected with the shaft, so as to turn therewith, a casing or drum encircling the said disk, so as to form a chamber between the drum and disk, means for supplying a liquid to the plate, so as thereby to raise the shaft from its step, means for withdrawing the liquid from the plate, and wings on the disk for facilitating the withdrawal of the liquid therefrom, substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN MORTIMER FINCH.

Witnesses:

C. N. WOODWARD,

LOUIS FEESER, Sr.