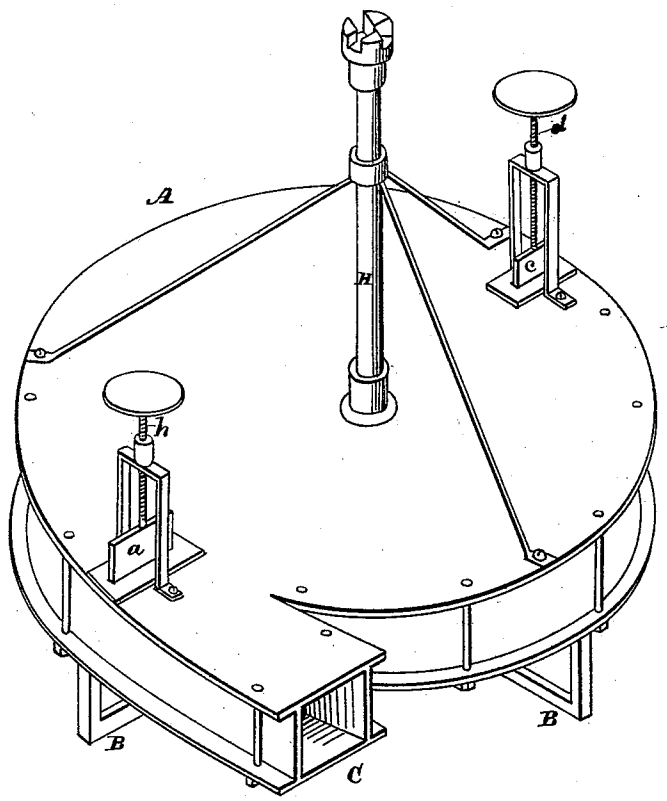
2 Sheets—Sheet 1.

W. HACHENEY.
Turbine Water Wheel.

No. 228,629. **Patented June 8, 1880.**

FIG. 1



WITNESSES

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2 Sheets—Sheet 2.

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Turbine Water Wheel.

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FIG. 2.

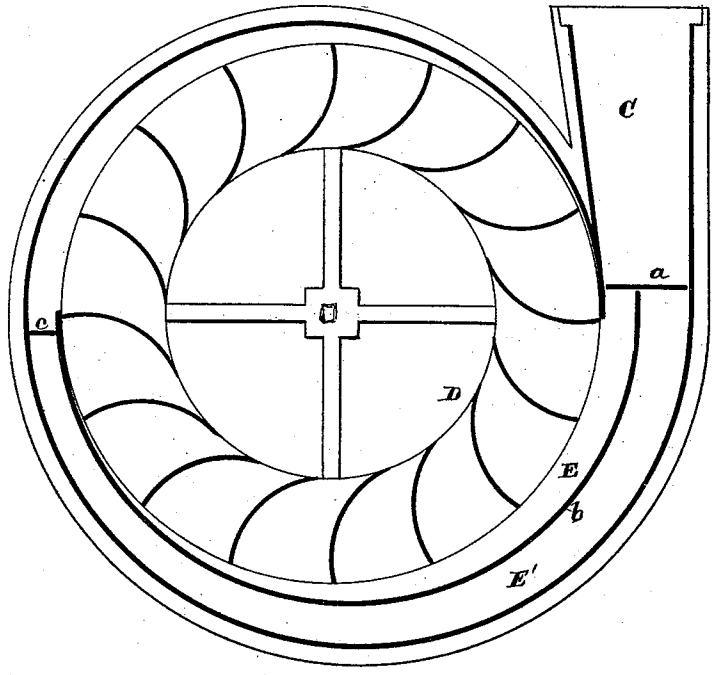
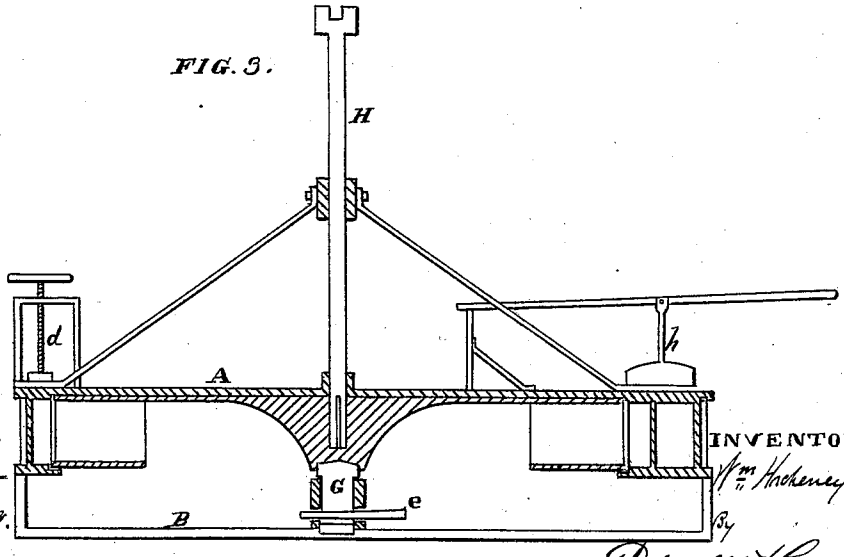


FIG. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM HACHENEY, OF SAN FRANCISCO, CALIFORNIA.

TURBINE WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 228,629, dated June 8, 1880.

Application filed July 30, 1879.

To all whom it may concern:

Be it known that I, WILLIAM HACHENEY, of the city and county of San Francisco, and State of California, have invented an Improved Portable Turbine Wheel; and I hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to an improved portable turbine wheel; and my improvements consist in providing a double scroll for delivering the water to the wheel, so that the power shall be applied on both sides of the wheel equally.

It also consists in peculiarly-operating gates for controlling the admission of the water to the scrolls, and in a peculiar construction of the step or bearing for the reduction of wear.

The wheel is made on a frame, so as to be easily portable, and is intended particularly for running with a small head of water, so as to utilize all the supply without waste of power.

Figure 1 is a perspective view. Fig. 2 is a horizontal section. Fig. 3 is a vertical section.

The case A has a stationary rim, to which the removable top is attached by means of bolts, as shown. The case is supported on the base-timbers B, which are made so as to rest on a suitable foundation, or to be set on the ground in the position where the wheel is to be used. The machinery is geared to the shaft H, passing through the upper end of the case. The entrance or throat C extends out from the side of the case, and the pen-stock or flume is led into this entrance, so as to deliver the water to the wheel D, as hereinafter described.

In a suitable position in the entrance or throat is placed a vertically-sliding gate, *a*, moving in grooves, and operated by a screw, *h*, and hand-wheels, as shown, or it may be raised by a lever, if desired. This gate is used to close the water from the entire wheel when necessary, or reduce the supply to the scrolls.

The inner scroll or channel, E, leads from the gate about half-way around the wheel, gradually tapering off to nothing, being of a wedge shape. A diaphragm, *b*, separates this from the outer scroll or channel, E′, which leads from the gate clear around the wheel, the diaphragm preventing the water from coming to the wheel until the end of the inner scroll, E, is passed. The water from this channel then begins to strike the wheel, and from this point to the end the scroll is wedge-shaped. At the end of the diaphragm a second gate, *c*, is placed, operated by a screw, *d*, and hand-wheel, or by a lever, if preferred, by which the flow through the outer channel is controlled independent of the main gate, and is used only, in case of a deficiency of water, to give the same pressure on both streams of water leading to the wheel.

The wheel rests on a wooden step, G, made in a conical form. of some hard wood previously prepared by being boiled slowly for three or four hours in beef tallow, for the purpose of taking the watery particles out of the wood. The tallow enters in its place, making the step self-lubricating. The step fits up into a socket in the center of the wheel. Under the step is a wedge, *e*, for lifting the step in case it should become worn.

Turbine wheels have been made with a single scroll, in which the water is led to the wheel by a wedge-shaped passage, the water striking the whole circumference of the wheel. In these, however, the wheel is apt to work itself out of the center by continual one-sided pressure, since the water being led through one opening cannot distribute its pressure throughout the wheel. A wheel of this kind will seldom run well by its not keeping in the center, as a good part of the water is lost between the opening of the wheel and the case, and on the other side the friction of the wheel against the edge of the case will retard it. These wheels will not run well under a deficiency of water, as the water is not led to the wheel in the most advantageous manner, and, as they have central gates working on the balance system, great force is lost when working a partial gate by the water being cut up. There are also many ring-gate turbines, which admit the water through several channels or openings around the circle of the wheel, the water coming in as the gate rises. This plan is good for giving equal pressure to the wheel and keeping it in the center, provided there is plenty of water. It does not work well, however, with small streams of water, as the water is too much cut up. The full power is not utilized as the water enters the different openings in the form of successive blows instead of with a steady pressure. This class of wheels

cannot be called portable, since they have to be put inside of a flume, making it very troublesome to set them up and difficult to keep them from leaking when the gate is closed. When they need repair the surrounding flumes have to be removed to get at the wheel.

It has always been difficult in all turbines to find something to keep the step supporting the wheel from rapidly wearing down and needing constant setting up or renewal. Different kinds of metals are in use, but none stand any length of time on account of the velocity at which the wheels run and the impossibility of keeping lubricants on them in the water.

My wheel has sixteen or more buckets, with their hollow sides facing the stream, as shown, the water striking the buckets perfectly square. The wheel has a central downward discharge, and as soon as the force of the water is spent it falls by gravity out of the way. As the wheel has a bottom rim the width of the length of the buckets and revolves in a water-tight case, it is easily portable. Each of the two channels E E′ is of a wedge shape, as shown, for half the circumference of the wheel. It is therefore a perfect balance pressure-wheel, half the water being applied on each side. With a single scroll the wheel has always a tendency to be pressed out of the stream by the pressure being always greatest on one side of the wheel. By leading the water to the wheel, as I do, in two unbroken streams I obtain its full power.

The main gate closes the water from the entire wheel. The second one in the outer scroll, near the outlet of the channel, is used in case of a deficiency of water; so the same pressure is maintained on both sides, the outer channel being larger than the inner, to overcome the friction of the water passing through the outer circle. As the gates admit the water from below, as the gates are raised, the wheel receives the two unbroken streams of the size corresponding to the opening of the gate.

The step is set up lengthwise the grain of the wood. After being boiled in the tallow or other fatty or oily substance it is close grained and hard, and being thoroughly saturated with the oily matter, will be almost frictionless. A step of this kind will run five or six years without lubrication, keying up, or repairs, while those of metal wear out frequently in a few weeks, especially if the water be at all gritty.

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

A turbine water-wheel provided with a curved tapering supplemental flume, E′, an outer scroll, and an inner scroll dividing the water-current and laid off so that it has the delivery-openings to the wheel of the same capacity, and arranged on opposite sides of the wheel, substantially as set forth.

In witness whereof I have hereunto set my hand.

WM. HACHENEY.

Witnesses:
S. H. NOURSE,
FRANK A. BROOKS.