

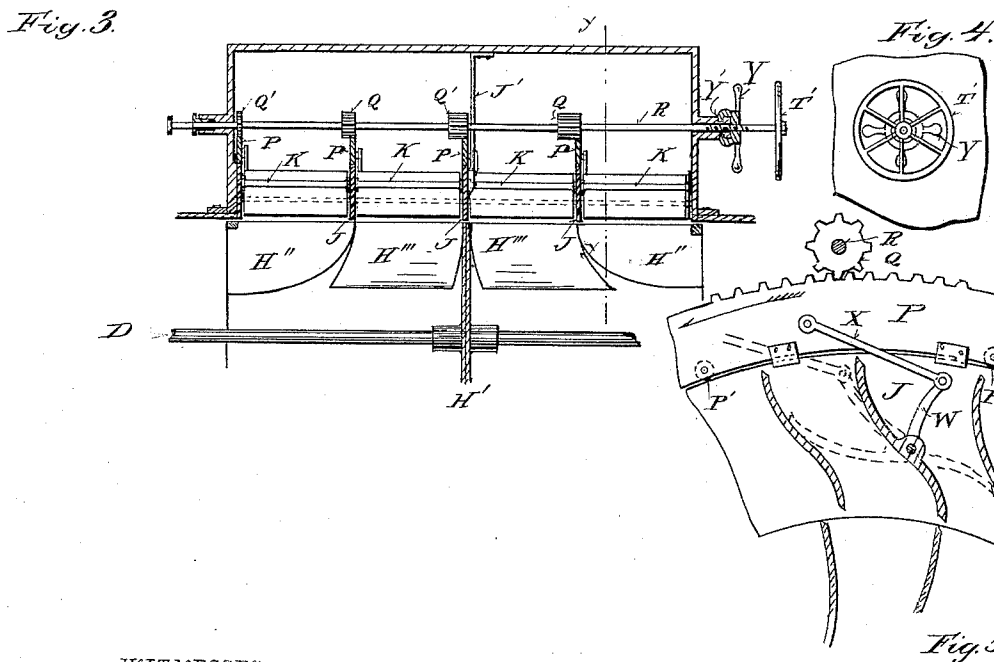
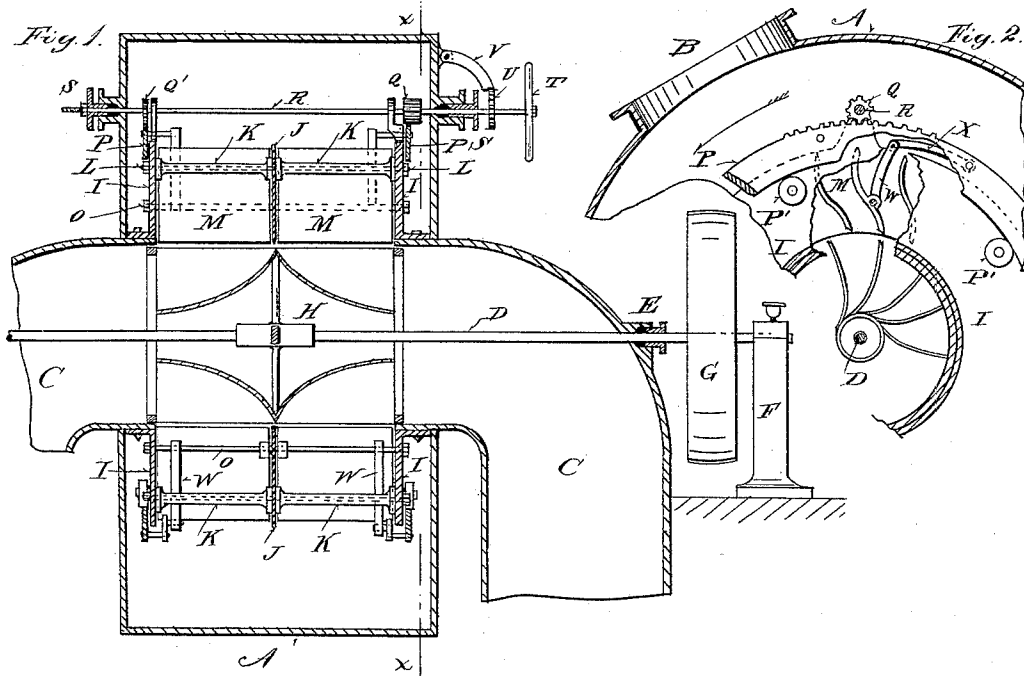
(No Model.)

2 Sheets—Sheet 1.

F. M. BOOKWALTER.
WATER WHEEL.

No. 452,829.

Patented May 26, 1891.



WITNESSES

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Warren Hull.

INVENTOR

Francis M. Bookwatter,
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(No Model.)

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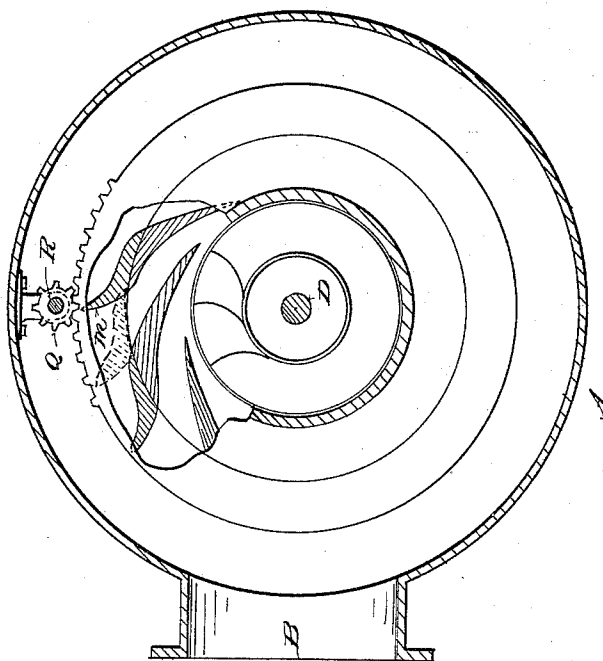


Fig. 6.

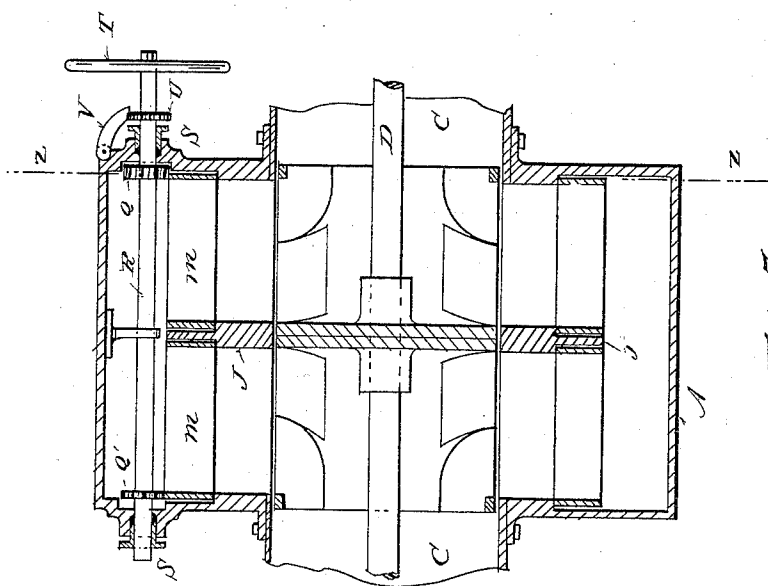


Fig. 7.

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UNITED STATES PATENT OFFICE.

FRANCIS M. BOOKWALTER, OF SPRINGFIELD, OHIO.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 452,829, dated May 26, 1891.

Application filed July 14, 1890. Serial No. 358,869. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS M. BOOKWALTER, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Water-Wheels, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to certain new and useful improvements in water-wheels; and the objects of my invention are, first, to provide a maximum width of gate-opening for the delivery of water to a wheel of maximum width, or two wheels placed end to end on the same shaft; secondly, to regulate this gate-opening as desired, whereby a portion of said opening delivers the water with unobstructed action and undiminished efficiency, while another portion is partially or wholly closed.

In the accompanying drawings, in which like reference-letters indicate corresponding parts, Figure 1 represents a central section parallel to the shaft of a wheel-case with a single wheel and operating mechanism mounted therein; Fig. 2, a transverse section on xx , Fig. 1, showing a portion of the interior mechanism; Fig. 3, a gate-opening for two wheels and corresponding gates therein; Fig. 4, an end view of the regulating mechanism; Fig. 5, an enlarged view on yy , Fig. 3; Fig. 6, an end view of a register-gate and adjacent parts, and Fig. 7 a sectional view of Fig. 6 on the line zz .

The letter A designates a wheel-case of cylindrical or other suitable construction, provided with an inlet-opening B and discharge or draft tubes C. A shaft D is mounted in stuffing-boxes E in the walls of said tubes and has an outside bearing, such as a pillow-box F, and carries a driving-pulley G thereon to transmit the power of the turbine wheel H, also mounted on said shaft within said case. This wheel may be single, double, or of any convenient style, since by my arrangement of gate-opening the width of wheel and gates therefor is not limited. It is preferred to employ a wheel discharging from both ends into the centrally-located draft-tubes C, and to form the gate-opening for the same I mount annular flange or side pieces I on the inner ends of said tubes, or otherwise, and conveniently bolt or

rivet them thereto. This gate-opening is divided into convenient divisions by one or more annular plates or partitions J, supported and braced preferably to said side pieces by intermediate columns K and connecting-bolts L, or otherwise. A corresponding gate series M is pivoted on rods O in each division of said gate-opening, and each gate is provided with a connecting mechanism to an annular ring P, mounted on rollers P' or otherwise, and having a portion of its rim toothed to mesh with respective pinions Q Q', mounted on a regulating-shaft R, carried in suitable bearings S S in said case A, and provided with a hand-wheel T or other means to rotate it, and with a ratchet U and pawl V or other fastening means to secure it at any desired degree of rotation in adjusting said gate-sections. The connecting mechanism for each of said pivoted gates conveniently consists of an arm W, fixed on said gates, and a connecting-link X, pivoted to said toothed ring P, whereby each gate is rotated to a wholly or partially closed position by its respective mechanism when the ring is actuated in the direction of the arrows in Figs. 2 and 5.

The ring-rollers P' may be carried on the side pieces, as in Fig. 2, or be mounted in said ring and roll on said side pieces and partitions, as shown in Fig. 5, or they may be dispensed with. The arrangement of rings, rollers, and partitions shown in Figs. 3 and 5 is preferred when more than one partition and ring is used, as when a gate-opening for two wheels placed end to end, as indicated at H', and discharging in opposite directions is employed. This tube may be conveniently of the double-bucket style, forming two wheels in one, as the Leffel turbine, for instance, in which the outer buckets H'' discharge laterally, and the inner buckets H''' discharge centrally inward and laterally behind the outer buckets, thus making virtually a double wheel. When two such wheels are mounted end to end, as shown in Fig. 3, they form practically a quadruple compound wheel, or one of four times the power of a single wheel and requiring a correspondingly-large gate-opening. The practical difficulties in using such an arrangement are, first, the suitable arrangement of the gates to supply the large amount of water required without binding or twisting said

gate, and, secondly, the ready regulation of the power through such a wide gate-opening without loss of efficiency.

My plurality of gates and adjacent parts, as above described, present the wide gate-opening, and by providing the pinions Q Q' with bearing-faces or meshing engagement of varying width, as shown in Figs. 1 and 3, a longitudinal motion of the shaft R will disconnect each series of gates. They may thus be operated either in unison or one or more at a time. The gates are so arranged as to have a tendency to close of themselves under the action of the incoming water, and will therefore remain closed when freed from the regulating-pinions. The gates may be alternately pivoted or fixed, as shown in Figs. 2 and 3, or may be otherwise arranged.

A convenient means for causing the longitudinal or axial movement of the regulating-shaft is by a handled sleeve or collar Y, Fig. 3, having finger-like projections slidingly engaged with an annular groove Y' and screwed upon said shaft. By rotating said collar the shaft will be moved axially to disengage one or more series of gate-sections, while the hand-wheel T' will rotate the shaft and collar together by the friction of the threads or other means without axial movement, and thus adjust the inclination or arrangement of said sections as desired.

The partitions J may be braced or held by straps J'' to the case or otherwise to prevent their sagging on the inclosed wheel.

Figs. 6 and 7 show my arrangement applied to a register-gate, in which style the gates are fixed in position between two sets of side plates or rings, one set being movable and the other fixed, and the gates being also divided, so that continuous open passages to the wheel are formed by the correct apposition of the outer and inner portions of said gates, while the gate-openings are closed by sliding one set of plates and the interposed portions of the gates provided with thickened walls past the other set. The outer portions will lap over the inner ones, as indicated by dotted lines in Fig. 6, and thus close the passages.

In Fig. 7 is shown a sectional view of two wheels back to back and fed by a register-gate of wide opening divided by a partition j, which is now supported by the connecting stationary portions of the gates intermediately placed, instead of by the columns K. These gates, mounted on projections or shoulders in the partition and side plates, are rotated about the corresponding inner set by the hereinbefore-described mechanism, as shown in Fig. 7. Thus it will be seen that a wheel, either single or compound, of very much greater width and correspondingly-in-

creased power than it was possible heretofore to use, on account of the difficulties attending a correspondingly-large gate-opening, can be successfully employed by my arrangement of gate-operating mechanism and wheel. The practical results from the increased power thus easily regulated and varied are of great importance to the users of water-wheels.

While I have shown and described a wide-breasted wheel, gates corresponding thereto, and independent rings operatively connected to said gates and to each other, and side plates, I do not claim such organization, broadly, in this application, for central partitions enter as elements in the claims; but I do claim substantially this organization in a broader sense in my application, Serial No. 357,790, filed July 5, 1890, in which the central partitions are not shown, described, or claimed. The gates in each division are shown in line with the corresponding gates on the other side of the annular partition and mounted on the same rod O, respectively. They may be otherwise placed, if so desired.

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

1. The combination, with a water-wheel and a casing for said wheel, having an outlet-opening leading from each side thereof and having an inlet-opening for the water, of side plates and an intermediate annular partition, and a plurality of gates mounted between said side plates and said partition, and adjusting mechanism for said gates adapted to be disengaged from one gate, yet preserve its engagement with the other gate, whereby the water may be cut off from one portion of the length of the wheel and be regulated independently at another portion of the wheel.

2. The combination, with a water-wheel and its inclosing casing having suitable inlet and outlet openings for the water, of partitions mounted edgewise to the breast of the said wheel within said casing, gates between said partitions, an annular plate rotatably mounted on each partition and provided with a gear-segment, intermediate connections between said annular plate and the gates to operate the latter by the rotation of said plate, a pinion meshing with each annular-plate segment, a rotatable shaft for said pinions adapted to slide axially, and adjusting means for said shaft, whereby one or more of said pinions may be thrown out of action and the others remain in operative position.

In testimony whereof I affix my signature in presence of two witnesses.

FRANCIS M. BOOKWALTER.

Witnesses:

H. M. PLAISTED,
A. N. SUMMERS.