# T. WELHAM, dec'd.

J. T. Welham, Administrator.

## COMBINING AND OPERATING A SERIES OF TURBINE WATER WHEELS.

No. 190,172. Patented May 1, 1877.

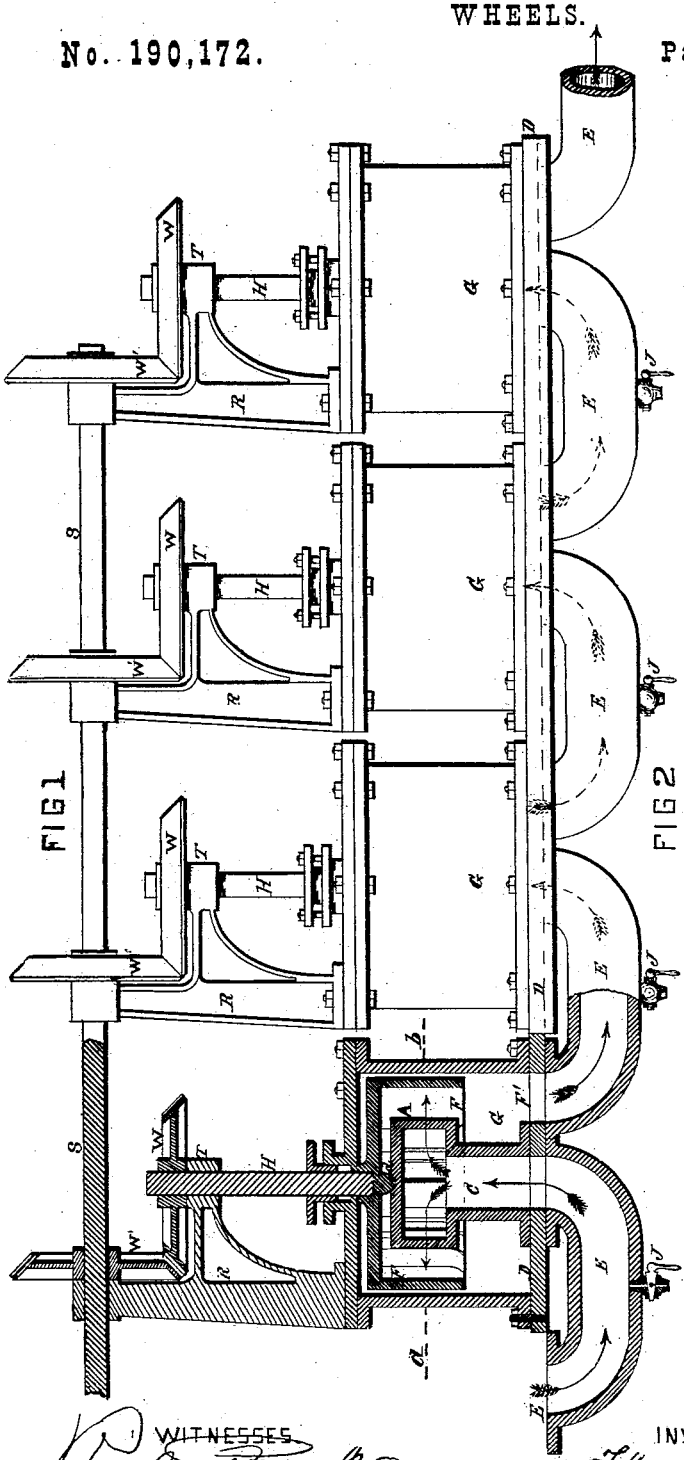

FIG 1

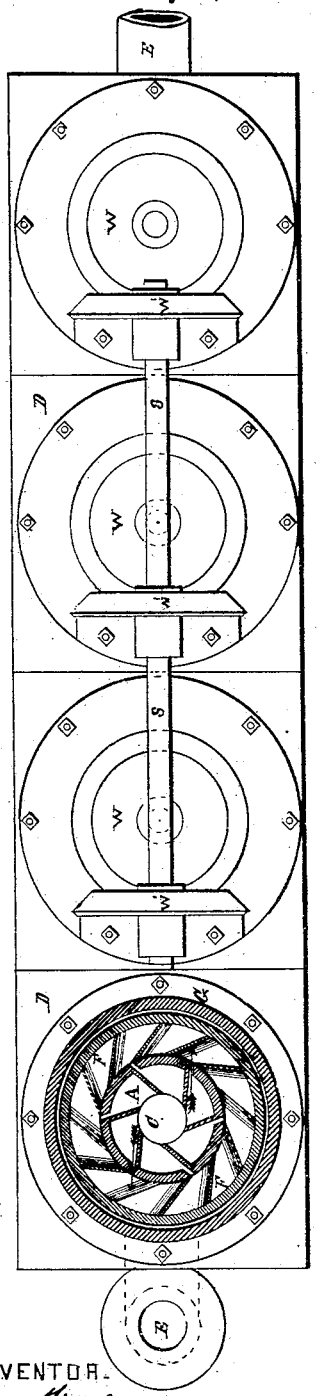

FIG 2

WITNESSES:

Richard Burr Wm. D.

A. H. Morgan,

INVENTOR.

Thomas Welham.

Per, Isaac P. Oakford, attorney for J. T. Welham, Administrator,

# UNITED STATES PATENT OFFICE.

J. THOMAS WELHAM, OF PHILADELPHIA, PA., ADMINISTRATOR OF THOMAS WELHAM, DECEASED, ASSIGNOR TO RICHARD BURR, OF SAME PLACE.

## IMPROVEMENT IN COMBINING AND OPERATING A SERIES OF TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. **190,172**, dated May 1, 1877; application filed October 9, 1876.

*To all whom it may concern:*

Be it known that THOMAS WELHAM, deceased, late of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Combining and Operating a Series of Turbine Water-Wheels, of which the following is a specification:

This invention relates to certain improvements in that class of turbine water-wheels in which the power of two or more wheels, operated by the same head or supply, is concentrated to drive a single main shaft.

A hollow cylindrical head provided with chutes and openings in the sides, for directing the water onto the buckets, and a vertical conduit at the bottom for the supply, is placed in the interior of each wheel, and is inclosed with the wheel in an air-tight casing. The wheel and head are elevated a suitable distance above the bottom of the casing, and the supply-water, after passing onto the buckets, is discharged at the lower part of the wheel, and, falling into the bottom of the casing, flows from thence through a suitable conduit to the next wheel in succession, and so on from wheel to wheel until its final discharge in the tail-race.

Figure 1 is a side elevation of my improvement in combining and operating turbine water-wheels, showing a vertical section of one of the wheels. Fig. 2 is a plan view of the same, showing a plan section of one of the wheels on the line *a b*.

Each wheel is provided in the center with a hollow cylindrical head, A, which is made with any number of suitable chutes and openings in the sides for conducting the water onto the buckets. The said head is supported upon a hollow vertical column, C, through which the supply-water passes. This column is secured at the lower end to a bed-plate, D, and communicates through an opening in the center of the plate with a tube or conduit, E, which leads from the supply-head. The wheel F is made with a closed top and sides, the bottom being open to form a passage for the discharge-water, which falls into the lower part of the casing G and out through a conduit, F′, to operate the next wheel in succession. The buckets of the wheel, which may be formed of straight or curved blades, are located around the interior of the rim, and receive the water at any suitable angle through the openings made in the sides of the cylindrical head A. Each wheel is provided with a vertical spindle, H, and is supported on a pivot, *d*, which revolves freely in a step formed in the head A. The upper end of each spindle is furnished with a bevel-wheel, W, which gears with a similar wheel, W′, arranged on a horizontal shaft, S, by which means the power of all the wheels is concentrated on the one shaft. The shaft S revolves in bearings formed in the vertical supports or standards R, which are secured to and rise above the top of the wheel-casings. These standards are also made with projecting arms T, through which the vertical spindles pass and work. The wheels are each inclosed in the air-tight casings G, and the water passes in the direction indicated by the arrows in Fig. 1. The return-bends E, which form channels for the water to pass from wheel to wheel, are each furnished with a water-cock, J, for drawing off any water remaining in them when the wheels are not in operation.

What I claim as my invention is—

1. The combination of the hollow cylindrical head A, turbine wheel F, and hollow column C, with the bed-plate D, provided with induction and eduction openings, and horizontal return-bends or conduits E and E′, substantially as shown and described.

2. The combination of the hollow column C, head A, turbine wheel F, pivot and step *d*, and vertical spindle H, substantially as shown and described.

J. THOMAS WELHAM.

Witnesses:

RICHARD BURR,

ISAAC R. OAKFORD.