(No Model.)

C. P. BRADWAY.

TURBINE WATER WHEEL.

No. 328,179. Patented Oct. 13, 1885.

Fig. 1.

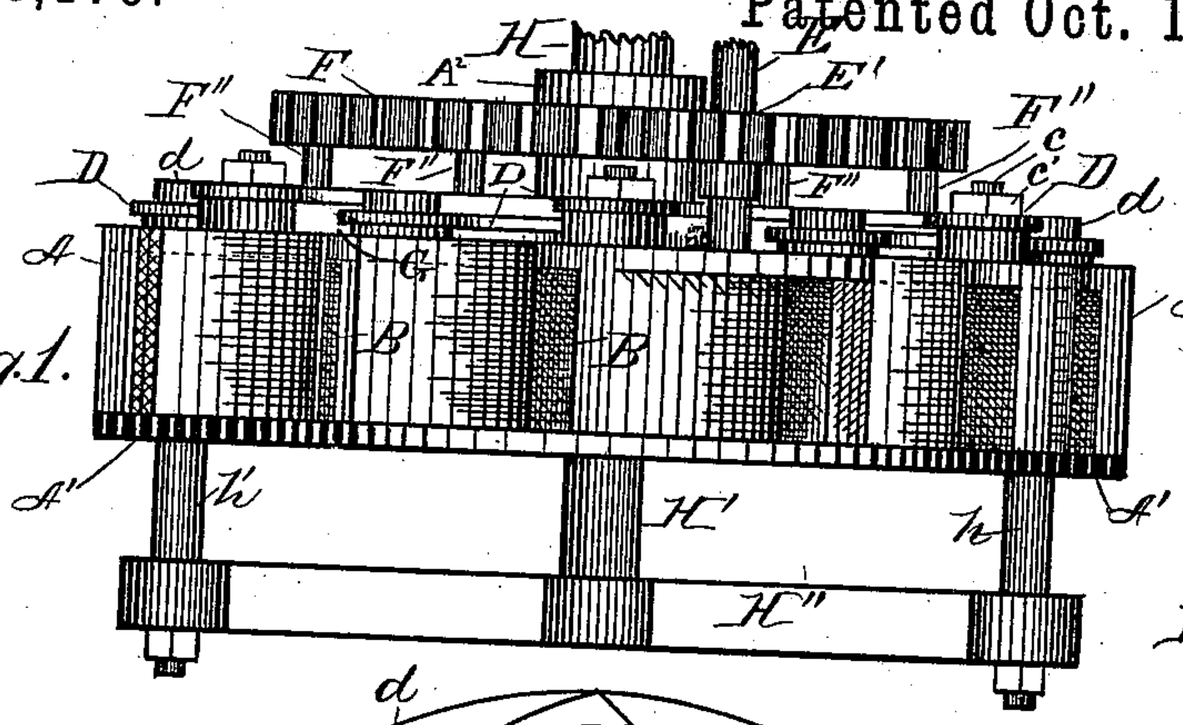


Fig. 7.

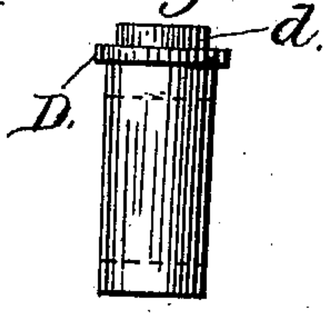
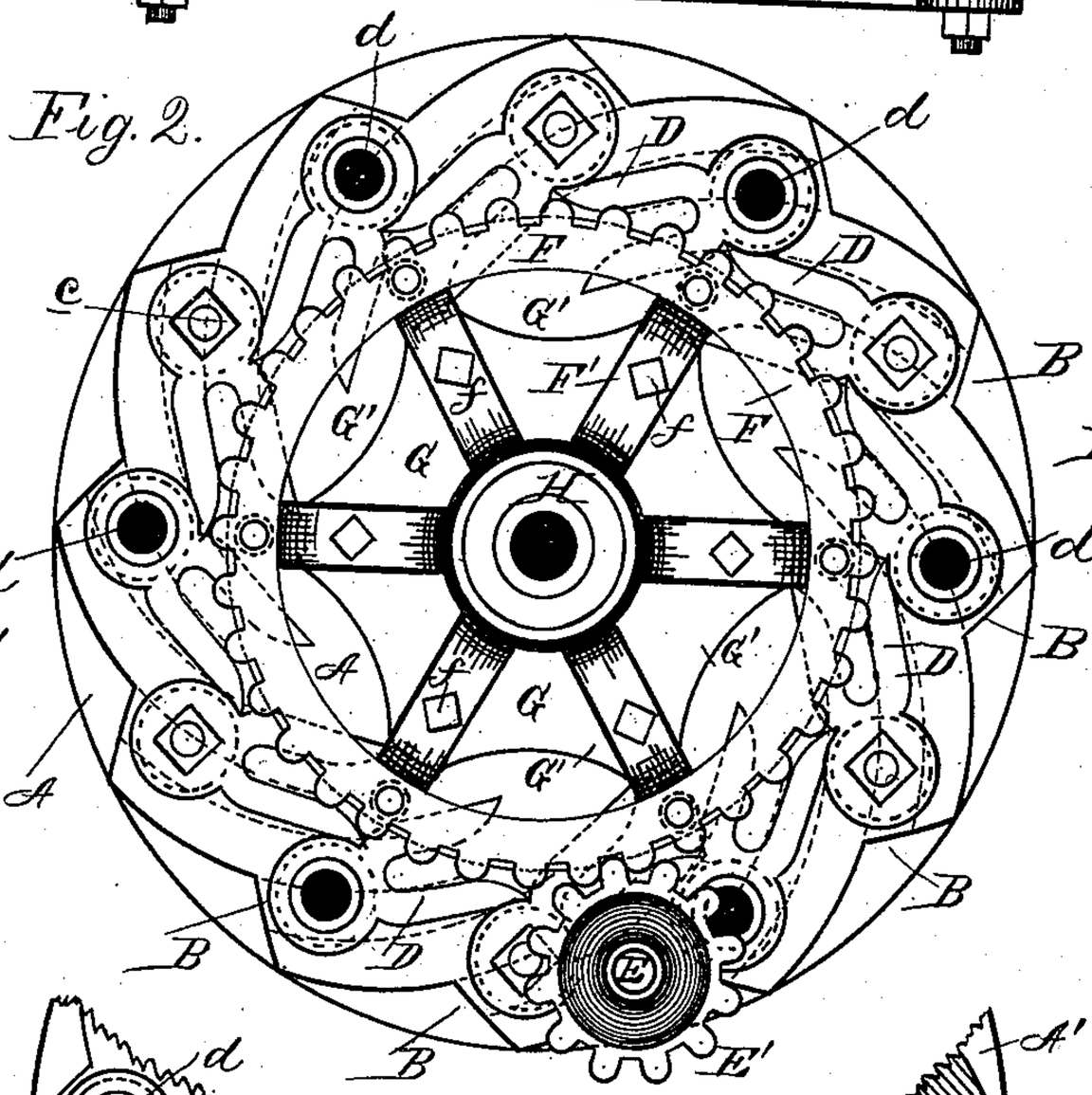


Fig. 2.



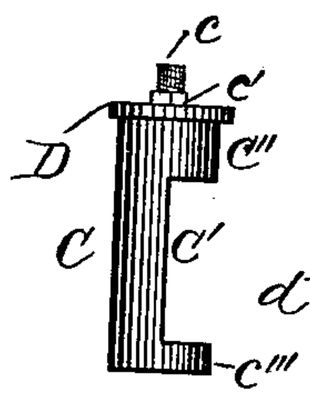
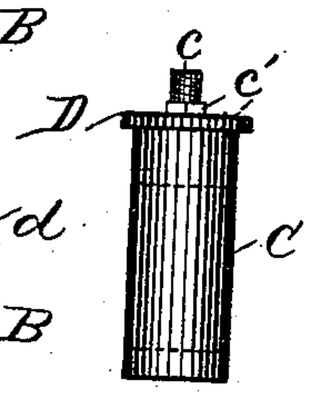


Fig. 4.

Fig. 5.



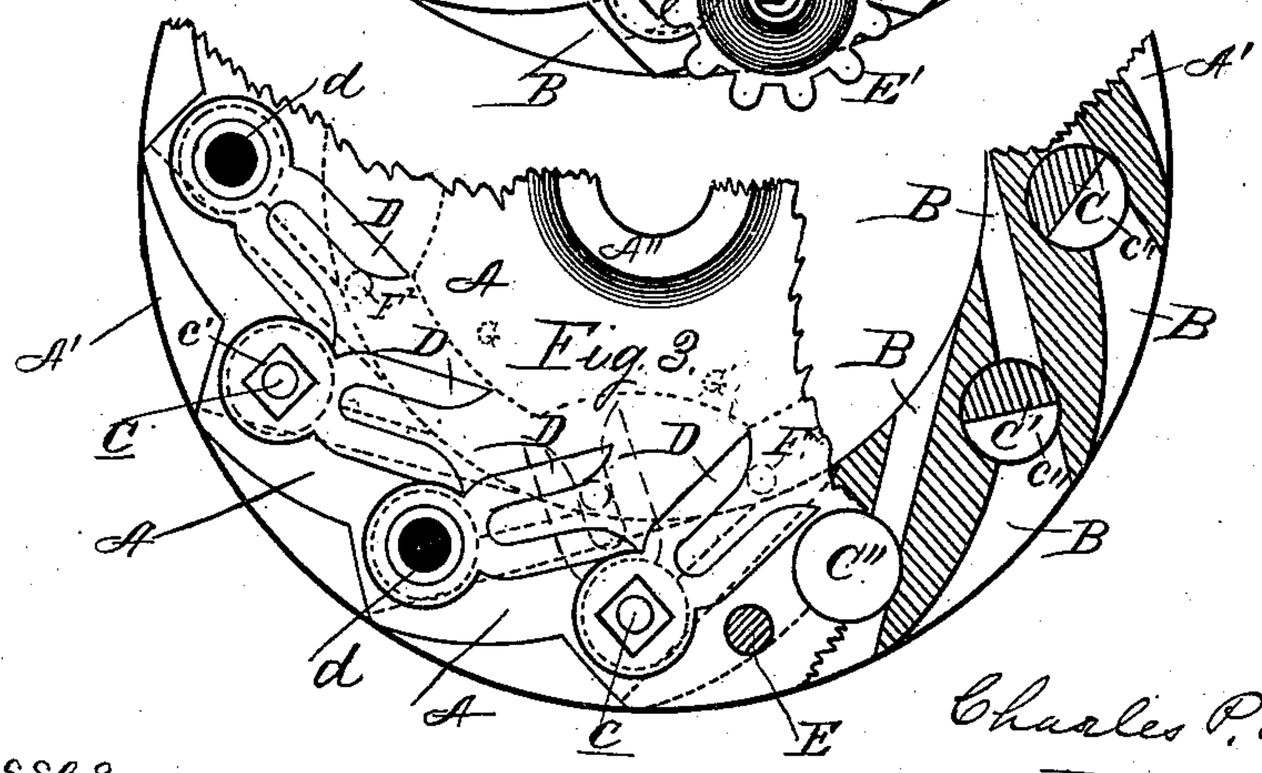


Fig. 3.

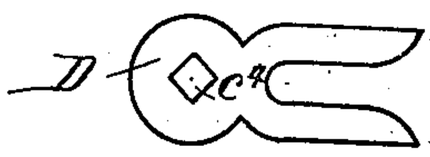


Fig. 6.

Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES PHILIP BRADWAY, OF STAFFORD, CONNECTICUT.

TURBINE WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 328,179, dated October 13, 1885.

Application filed April 29, 1884. Serial No. 129,740. (No model.)

To all whom it may concern:

Be it known that I, C. P. BRADWAY, a citizen of the United States, residing at Stafford, in the county of Tolland and State of Connecticut, have invented certain new and useful Improvements in Turbine Water-Wheels; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this improvement is a gate or valve system for more perfectly controlling the passage of water through and regulating the action of turbine water-wheels. These results are attained by the mechanism illustrated in the drawings herewith filed as a part hereof, in which the same letters of reference denote the same parts in all the views.

Figure 1 is a side elevation representing my improvement. Fig. 2 is a top view. Fig. 3 is a sectional view showing a modified form of cam, and more fully illustrating special features of construction. Fig. 4 is a view of one of the gates or valves detached, and showing a different adjustment of one of its connecting parts. Fig. 5 is a rear elevation of a gate or valve detached, showing the same adjustment of one of the connecting parts as shown in Figs. 1, 2, and 3. Fig. 6 is a top view of one of the parts detached. Fig. 7 is a rear elevation of a gate or valve detached, showing the operating-lever attached thereto in a lower plane than those shown in Figs. 4 and 5.

A A′ is the shell or casing surrounding the wheel, which may be of any suitable pattern. B B are the water-ways, each one of which is provided with a valve or gate, C, having a recess, C′, corresponding to the height of the water-ways B, and of circular form at the upper and lower ends, C″ C‴.

The shell or casing A A′ is provided with suitable recesses, as shown at C″, Fig. 3, for the reception of the valves C, which may be additionally secured in position.

D D represent slotted or forked levers, affixed to the top of the valves by screw-threaded studs *c* and corresponding nuts or other suitable means. The levers D are mounted so that each alternate one of the series will be in the same horizontal plane, while the intermediate ones will likewise be in a given plane, but on a different level, thus permitting the levers to pass by one another in their operation of the valves. Those levers which are on the higher plane are attached directly to and rest upon the upper edge of the valve, and are secured by the nuts *c′*, whereas those levers of the series on the lower plane have a collar, *d*, of nearly the same diameter as the valve, placed on the top lever, directly in line with the valve, and of such a thickness as to project within the plane of the levers on the higher level, for a purpose presently explained.

E represents a vertical shaft, secured at its lower end to the casing A A′ and provided with a pinion, E′, which meshes with cog-wheel F, having arms F′, and suitably secured to but arranged to move on the vertical extension A″ of the casing A A′, for a purpose hereinafter set forth.

Secured to the arms F′ of the cog-wheel F by means of bolts *f* is a cam, G, having inward curves, G′.

F″ represents pins secured to the arms F′ of the cog-wheel F, in position to enter the slots of and engage with the levers D, secured to the valves C, when motion is given to the wheels F by means of the shaft E and pinions E′, by the movement of which one way or the other the valve C may be partially or entirely opened or partially or entirely closed, as shown at C and C′, Fig. 3. This cam C is arranged in the same horizontal plane with the levers D, and its inward curves or recesses, G′, give clearance for the complete oscillation of the levers D, and the convex surfaces thereof will prevent the slots of the levers from getting out of the line with the projections or pins F″ when moving inwardly, and the sides of the respectively adjoining valves will perform the same office when the levers D are moved outwardly. This feature is more clearly illustrated in Fig. 3, in which the cam is represented in dotted lines, the inward curves being at a greater distance apart, as the pins F are arranged to actuate a series of the three levers, instead of two, as shown in Fig. 2. By reference to Fig. 3 it will be seen that the levers D are longer than the distance between their hubs. Consequently they are limited to their outward movement by impingement with the hub or collar of the adjacent lever, as the case may be, and they are likewise limited in their inward movement by the convex surface of

the cam G, as clearly indicated in the aforesaid figure of the drawings, it being understood that the said cam is of sufficient thickness to extend within both planes of the levers on the higher and lower level, as will be understood by reference to Figs. 1 and 3, but more particularly shown in Fig. 1.

In Fig. 2 each of the pins F is shown as arranged to actuate two of the valves, there being one pin for each two valves. By reference to Fig. 3 the operation may be easily understood. The cog-wheel F being rotated to the right, one of its pins engaging the slotted arm-lever carries the same in position shown in dotted lines, Fig. 3, when, on the continued rotation of the cog, the pin will engage the next lever, and so on successively throughout the whole series, each lever being acted on successively by the pin. From this it will be seen that if only a single pin were employed the cog-wheel would have to make a complete revolution to actuate all the valves. If two pins were employed it is evident that the cog-wheel would only make a semi-revolution in actuating all the valves. Where the pins are half the number of valves, as shown in Fig. 2, the cog-wheel in a slight movement will actuate all the valves. Thus it is evident that a single pin may be employed to actuate all the valves of the case, or a series of pins be made to actuate a series of valve; or, there may be a single pin for each valve.

H represents a hollow driving-shaft. H′ is a center post or bearing for the wheel, and *h h′* are the stud-bolts, securing the position of the transverse piece H″, supporting the center post, H′.

By the adjustment shown two or more gates operate together on opposite sides of the wheel, thus always keeping the wheel properly balanced, so when one gate is opened or closed the adjoining gate immediately begins to open or close, if the gate-rod E continues to be turned.

It is obvious that when this form of gate is fully opened, unbroken columns of water enter squarely against the buckets of the wheel, and the same is the case with each of the gates when partially opened.

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

In a turbine water-wheel, the combination of an annular casing provided with water-ways at stated intervals around its periphery, valves regulating said water-ways and provided on their outer ends with slotted levers, with a disk, pins depending therefrom, and arranged to successively actuate the valves, and a cam attached to the disk and located within the plane of the slotted levers and provided with inwardly-curved recesses, substantially as shown and for the purposes described.

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

CHARLES PHILIP BRADWAY.

Witnesses:

J. H. SEGAR,

D. H. BELLROSE.