2 Sheets—Sheet 1.

T. H. RISDON & W. W. TYLER.

TURBINE-WHEEL.

No. 193,283. Patented July 17, 1877.

FIG. 1.

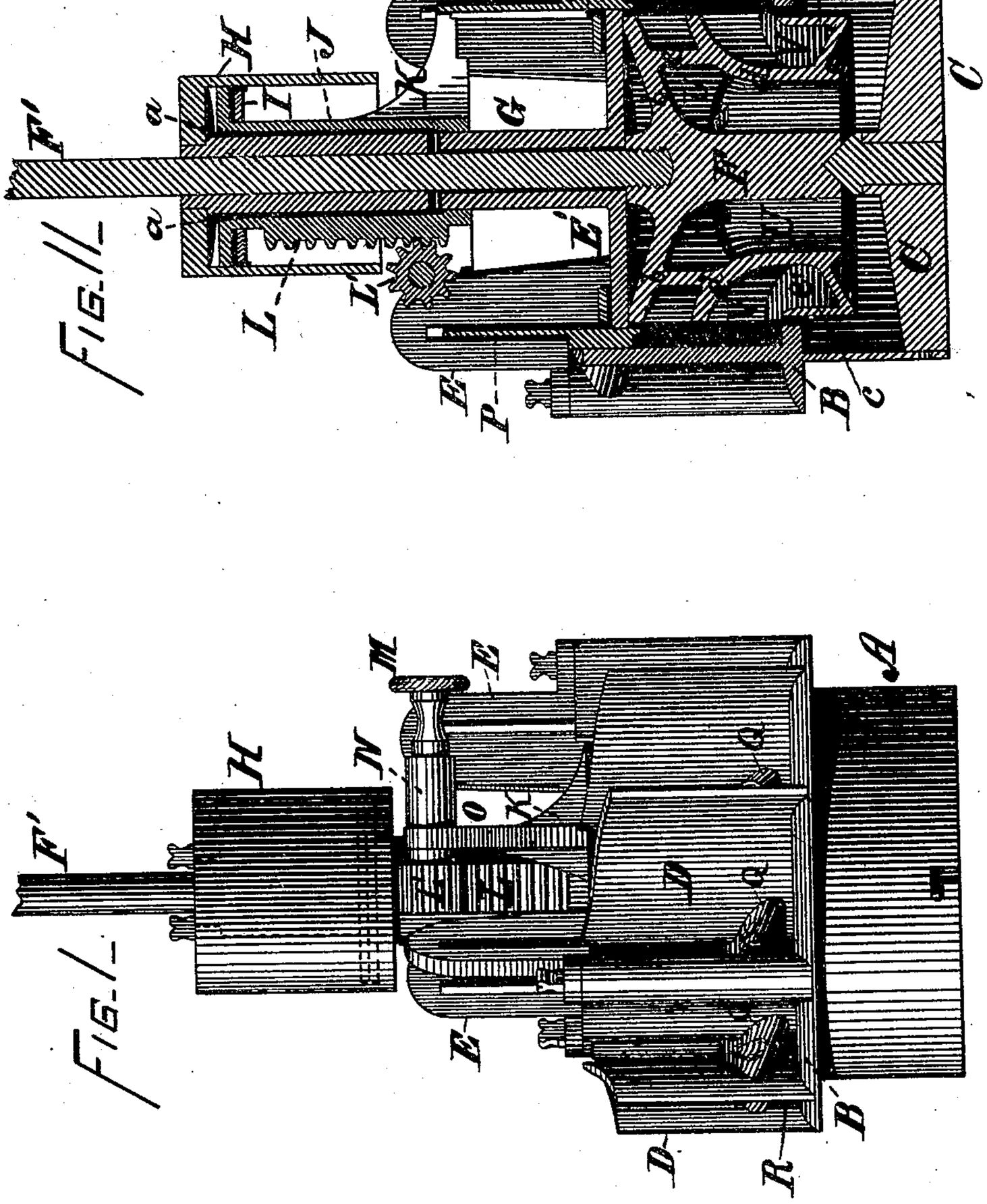
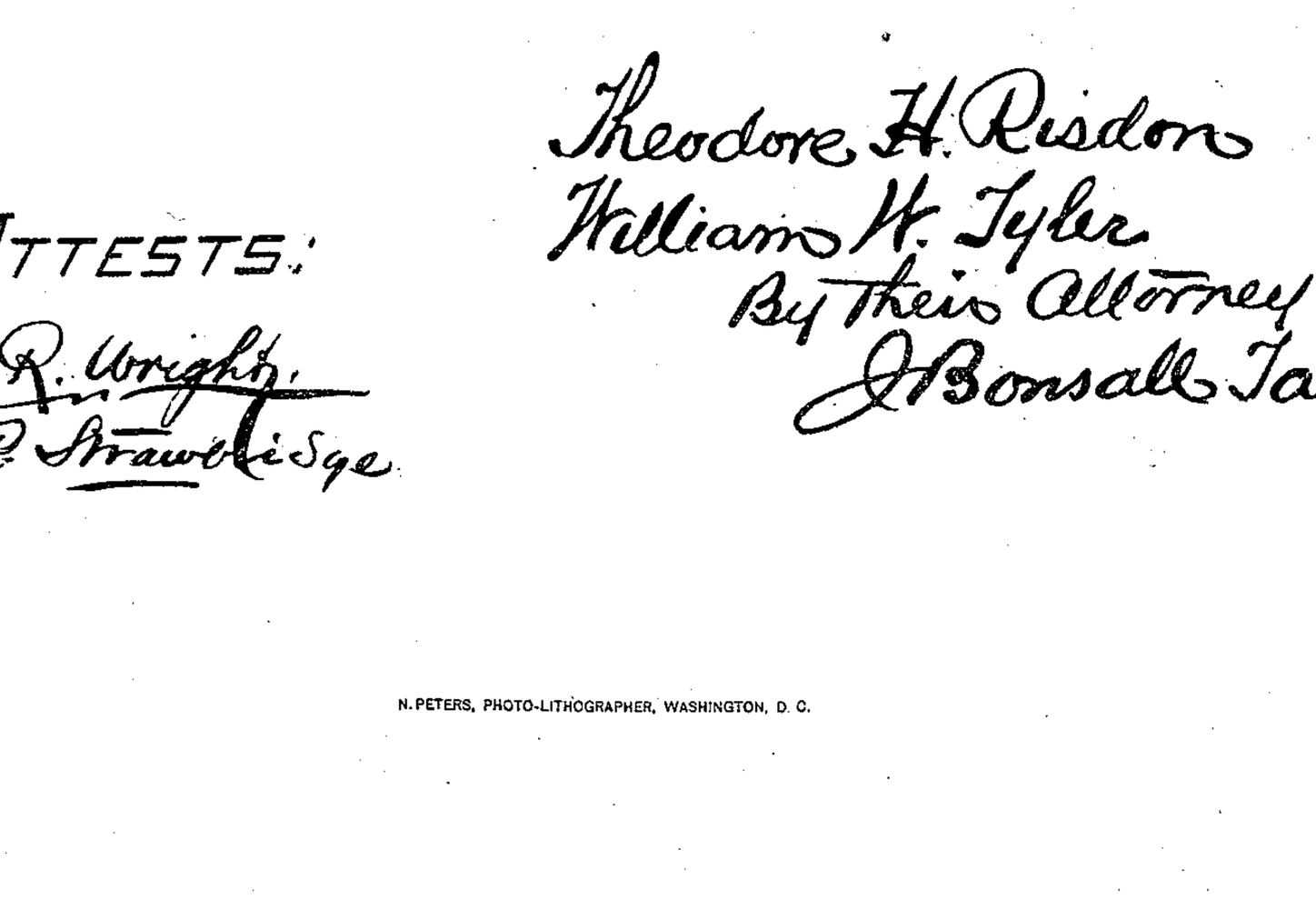


FIG. 2.



Theodore H. Risdon
William W. Tyler
By their Attorney
J. Bonsall Taylor.

ATTESTS:

W. R. Wright.
W. C. Strawbridge.

2 Sheets—Sheet 2.

T. H. RISDON & W. W. TYLER.

TURBINE-WHEEL.

No. 193,283. Patented July 17, 1877.

FIG. III.

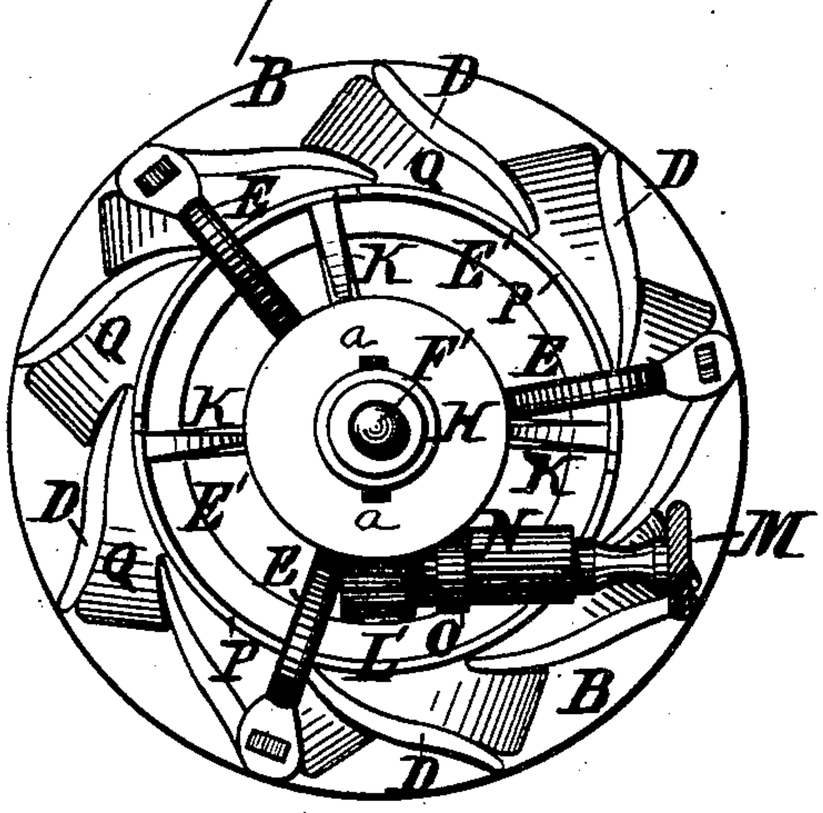


FIG. IV.

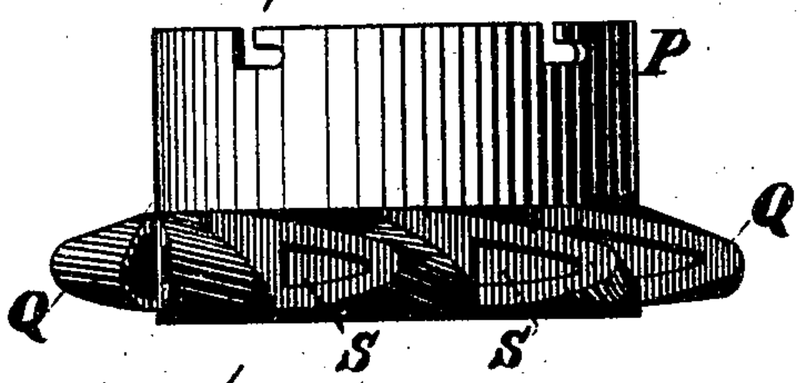


FIG. V.

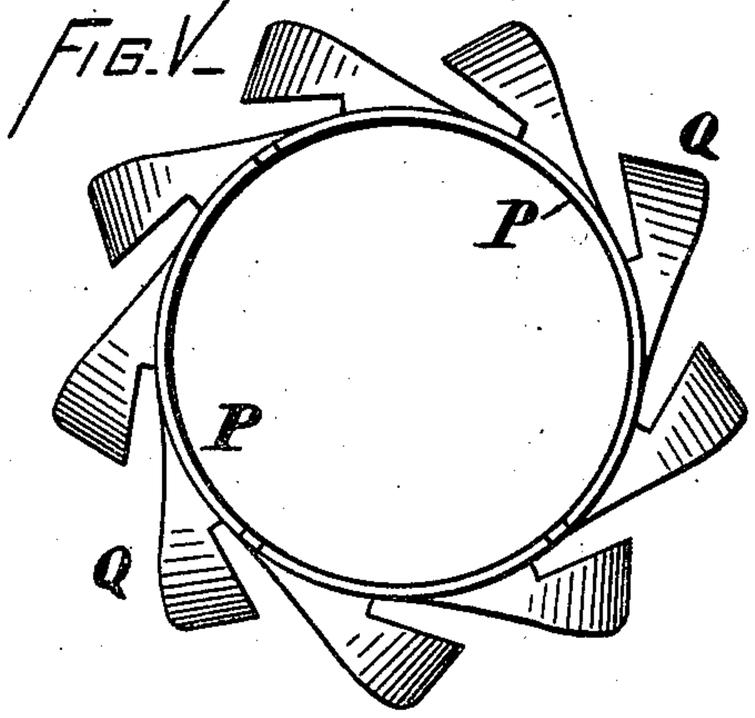


FIG. VI.

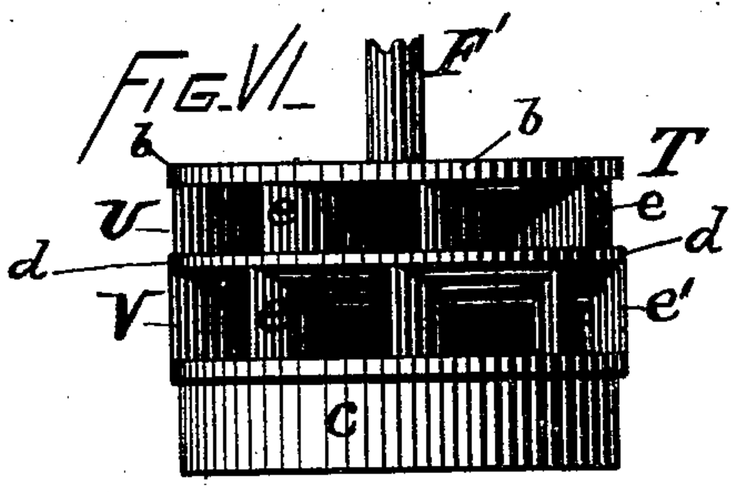


FIG. VII.

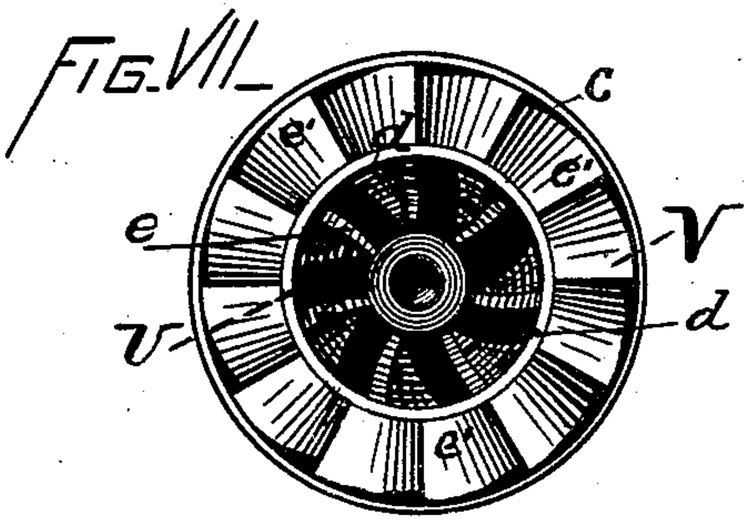
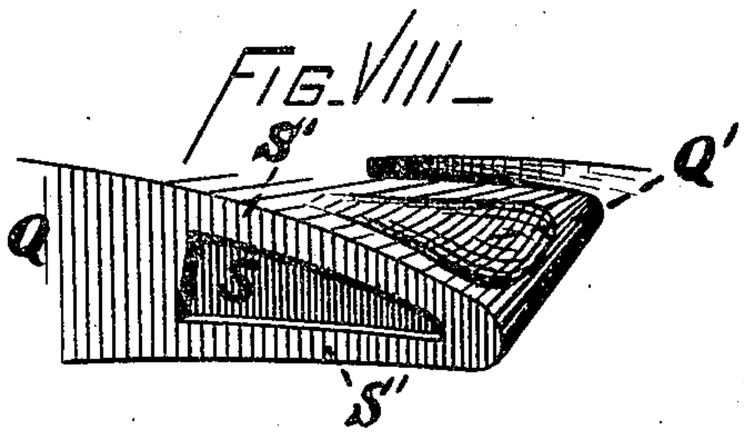


FIG. VIII.



ATTESTS:

W. R. Wright.

W. C. Skaw[illegible]ridge

Theodore H. Risdon
William W. Tyler
By Their Attorney
J. Bonsall Taylor.

UNITED STATES PATENT OFFICE.

THEODORE H. RISDON AND WILLIAM W. TYLER, OF MOUNT HOLLY, N. J.

IMPROVEMENT IN TURBINE WHEELS.

Specification forming part of Letters Patent No. **193,283**, dated July 17, 1877; application filed April 27, 1877.

To all whom it may concern:

Be it known that we, THEODORE H. RISDON and WILLIAM W. TYLER, both of Mount Holly, in the county of Burlington and State of New Jersey, have invented certain new and useful Improvements in Turbine Wheels, of which we do hereby declare the following to be a full, clear, and precise description, and sufficient to enable those skilled in the art to which it appertains to make and use our said invention, reference being made to the accompanying drawings, forming part of this specification.

Our invention relates to center-vent cylinder-gate turbine wheels; and consists, first, in supporting the crown-plate of the wheel-case close to the top of the wheel by means of goose-necks which pass over the gate.

It further consists in such an arrangement of the crown-plate and its supporting goose-necks with the cylindrical gate that the gate can move vertically within said goose-necks.

It further consists in the combination, with the cylindrical gate, of a sleeve and spider surrounding and sliding upon a central stem or turret, (erected upon the crown-plate,) and operated to raise or lower the gate by means of a pinion meshing with a rack upon said sleeve, or by equivalent devices.

It further consists in the combination, with the sleeve and spider which carry the gate, of a piston attached to said sleeve, and free to move within a cylinder supported upon the above-mentioned stem, the whole being inclosed within the pen-stock, so that the upward pressure of the head-water on the piston will tend to balance the weight of the gate, and aid the rack and pinion in lifting it.

It further consists in the combination, with a cylindrical gate, of a garniture placed upon its outer circumference, the top of which garniture is so downwardly and outwardly inclined that obstructions of any kind falling upon it are, by their own weight, shed away from the wheel and gate, while the bottom is so reversely and inwardly inclined as to form the top of a contracting chute.

It further consists in constructing the garnitures with centrally-converging ditches Q′, channeled out in such manner that obstructions falling on top will be carried, by their own weight, away from the guides of the chutes, to prevent jamming between the guides and garnitures.

It further consists in constructing the garnitures with recesses S in their sides, to lessen the side areas requiring to be file-dressed in the fitting of the gate within its guides.

It further consists in a double water-wheel, the upper section of which surrounds the central shaft F′ without interior dividing diaphragm or partition whatever, and both sections of which receive the water horizontally on the outside, while the lower section discharges vertically, or nearly so, and the upper in the direction of an angle of forty-five degrees between the vertical and horizontal, the buckets of the upper section of which are carried in to the hub, their discharge end being central and higher up than that of the buckets of the lower section, whose discharge is circumferential and at the bottom of the wheel.

It further consists in the combination of a double water-wheel, constructed as above described, and a cylindrical gate adapted to open upon the lower section thereof, alone or both sections together.

Of the drawings, Figure 1 is a side elevation of a turbine wheel embodying our improvements; Fig. 2, a vertical central sectional elevation of the same; Fig. 3, a plan of the same; Fig. 4, a side elevation of the gate and garnitures; Fig. 5, a plan of the same; Fig. 6, a side elevation of the double wheel; Fig. 7, a bottom plan of the same; and Fig. 8, an enlarged detached view of one of the garnitures of the gate.

Similar letters of reference indicate corresponding parts wherever used.

The following is a description of our invention: A is the top portion of the draft-tube leading to the tail-race, supporting the annular downwardly-flaring flange B, which forms the bottoms of the converging chutes, and inclosing and supporting a bridge-tree, consisting of any number of arms, C C, radiating from a central hub, which incloses and sup-

ports a stud or pin, whose upper end forms the bearing of the vertical shaft of the turbine wheel.

D D are curved guides, which form the walls of the chutes, two or more of which guides support goose-necks E E, to the opposite extremities of which is secured the crown-plate E′ close to the top of the wheel T, as shown in Fig. 2. The plate E′ is closely encircled by the gate P, which slides up and down in the goose-necks E.

F is the hub, and F′ the shaft, of the wheel.

G is a vertical hollow stem affixed to and rising from the crown-plate, and forming a bushing about the shaft. To the upper extremity of this stem is affixed a cylinder, H, closed at the top and open at the bottom.

I is a piston fitted within said cylinder, and connected to a sleeve, J, surrounding and sliding upon the stem G. Affixed to and branching from this sleeve are radial arms K K, forming a spider carrying the gate P.

L is a rack cast or otherwise formed upon the sleeve, and meshing with a pinion, L′, the shaft of which is provided with a crank or hand wheel, M, and is journaled in a bearing, N, supported on a standard, O, springing from the crown-plate.

By rotation of the hand-wheel the pinion, operating through the rack, raises or lowers the sleeve and piston, and with them the spider and gate.

The upward pressure of the head-water on the piston aids to balance the weight of the gate, and assists the rack and pinion in lifting the same.

a a are relief-ports to discharge water leaking past the piston into the tail-water.

Q are garnitures placed upon the outside of the gate, the tops of which are so inclined that obstructions falling upon them will be carried by their own weight outward and away from the wheel, while their under sides are so angled as to form the tops of contracting chutes R, of which the flange B and guides D form the sides and bottoms.

Q′ are centrally-converging ditches channeled down the central top portion of the garnitures, to aid in directing falling obstructions away from the guides, to prevent jamming between the guides and garnitures.

S are recesses cast or otherwise formed into each side of each projection of the garniture, to lessen the side areas requiring to be filedressed in the fitting of the gate within the guides, the edge portions S′ in our structure alone requiring to be dressed.

T is the double water-wheel, U being its upper, and V its lower, section, both of which are so constructed as to receive the water horizontally, while the lower section discharges vertically, or nearly so, and the upper in the direction of an angle of forty-five degrees between the vertical and horizontal, the buckets of the upper section being carried into the hub, and their discharge being central, while the lower buckets discharge below the upper ones and around them, as shown in Fig. 7.

Our double wheel is constructed as follows:

b is a head-plate, made with a depression or disk, as shown in Fig. 2, and forming the tops of the upper buckets.

c is an annular band encircling the base of the wheel proper, and forming the outer walls of the lower buckets.

Between *b* and *c* is an annular diaphragm, *d*, flaring out at the top, as shown, separating the upper buckets from the lower, and forming the outer walls of the upper and the inner of the lower buckets.

e are the curved paddles or impact-pieces of the upper buckets, set at suitable angles between the head-plate *b* and the diaphragm *d*, while those *e′* of the lower are set between the diaphragm *d* and the encircling band *c*, all as represented in Figs. 2, 6, and 7.

We have found the structure of the upper section to be such as to form a most effective part-gate wheel, adapted to be used at part gate in connection with a cylinder-gate with less loss of useful effect than heretofore.

The gate, rising vertically on this double wheel, will, in practice, use the whole or the greater part of the lower wheel (running best at full head) all the time, while, when greater power is required, it will use the upper gate also, (running proportionally better at part gate, with less water than required for the lower, and with proportionately greater effect,) thus raising the average of power of the entire wheel.

Having thus described our invention, we claim and desire to secure by Letters Patent of the United States—

1. In a cylinder-gate turbine wheel, a crown-plate, E′, supported close to the top of the wheel by means of goose-necks E, which pass over the gate, substantially as described.

2. The arrangement, substantially as shown and described, of the crown-plate E′, goose-necks E, and gate P, which moves within said goose-necks, substantially as shown and described.

3. In combination with the gate P, a sleeve, J, and spider K, carrying the gate, sliding upon a central stem, G, erected upon the crown-plate, and operated by a rack and pinion, L L′, to open or close the gate, substantially as described.

4. The combination, substantially as shown and described, of the stationary cylinder H and the piston I, connected with the gate P, whose weight is partly balanced by the upward pressure of the water on said piston.

5. In combination with the cylindrical gate P, a garniture, Q, the top of which is downwardly and outwardly inclined, in order to shed obstructions, while its bottom inclines inwardly to form the top of a contracting chute, substantially as shown and described.

6. The garniture Q, constructed with a centrally-converging ditch Q′, substantially as described.

7. The garniture Q, constructed with recesses S in its sides, substantially as and for the purposes set forth.

8. A double water-wheel, T, the upper section of which surrounds the central shaft F, without interior dividing diaphragm or partition whatever, substantially as shown and described.

In testimony whereof we have hereunto signed our names.

THEODORE H. RISDON.
WILLIAM W. TYLER.

In presence of—
ELSWORTH HOLEMAN,
RICHARD P. HOLEMAN.