No. 865,796. PATENTED SEPT. 10, 1907.

F. W. O'BRIEN.

HYDRAULIC MOTOR.

APPLICATION FILED DEC. 24, 1906.

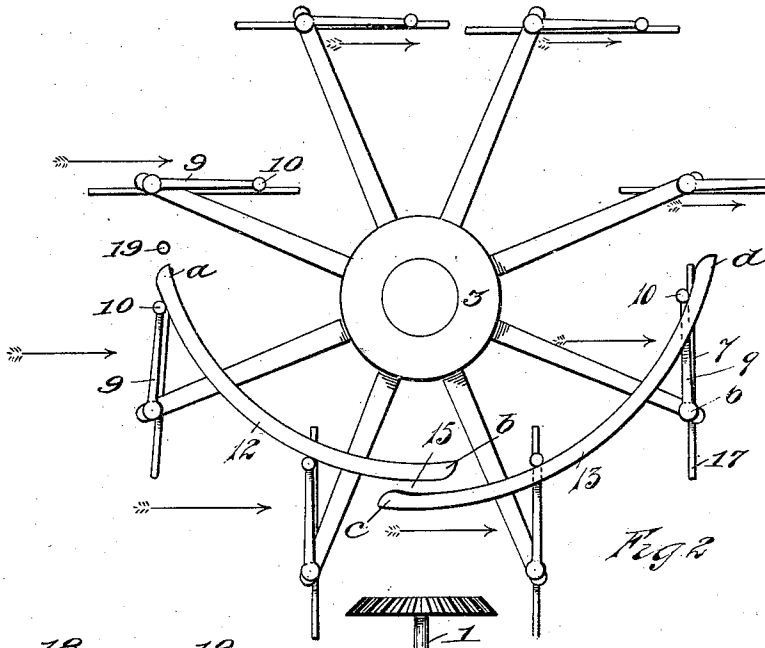

Fig. 2.

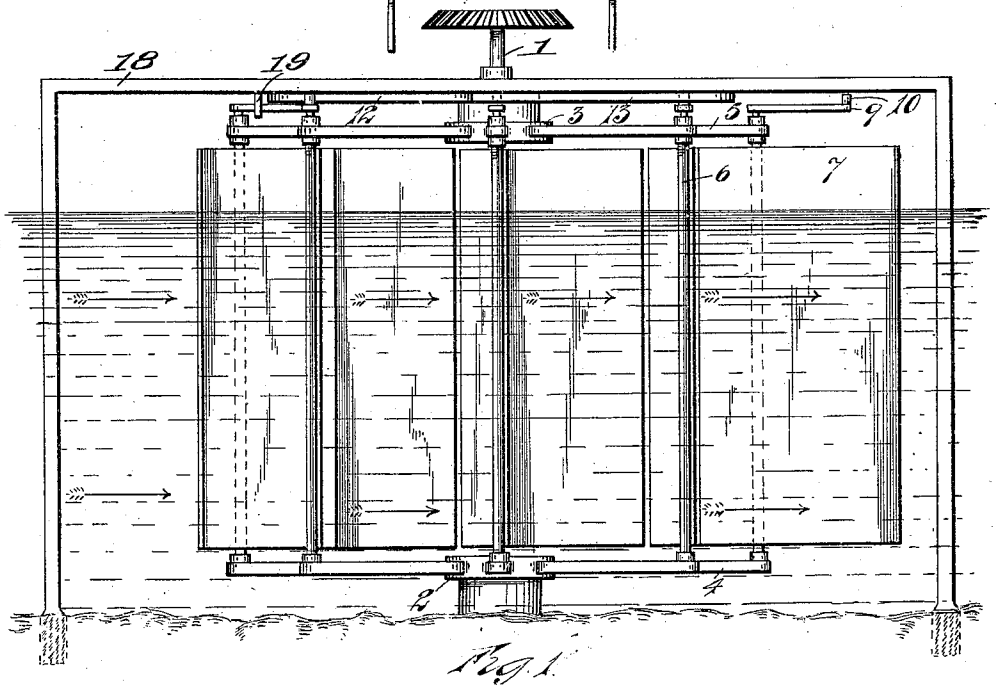

Fig. 1.

WITNESSES

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HYDRAULIC MOTOR.

No. 865,796. Specification of Letters Patent. Patented Sept. 10, 1907.

Application filed December 24, 1906. Serial No. 349,289.

To all whom it may concern:

Be it known that I, FREDERICK W. O'BRIEN, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Hydraulic Motors; and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to hydraulic motors; it has for its object an improved feathering water wheel mounted on a vertical shaft and adapted to be actuated by water flowing in a channel in which the motor is erected.

In the drawings:—Figure 1, is an elevation. Fig. 2, is a diagram which indicates the movements of the several buckets and the arms by which the individual buckets are carried.

A vertical shaft 1, suitably supported, has mounted on its lower end a hub 2, and near its upper end a hub 3; from the lower hub radiate a number of bucket carrying arms 4; from the upper hub radiate a number of similar bucket carrying arms 5. The arms are arranged in pairs, with an upper member and a lower member in each pair; between the members of each pair extends a vertical shaft 6, upon which there is mounted a vane or bucket 7. The bucket projects to each side of the shaft with a broader projection 7 at the one side, and a narrower projection 17 at the opposite side.

On that end of the shaft 6, which projects through and above the radiating arm 5, is secured a crank arm 9 that projects over the broader part 7, of the bucket. At the extremity of the crank arm 9 is mounted an antifriction roll 10, on a pin whose axis is parallel to the shaft 6. The bucket itself it adapted to swing freely between the arms 4 and 5, and the crank arm 9 being secured to the same shaft swings with the bucket and remains always parallel with the broader part of the vane, and in connection with the cams hereinafter to be mentioned, at times controls the swing of the bucket and causes the bucket to assume a position with its plane face across the direction of the current and substantially at right angles thereto.

Secured to the frame 18 are two cam guides 12 and 13; these guides lie arched around the center of the shaft 1, but somewhat eccentric thereto, they are above the path of travel of the crank arms 9, and are located to engage the antifriction wheels 10. The extent of arc over which the two guides 12 and 13 reach is substantially half of the complete circle of the revolution of the arms, each, however, extends over somewhat more than a quarter of the complete circle, and at their adjacent ends the two guides 12 and 13 overlap with a space 15, between the overlapping ends. The space 15 is of a width sufficient to allow the antifriction roll 10 to pass between the two guides so that a bucket with its crank arm traveling from the end *a*, of the guide 12, to the end *b*, of said guide, travels on the outer curve of the guide and enters behind the end *c*, of the guide 13, and from the end *c*, of the guide 13 to the end *d* thereof, travels on the inner curve of said guide. From the end *d*, the remainder of the travel of the bucket and the crank arm is unobstructed and without guides until the bucket nearly reaches the end *a*, of the guide 12 in the course of its travel. Just before the bucket reaches the end *a*, however, the arm 9 strikes a pin 19 that hangs from the frame 18 and is forced to turn to bring the faces of the bucket across the current of the flowing water, and to bring the antifriction roll to the outside of the guide 12. During the remainder of the travel of the bucket and so long as the antifriction roll remains in engagement with the guide 12, the bucket is held by the force of the current in a position substantially parallel to that which it has just assumed and the current exerts the greatest possible force upon the bucket and the arm to which it is attached. After the antifriction roll passes from the guide 12, to the guide 13, the guide 13 performs the same function of holding the bucket with its broad face across the current, and this continues until the antifriction roll passes beyond the end *d* of the guide 13. As soon as the antifriction roll passes beyond the end *d* of the guide 13, the force of the current acting on the broader part 7 of the vane swings the broad part downstream and the bucket assumes a position with its broad face parallel to the current force and retains this position during the succeeding half revolution until the arm 9 again strikes the pin 19.

What I claim is:—

1. In a water motor, in combination with a vertical shaft, arms extending radially therefrom, buckets pivotally connected to said arms, a crank arm fixed in parallel relation to each bucket, a pair of curved guides extending around one half the circle of travel of the said buckets, the first of said guides being adapted to engage the antifriction rolls with the antifriction roll against the outer curve of said guide, the second of said guides being adapted to engage said roll with the roll on the inner curve of said guide, and means whereby the bucket is caused to engage on the outside of the first mentioned guide, substantially as described.

2. In a water motor, in combination with a vertical shaft, arms projecting radially therefrom, buckets connected pivotally to said arms and having portions extend-

ing unequally from the pivotal axis thereof, a crank arm for each bucket extending parallel with the broader portion of the bucket to which it is connected, a curved guide adapted to engage said crank arm with the engaging part of the crank arm on the external curve of said guide, means co-acting with the current force to cause the said arm to engage the outer curve of said guide, a second curved guide adapted to engage said crank arm with the engaging part of the crank arm on the inner curve of said guide, and means whereby the said arm passes from the outer curve of the first guide to the inner curve of the second guide, substantially as described.

In testimony whereof, I, sign this specification in the presence of two witnesses.

FREDERICK W. O'BRIEN.

Witnesses:

CHARLES F. BURTON,

MAY E. KOTT.