N. L. HALL.

RADIAL HEAD GATE.

APPLICATION FILED JAN. 12, 1912.

1,036,613.

Patented Aug. 27, 1912.

4 SHEETS—SHEET 1.

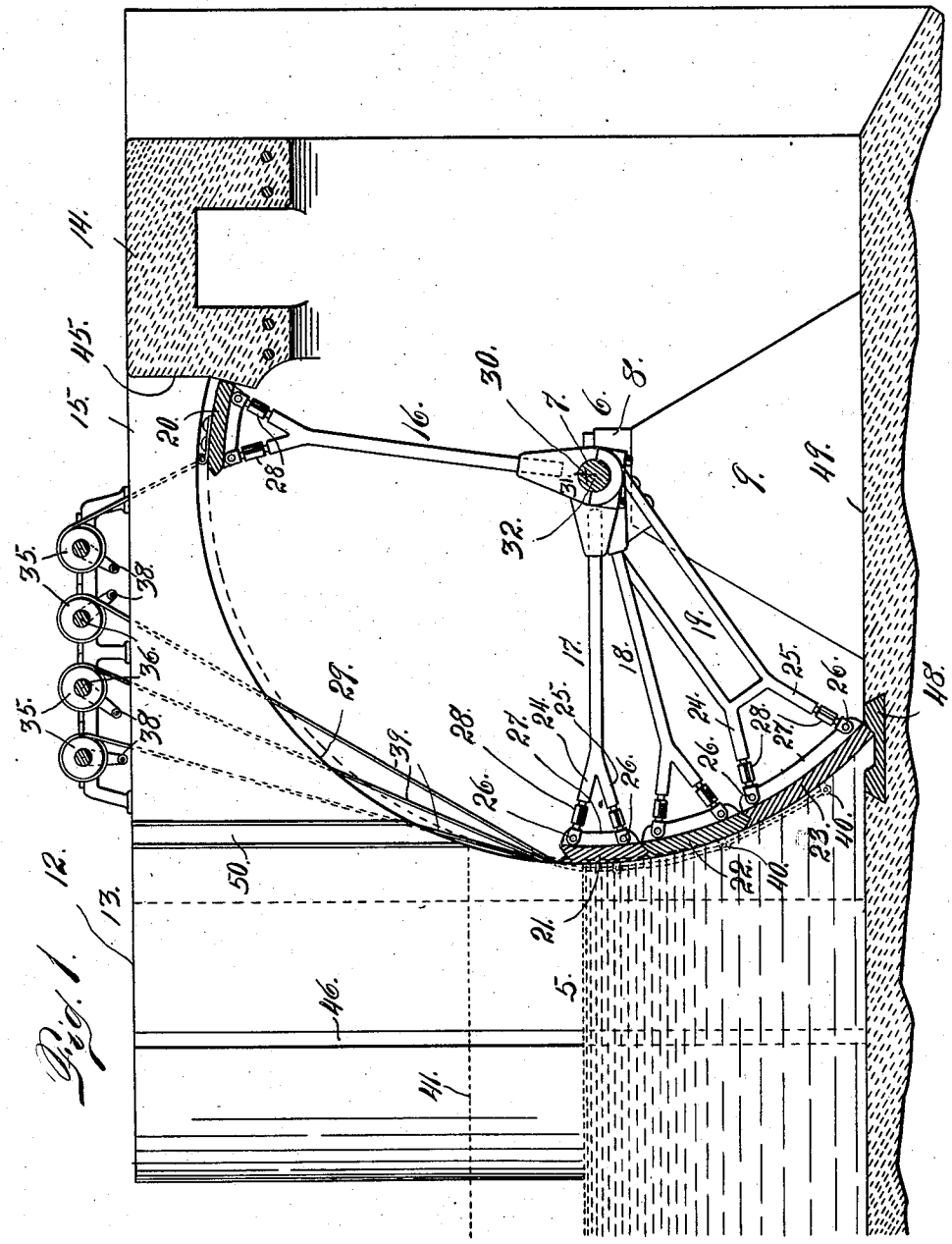

Fig. 1.

Witnesses

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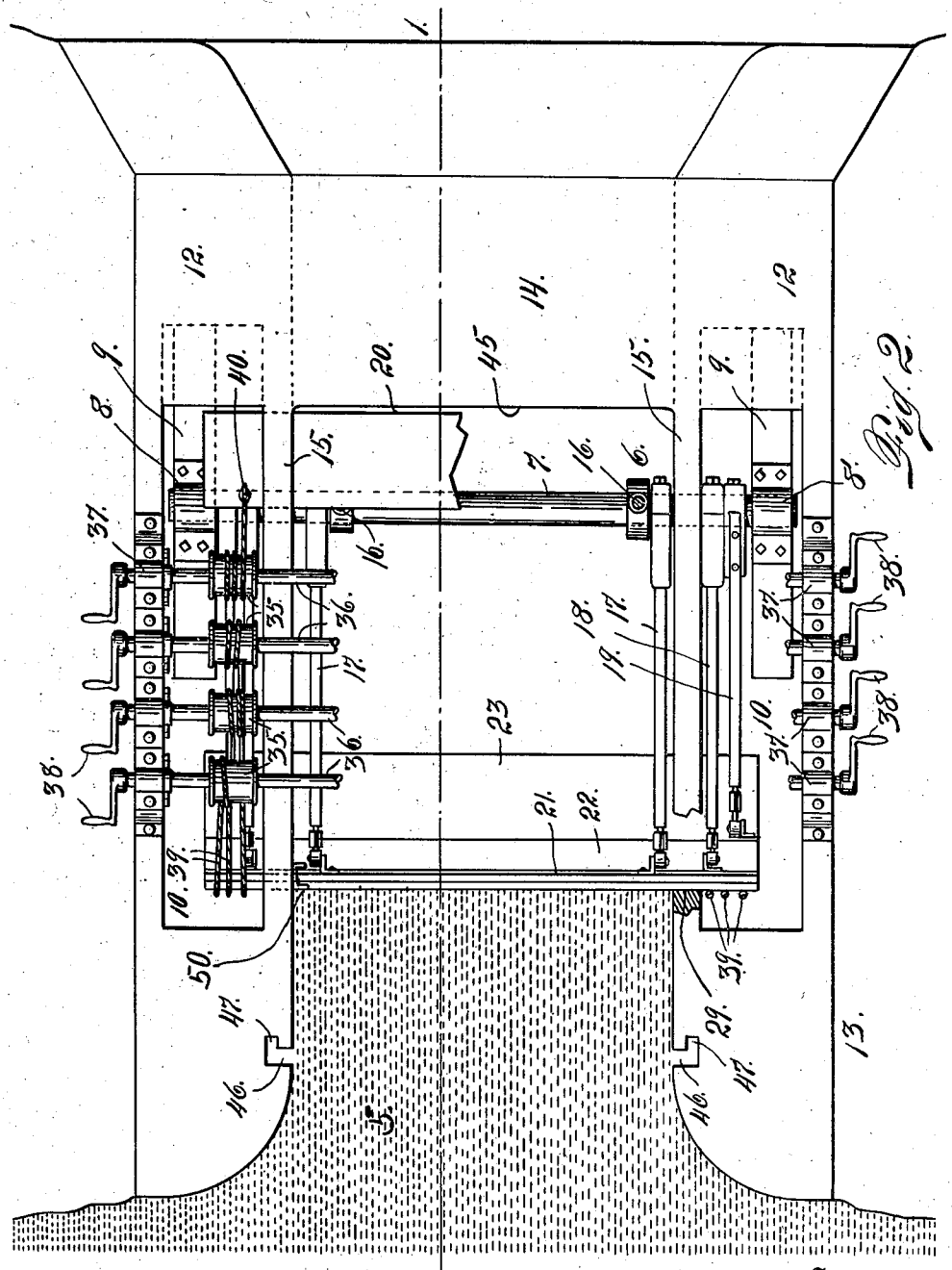

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4 SHEETS—SHEET 3.

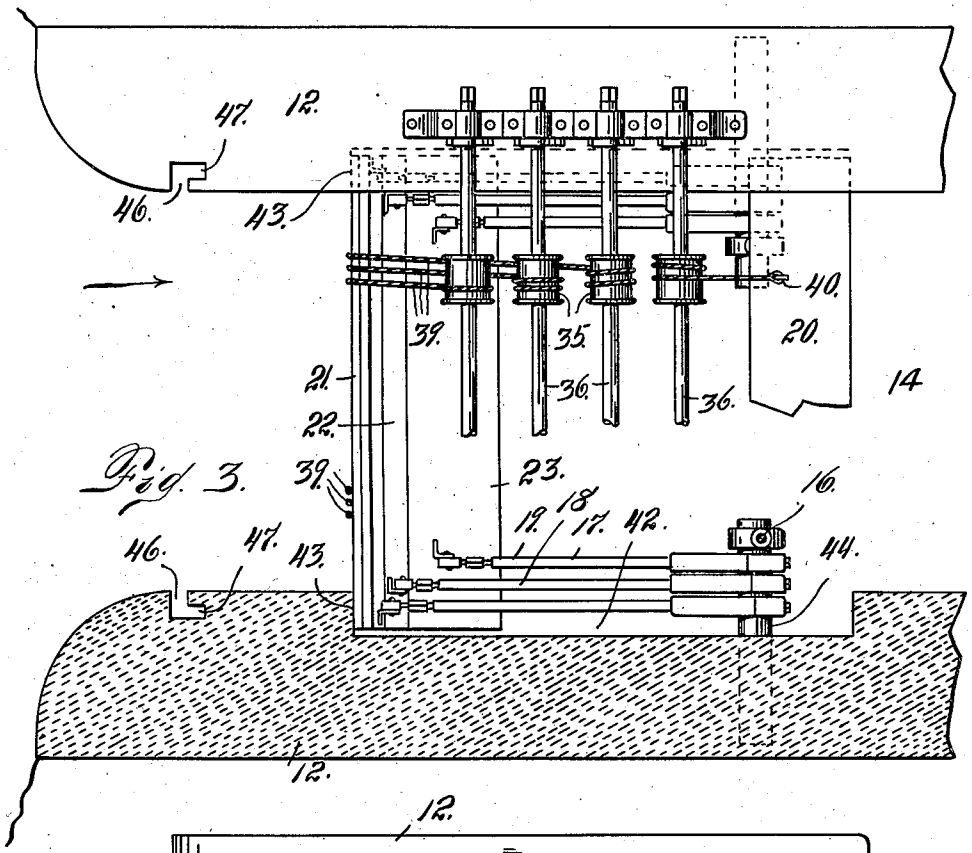

Fig. 3.

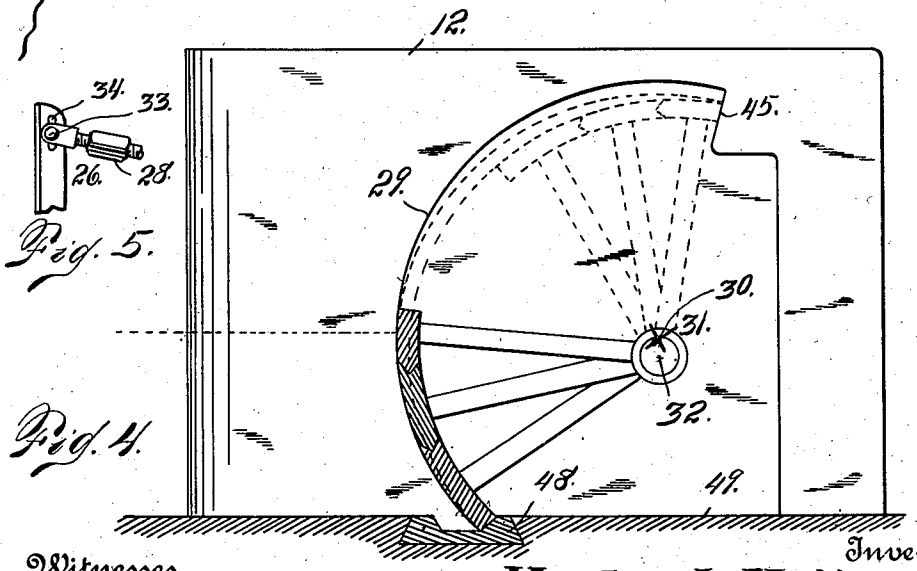

Fig. 5.

Fig. 4.

Witnesses

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4 SHEETS—SHEET 4.

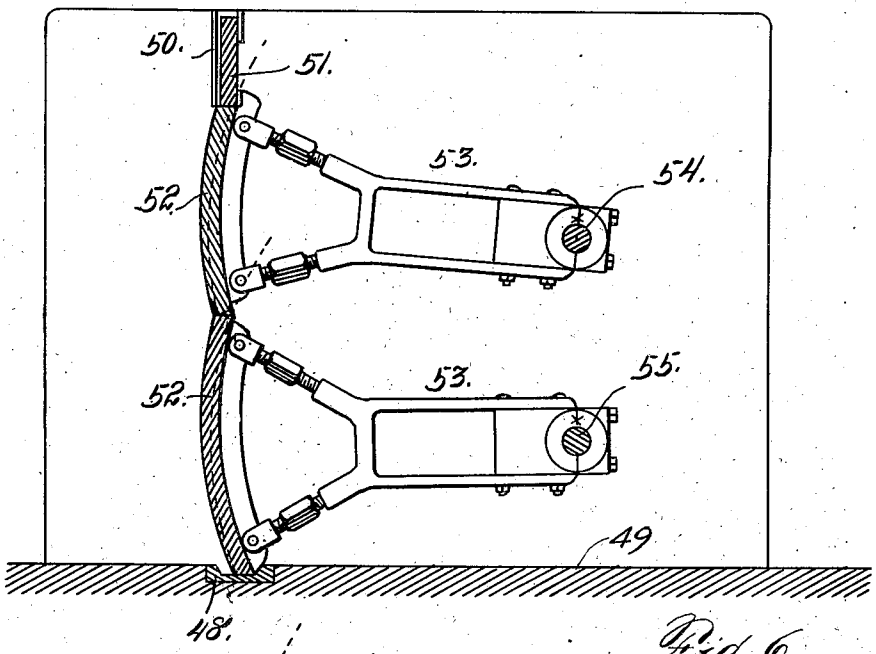

Fig. 6.

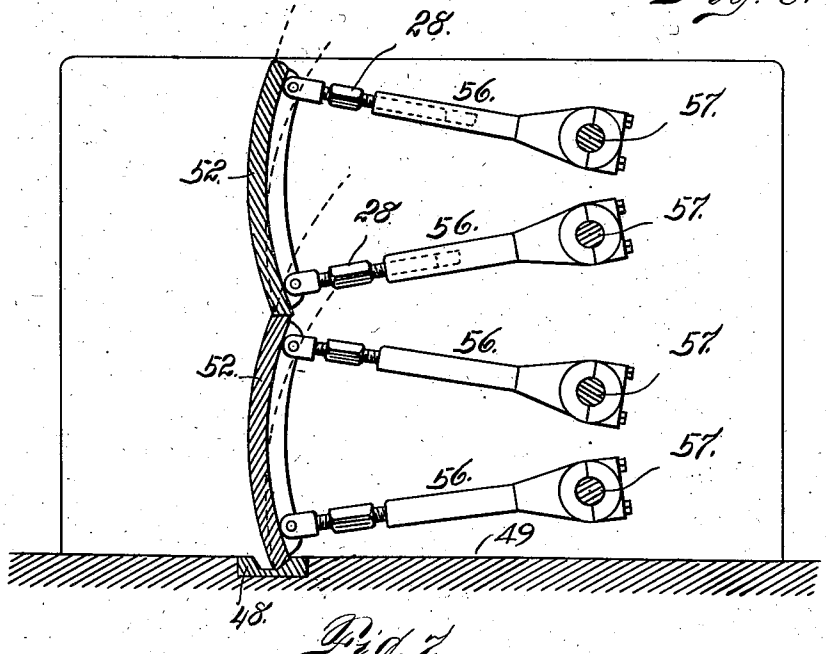

Fig. 7.

Witnesses

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UNITED STATES PATENT OFFICE.

NEWTON L. HALL, OF DENVER, COLORADO.

RADIAL HEAD-GATE.

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Application filed January 12, 1912. Serial No. 670,928.

To all whom it may concern:

Be it known that I, NEWTON L. HALL, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Radial Head-Gates; and I do 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, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in radial head gates adapted to be employed in taking water from a reservoir, stream or other body of water for irrigation or other purposes, my object being to make it practicable to take the water from the top or different levels of the source rather than from the bottom thereof.

Heretofore, so far as I am aware, radial gates could only be opened by raising them in their entirety, thus opening the gate at the bottom to permit an underflow from the source. This is objectionable for the reason that solid material or debris of any kind, which has settled or may be comparatively loose at the bottom of the source, is carried by the underflow of water into the canal below the gate, thus partially filling the canal, and, in any event, forming an undesirable obstruction.

By virtue of my improvement, it becomes practicable to take the water from the top of the source, the bottom of the source, or from an intermediate position, as may be desired, and to this end the gate is composed of independent sections, which, when the gate is closed, coöperate to make a continuous device, the various sections interlocking with each other in such a way as to form a tight structure.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing, in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a vertical section of my improved gate construction, taken on the line 1—1 of Fig. 2. Fig. 2 is a top plan view of the same. Fig. 3 is a similar view, showing a modified form of construction. Fig. 4 is a diagrammatic view illustrating the fact that the arc of the bearing surface of the gate is struck from a different center from that in which the faces of the gate sections travel. Fig. 5 is a fragmentary detailed view shown on a larger scale than in the general views. Fig. 6 is a side elevation, partly in section, illustrating a modified form of construction. Fig. 7 is a similar view, showing still another form of construction.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the body of water adjacent a canal which is to be supplied through a gate, which may be designated in its entirety by the numeral 6. This gate will now be described in detail.

A shaft or axle 7 (referring more particularly to the construction disclosed in Figs. 1 and 2), has its extremities supported in bearings 8 mounted on pedestals 9 located in cavities 10 formed in the sides 12 of a pier 13, the two sides of the pier being spaced to harmonize with the width of the mouth 14 which is to be controlled by the gate and through which the water is to flow from the source to the canal. In this form of construction, the extremities of the shaft or axle 7 pass through partitions 15 of the pier and enter the cavities 10 in which the bearing pedestals are located. Journaled on the axle 7 is a number of arms 16, 17, 18 and 19, to whose outer extremities are respectively secured gate sections 20, 21, 22 and 23. It will be understood, however, that a greater or less number of sections may be employed, as desired, the illustration in the drawing being only for the purpose of indicating that the gate is composed of a plurality of sections or leaves, the same being arranged one above another and coöperating to form a tight structure to control the flow of water from the source to the canal. As illustrated in the drawing, the sections 20, 21, 22 and 23 have their adjacent edges tongued and grooved whereby they interlock to form water-tight joints. Of course, any other interlocking arrangement or construction may be employed.

As illustrated in the drawing, each arm 16, 17 and 18 is composed at its outer extremity of two members 24 and 25, each of which is pivotally connected, as shown at

26, with angle iron members 27, suitably secured to the gate sections or leaves near the outer extremities of the latter, each section being preferably controlled by a pair of arms 16, 17, 18 or 19, as the case may be.

In order to properly adjust the sections, each of the branches 24 and 25 of each arm is composed of two parts having a turnbuckle connection 28, whereby the sections may be adjusted to fit the curve 29 of the partitions 15 of the pier, when the said sections are in the closed position. The arc 29 is struck from a center 30 located at the intersection of the cross marks 31 in Fig. 4, the said center being above the center 32 of the shaft 7 which is the center of motion of the gate sections, when the latter are moved. The center of the curve or arc 29 is so arranged that the gate sections move away from the faces of the pier partitions 15 as the gate sections are raised, thus reducing the friction incident to the opening of the gate sections and relieving the latter from the wear which would otherwise be incident were the construction such that the sections were in constant engagement with the adjacent pier faces during the entire opening movement of the said sections. For this reason, it is important to make provision for adjusting the gate sections to cause them to fit the pier faces which correspond with the curves or arcs 29 when the gate sections are in the closed position. When, however, these sections are raised, their faces must move in an arc struck from the center of the shaft 7 which causes the faces of the said sections to move away from the curved faces of the pier during the opening movement of the sections. For this purpose, the connection of the parts 24 and 25 with the angle iron members 27 is made reasonably loose, as illustrated in Fig. 5 of the drawing. In other words, the pivot pins 33, forming the aforesaid connections, pass through curved slots 34 formed in the outwardly-projecting flange of each angle iron. These gate sections may be raised and lowered through the instrumentality of drums 35 mounted on shafts 36 journaled in bearings 37 mounted on the outer edges of the pier 13, the shaft extremities protruding beyond the outer walls of the pier and being equipped with hand cranks 38, whereby each gate section may be manually raised or lowered. This may, if desired, be accomplished by employing two men, one to manipulate each crank of the shaft. Ordinarily, however, it will only be necessary to employ one man, who where each shaft is provided with two cranks, may operate the gate section from either side of the gate, and, consequently, from either end of the shaft.

In the form of construction shown in Figs. 1 and 2, the ropes or cables 39, which are connected with the respective gate sections, are located entirely outside of the mouth or channel 14, through which the water is to pass from the source 5, since, as disclosed in the aforesaid figures, the drums 35 are located above the cavities 10 of the pier, allowing the ropes or cables 39 to be connected with their respective gate sections within the cavities 10, into which the respective extremities of each gate section protrude. There should be two drums 35 fast on each shaft, all of the drums of the said shafts being located above the cavities 10. The extremities of each pair of ropes or cables 39, remote from the drum on any shaft, are connected with the gate sections, as shown at 40, or in any other suitable manner, while the opposite extremities of the same pair of ropes or cables are connected with the drums on the shaft, which is to be rotated in maniuplating the gate section.

From the foregoing description, the use and operation of my improved construction will be readily understood. The aggregate area of the gate sections should be such as to reach to the highest level which the reservoir or other body of water will reach. It may be assumed that the dotted line 41 in Fig. 1 indicates this level. Hence, when the section 20 is in the closed position, its upper edge should reach the dotted line 41, thus making provision for confining the water within the source, when it is at its highest level. This makes it practicable, if desired, to relieve the reservoir or source, in the event that the water is rising to a dangerous level, by lifting the uppermost section of the gate and thus allowing the water to gradually drain off, and thus preventing it from reaching a height which might result in overflowing or breaking the banks of the reservoir or stream.

If we assume that the water is at the level indicated by the relatively close parallel dotted lines in Fig. 1, if it is desired to allow water to enter the canal through the gate, the section 21 will be raised. The degree to which the section may be opened may be regulated, as desired. For instance, if it is desired that only a small amount of water shall pass through the gate, the section only need be lifted an inch or two, or, in other words, the upward movement of the section need not be sufficient to lift its lower edge above the level of the water, unless it is desirable to draw off a quantity of water equivalent to that which will flow through the gate when the section is lifted above the water level. It will be understood, by virtue of my improved construction, that the water which is taken out of the reservoir or source, by lifting the uppermost section, or one or more of the upper sections, will be comparatively free from dirt or solid matter. In other words, my improved construction makes it practicable to draw off water sub-

stantially pure from the source, since that taken is drawn from the upper part of the source. It is evident, however, that, if desired, the entire gate, including all the sections, may be raised so as to allow the water to flow underneath the gate. Again, and at the same time, the upper sections may be so adjusted as to allow the water to overflow into the canal, while, at the same time, the said sections may be so adjusted as to permit an underflow, an overflow, and an intermediate flow, all at the same time, or any one of these flows separately, as may be desired. Furthermore, by virtue of my improved construction, as soon as any gate section begins to rise, it moves away from the curved face of the pier, since the arc of such face is so regulated that its radius above the gate sections is greater than the radius of any section. This is accomplished by striking the arc of the curved face of the pier adjacent which the gate sections move when raised on a radius having its center above the axis 32 of the shaft 7, upon which the arms of the gate sections are concentrically journaled.

Referring now to the construction illustrated in Fig. 3, attention is called to the fact that the cables or ropes 39 are connected with the gate sections between the inner surfaces of the pier members 12, while the drums are located above the mouth 14, through which the water flows when the gate is open. In this case, the walls 12 of the pier are provided with recesses 42 cut thereinto from the planes of the normal inner surfaces of the pier walls, where the gate is located, thus forming offset bearing faces 43 which the gate sections engage when in the closed position, but which the faces of the gate sections leave as soon as they begin to rise during the opening operation. In this case, the shaft or axis of the gate sections is composed of two relatively short members 44, whose outer extremities are anchored in the walls 12 of the pier.

As illustrated in Figs. 1 to 3, of the drawing, the raised section 20 in each instance is thrown farther back than would be permissible by rotating its drum in a direction to raise the gate section. Hence, it should be explained that this gate section may only assume the position which it is illustrated as occupying, by manually pushing it back against the abutment 45, in which event, the drums which have been operated in raising the section must necessarily rotate slightly in the reverse direction. The relatively narrow angular recesses 46 formed in the pier walls, forward of the gate, are for the introduction of a flash board, when it is desired to cut off the water from the gate, as when making repairs on the latter.

By virtue of the rearwardly cut portions 47 of these recesses, provision is made for introducing pike poles, whereby the hooks of the latter may be permitted to engage the lower edge of the flash board for the purpose of raising the same.

As illustrated in Figs. 1, 4, 6 and 7 of the drawing, the lowermost gate section engages a seat 48, which may be composed of any suitable material set into the bottom 49 of the mouth through which the water must pass to the canal.

In the form of construction shown in Figs. 1 and 2, the gate has a face which passes into the hollow of the pier and the face may extend into it far enough to allow the lifting cords, ropes or cables 39 to be fastened at each end, (see Fig. 2). As the channel below the gate drains, it can thus be seen that the cavity of the pier will accordingly not have the amount of water which is to be above the gate, and the lifting cords or cables could be placed or replaced without the extreme inconvenience which is sure to be met when a head of water is above the gate and the cords have to be secured in the center of the gate.

The change of the lengths of the radial arms 16 to 19, disturbs to some extent the direction of pressure, whereby the resultant of pressure from the combined faces above the axle would tend to lift the gate, but the difference in the length of the lowest arm from the highest arm is so small as not to create enough upward pressure to overcome the weight of the gate.

In Fig. 1 I have shown the pier walls provided with grooves 50, preferably formed by applying channel irons to the pier walls. By virtue of this construction, a flash-board may be introduced above section 20, so that in the case of extreme high water, the latter may be cut off to the full height of the pier walls. This flash-board is designated "51" see Fig. 6.

In the form of construction shown in Fig. 6, the different gate sections which are designated "52" have their arms 53 mounted on different axles 54 and 55, this construction while practicable, is not considered as desirable as the construction where the arms of all of the sections have a common axis.

Again, in the form of construction shown in Fig. 7, each of the gate sections 52 is connected with two arms 56, each arm being connected with a different shaft or axle 57. The turn-buckles, 28, employed in Figs. 6 and 7, are substantially the same as in the other forms of construction, and therefore, need not be specifically described.

In common practice, good workmanship can produce a gate which will fill the space between the piers to a workable degree, and be reasonably water tight without any special waterproofing provision.

The sections of the gate may be lowered into a flowing canal, and serve as a partial

water check, and thereby raise the water level of the canal above, so as to serve a higher gate level on a branch canal.

Between the gate face and the pier wall, a heavy lubrication should be placed to overcome friction, and also to avoid compact ice freezing between the two faces.

Attention is called to the fact that the turnbuckles 26, may be operated to relieve the gate face if it should become fast in any position of adjustment.

This gate can easily maintain a desired water level for a water wheel or turbine.

Having thus described my invention, what I claim is:—

1. A radial headgate composed of a plurality of independently operable sections arranged one above another.

2. A radial head gate composed of a plurality of independently-movable sections.

3. In a radial head gate, the combination of a pier having curved faces, and a gate adjacent the pier faces and movable in an arc different from that of the pier faces, whereby the gate faces recede from the pier faces during the lifting operation, the face of the gate being curved in an arc to fit the curve of the pier-face when the gate is closed.

4. In a radial head gate, the combination with a pier composed of walls located on opposite sides of the gate proper, the walls being cut away on opposite sides to allow the gate to enter, the walls being curved adjacent the face of the gate, and a gate having a face curved to fit the faces of the pier walls when the gate is closed, and means for raising the gate, the latter being pivoted to swing in an arc, whose center is different from the center from which the curved faces of the walls are struck, whereby the gate face moves away from the wall faces during the opening movement of the gate.

5. A radial head gate composed of a plurality of coöperating sections arranged one above another and independently movable, each section having an arm arranged to swing in an arc struck from a common center, but with different radii, the radii of the sections gradually increasing in length from the lowermost upwardly, substantially as described.

6. The combination with a pier having separated walls, each wall having a cavity, the inner partition of each cavity having an opening bounded in front by a curved face, and a radial gate member extending transversely across the space between the walls of the pier and whose extremities pass through the said openings of the pier walls into the said cavities.

7. The combination with a pier having separated walls, each wall having a cavity, the inner partition of each cavity having an opening bounded in front by a curved face, and a radial gate member extending transversely across the space between the walls of the pier and whose extremities pass through the said openings of the pier walls into the said cavities, the arcs of the curved faces of the pier walls being struck from a different center from the arc in which the radial gate members move, the latter being arranged to engage the wall faces when closed and to swing free from said faces during upward travel.

8. A gate composed of curved coöperating independently operable sections arranged one above another, and radial arms with which the respective sections are connected, the said arms being journaled to swing independently of each other.

9. A gate composed of curved coöperating independently operable sections arranged one above another, radial arms with which the respective sections are connected, the said arms being journaled to swing independently of each other, and from a common center.

10. A gate composed of curved coöperating independently operable sections arranged one above another, radial arms with which the respective sections are connected, the said arms being journaled to swing independently of each other, and from a common center, and means for manipulating said sections.

11. A gate composed of curved coöperating sections arranged one above another, radial arms with which the respective sections are connected, the said arms being journaled to swing independently of each other and from a common center, and means for manipulating said sections, comprising winding drums and flexible devices respectively connected with the drums and gate sections, substantially as described.

12. A gate comprising coöperating curved independently operable sections arranged one above another, an axle, and arms journaled on the said axle and respectively connected with the said sections.

13. A gate comprising coöperating curved sections arranged one above another, an axle, arms journaled on the said axle and respectively connected with the said sections, and means for adjusting the sections on the respective arms to cause the faces of the gate sections to occupy arcs struck from a center different from that in which the gate sections travel during their upward movement.

14. A gate comprising coöperating curved sections arranged one above another and journaled to cause the faces of the gate sections when closed to occupy arcs struck from a center different from that in which the gate sections travel during their upward movement.

15. A radial head-gate composed of a plu-

rality of independently movable sections mounted to swing on a common axis.

16. A radial headgate composed of a plurality of sections arranged to be moved away from the bed of the stream or other body of water, for opening purposes, substantially as described.

17. A radial headgate composed of a plurality of sections and means for opening said gate by moving the sections away from the bed of the stream or other body of water, substantially as described.

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

NEWTON L. HALL.

Witnesses:

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