

Apr. 17, 1923.

1,451,694

M. HAEBERLEIN

WICKET GATE ADJUSTING MEANS

Filed Oct. 17, 1921

2 sheets-sheet 1

Fig. 1.

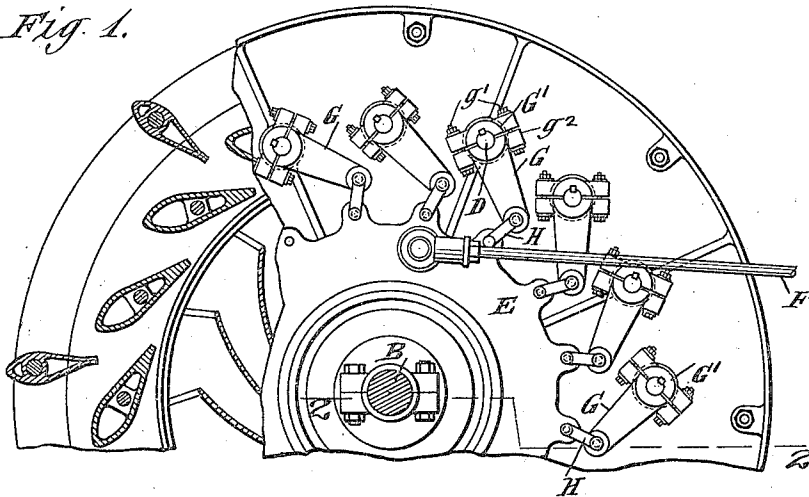
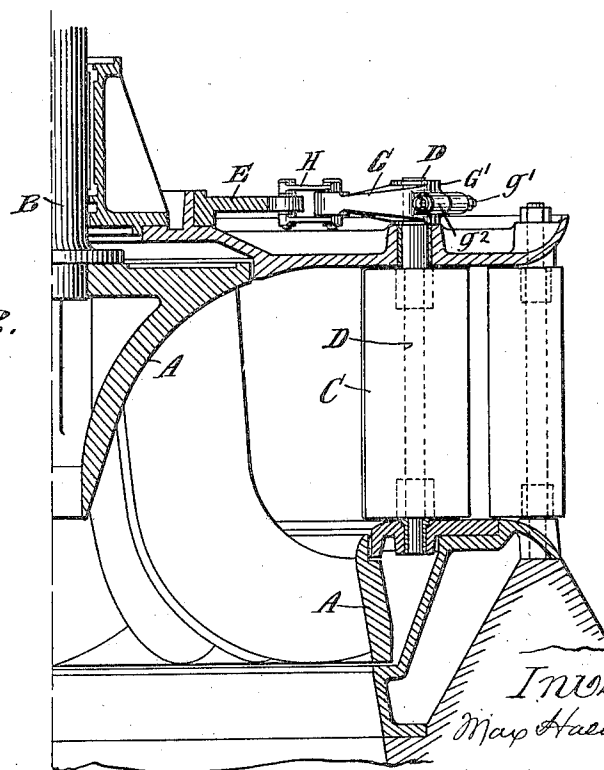


Fig. 2.



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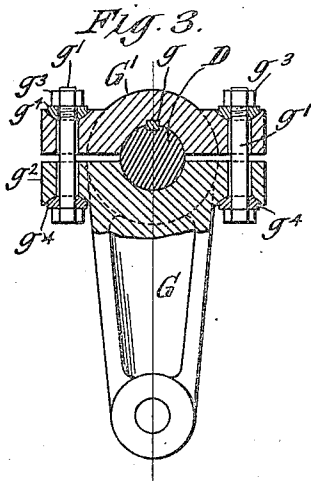
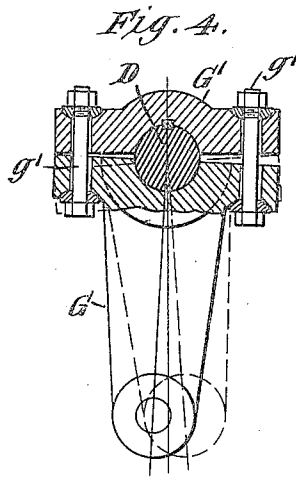
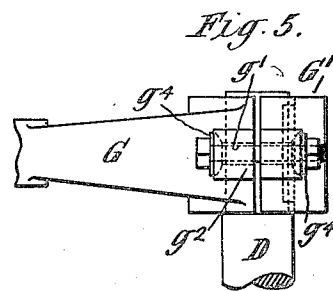
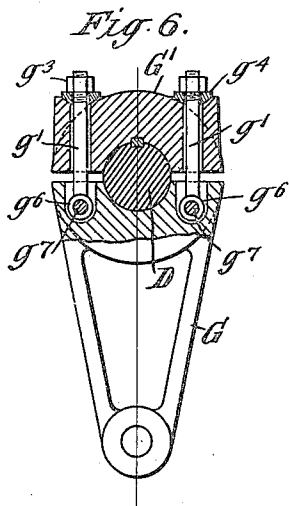
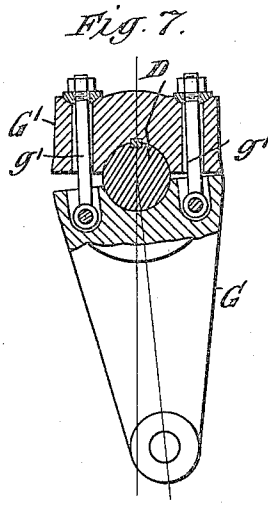
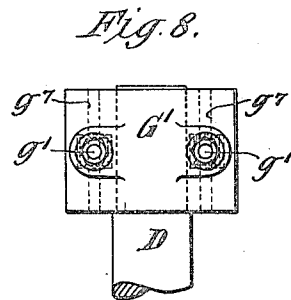
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WICKET GATE ADJUSTING MEANS

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2 sheets-sheet 2



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UNITED STATES PATENT OFFICE.

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WICKET-GATE-ADJUSTING MEANS.

Application filed October 17, 1921. Serial No. 508,079.

To all whom it may concern:

Be it known that I, MAX HAEBERLEIN, a citizen of the United States, residing at Maplewood, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Wicket-Gate-Adjusting Means, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to improvements in adjusting mechanism, and particularly to mechanism for adjusting the wicket gates of hydraulic turbines in proper relation to their operating devices.

In a hydraulic turbine, it is common to provide a series of wicket gates which serve not only to determine the amount of water supplied to the runner but also when open either wholly or partly to guide the water in a proper direction to the runner. In order that these wicket gates may be simultaneously adjusted, it is necessary to connect all the gates to a common operating device, which may then be operated either by hand or by a suitable governor mechanism.

In such an arrangement it is important that the respective gates shall have a correct relation to the common operating device, in order that all the gates shall close simultaneously or that when partly opened all of them will have the same angular relation to the runner. Slight difference in this angular relation may cause a considerable variation in the efficiency of the turbine. To obtain this accuracy of setting with gates and connecting mechanism of a fixed or not adjustable type, great care in construction is necessary. To avoid such refinements in workmanship which, of course, involve considerable expense, attempts have been made to provide adjustable connections between the gates and their common operating device, but the means heretofore provided have introduced difficulties of their own in that they either introduce new points of wear leading to errors of setting of the gates, or cannot be quickly and easily adjusted with certainty to any desired extent, but must be carefully adjusted with great skill and frequently by repeated trials.

The object of this invention is to provide an adjusting mechanism whereby no new

wearing point will be introduced and whereby the adjustment may be quickly made to any desired extent.

With the above general object in view the invention consists in the features, details of construction and combination of parts which will be described in connection with the accompanying drawings, and then more particularly pointed out.

In the drawings,—

Fig. 1 is a detail view, partly in plan and partly in section of one type of hydraulic turbine, with the invention applied to it;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Figs. 3 to 5 inclusive are detail views illustrating the adjusting mechanism in its preferred embodiment; and

Figs. 6 to 8 inclusive are similar views of another embodiment of the invention.

Referring to Figs. 1 and 2 of the drawings, A is the runner, B the turbine shaft, C the wicket gates, D the gate spindles to which the respective gates are suitably secured, and E an operating device common to all the gates. In this case the common operating device is shown as a ring arranged to be shifted angularly by an operating rod F which leads to suitable rod shifting mechanism generally governor controlled but capable of manual operation. The rod shifting mechanism is not shown, as it may be of any well known construction and is unnecessary to a full explanation of the invention.

Between each gate spindle D and the common operating device E is a connecting mechanism comprising an arm G having one end pivotally connected to a link H which in turn is pivotally connected to the operating mechanism. The other end of the arm G is provided with a recess arranged to fit the cylindrical upper end of the corresponding gate spindle D. On the side of the gate spindle opposite the arm G is a yoke G₁ which is secured against angular movement relative to the spindle and has each end connected to the corresponding arm G by an adjustable tension device. In the embodiments of the invention shown in the drawings, the yoke is provided with a recess fitting tightly against the cylindrical surface of the gate spindle, and secured against an-

gular movement relative thereto by a key g fitting into slots in the gate spindle and yoke respectively.

In the preferred embodiment of the invention illustrated in Figs. 3 to 5 inclusive, the adjustable tension devices are bolts g_1 which pass through holes in the yoke and through holes in lugs g_2 carried by the arm G. These holes are made larger than the respective bolts, at least in a direction at right angles to the gate spindle, so as to allow a limited amount of angular adjustability of the bolts in the holes.

The bolts have the usual nuts g_3 and beneath the nuts and also beneath the heads of the bolts are placed washers g_4 , convex on their under sides and resting in concave recesses formed in the yoke G_1 and in the lugs g_2 of the arm G.

A suitable clearance is left between the end of the arm G and its yoke G_1 , as will be clear from the drawing, so that the arm G may be shifted through a certain angle relative to its gate spindle D by tightening up one of its bolts and loosening the other one. The maximum amount of angular adjustment will be determined by the amount of clearance between the yoke and arm and the clearances of the bolts in their holes. In practice it is possible to obtain all the adjustment of the arm that is necessary without too great a clearance, so that parts can be made strong and both the yoke and the arm may have their recesses which receive the gate spindle so fitted as nearly to surround the gate spindle, thereby giving a good frictional contact between the gate spindle and the arm and yoke, thereby assisting in making a rigid connection of the arm to the spindle, without too much strain on the key.

As the connection between the arm and the yoke is made by the bolts and these are subjected to tension strains only, it is possible to make the bolts relatively light. Furthermore, it is possible to make an adjustment of the arm relative to the gate spindle without at any time releasing the arm from the spindle, merely by loosening one nut slightly and tightening the other, and doing this in alternation until the arm has been shifted to the required extent. This avoids the trouble which arises with those adjusting devices where the parts must be released from each other before adjustment can be made. A further important advantage is that the arm may be adjusted with great accuracy and, when threads of close pitch are provided on the bolts, a very slight amount of power on the wrench will serve to shift the arm relative to the gate spindle. This is a great advantage when the work must be done in close quarters, as in some wheel pits.

In the modification of the invention shown

in Figs. 6 to 8 inclusive, the bolts, instead of having the usual heads, are provided with eyes, as indicated at g_6 through which pass pins g_7 . These eyes are received in recesses in the arm, as will be clear from the drawings.

While the invention is particularly important in connection with a plurality of wicket gates and the common gate operating mechanism to which the various arms are connected by links, the improved means for adjusting the arms may be used in other places where the angular adjustment of an arm relative to the shaft to which it is fixed may be desirable.

What I claim is:

1. The combination, with a shaft, an arm having one end in contact with said shaft and arranged for angular movement in a plane at right angles to the shaft axis, of a yoke arranged to engage the shaft on the side opposite the arm, said yoke being fixed relative to the shaft, said yoke and arm being separated by a clearance space, and a pair of adjustable tension devices located one at each side of the shaft and arranged to hold the arm in adjustable fixed relation to the shaft.

2. The combination, with a shaft, an arm having one end recessed to receive the shaft and arranged for angular movement in a plane at right angles to the shaft axis, of a yoke arranged to engage the shaft on the side opposite the arm, said yoke being provided with a recess to receive the shaft, said yoke and arm being separated by a clearance space, means for fixing the yoke against angular movement relative to the shaft, and a pair of bolts located one at each side of the shaft and arranged to pull the yoke and arm toward each other and in close contact with the shaft.

3. The combination, with a shaft, an arm having one end recessed to receive the shaft and arranged for angular movement in a plane at right angles to the shaft axis, of a yoke arranged to engage the shaft on the side opposite the arm, said yoke being provided with a recess to receive the shaft, said yoke and arm being separated by a clearance space, means for fixing the yoke against angular movement relative to the shaft, and a pair of bolts arranged to pull the yoke and arm toward each other, said bolts being located in openings in the yoke and arm wide enough to allow an angular adjustment of said bolts, substantially as described, the bolts being arranged one at each side of the shaft.

4. The combination, with a plurality of turbine gates and their spindles, of an operating mechanism common to all the gates, an arm for each gate, each arm having a pivotal connection to the common operating mechanism, a device for each gate spindle,

fixed against angular movement relative to its respective spindle, and means for adjustably connecting each device to its respective arm, whereby the arm may be held in fixed
5 yet adjustable relation to its spindle.

5. The combination, with a series of wicket gates and their spindles, a plurality of arms, one for each gate, each arm being in contact with its spindle, a yoke for each
10 arm, and means for fixing each yoke against angular movement relative to the spindle, of a pair of bolts for each arm and yoke, said

bolts being angularly adjustable relative to their respective yoke and arm and being arranged to draw the corresponding yoke and
15 arm toward each other and in close contact with the shaft, said bolts being arranged one on each side of the shaft, and means pivotally connected to each arm for simultaneously operating all the arms to adjust the
20 gates.

In testimony whereof, I have hereunto set my hand.

MAX HAEBERLEIN.