April 14, 1925. 1,533,137

L. J. POSPISIL

HYDRAULIC GATE

Filed May 12, 1921 3 Sheets-Sheet 1

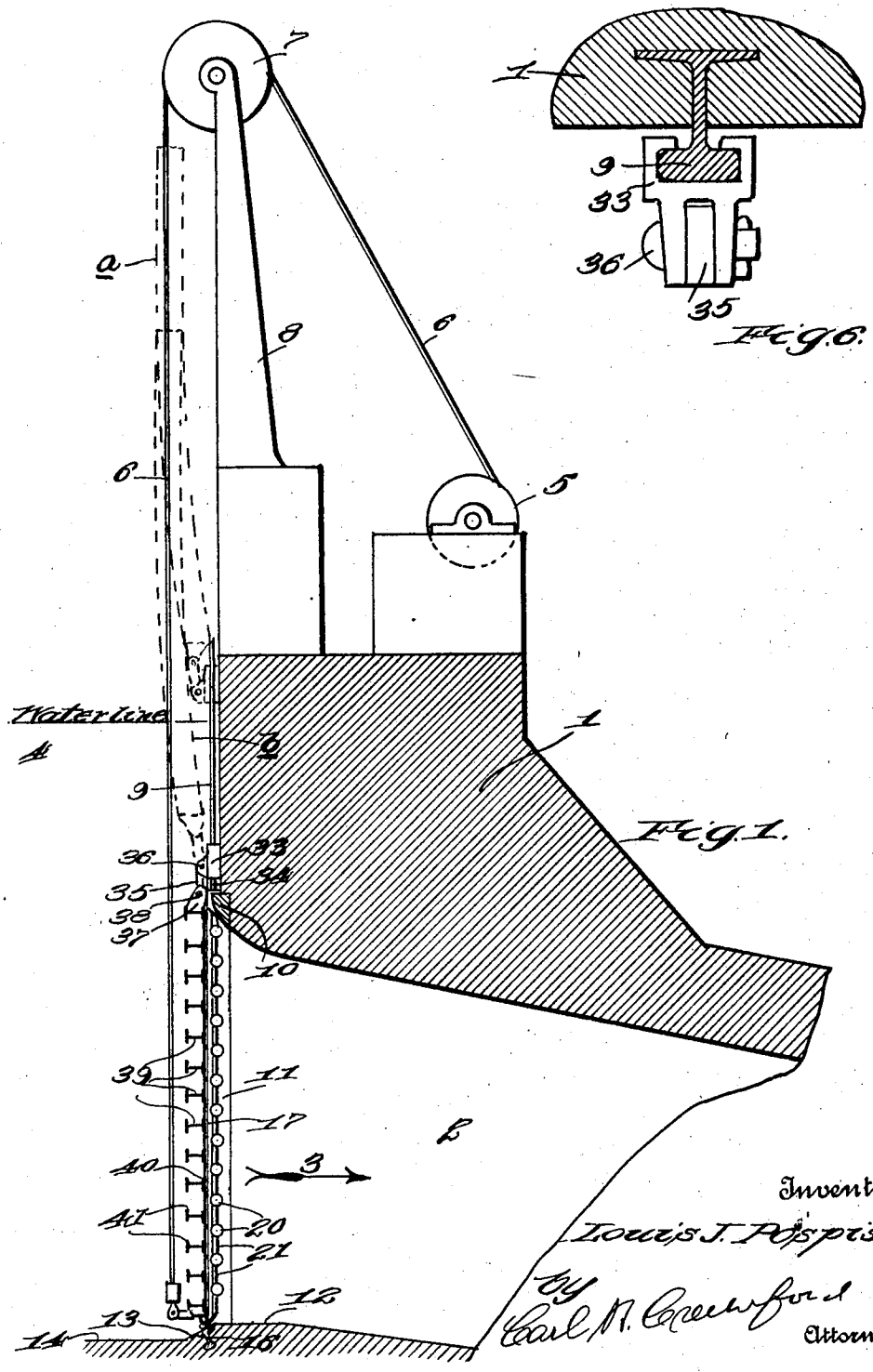


Fig. 1.

Fig. 6.

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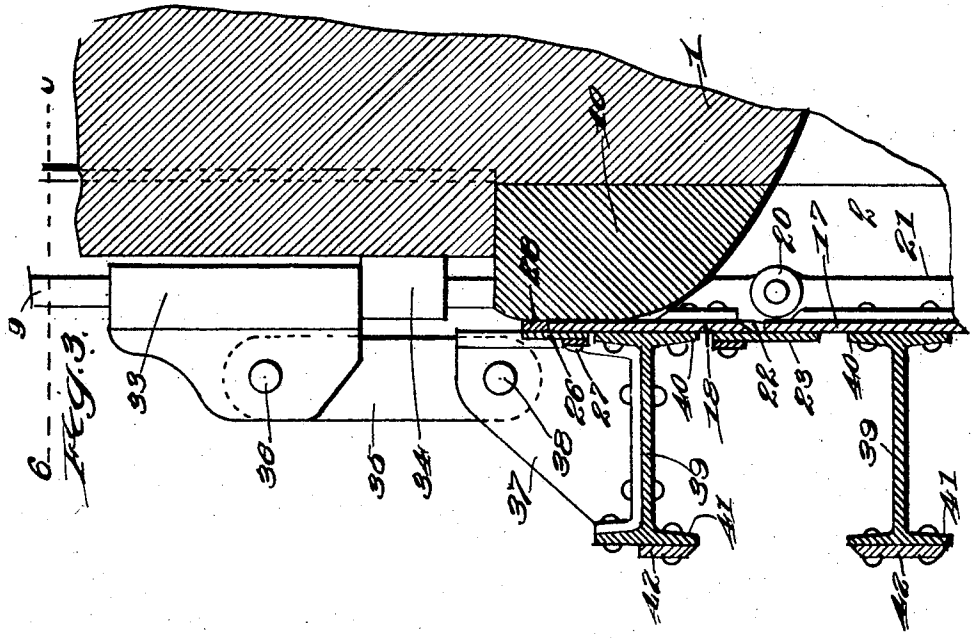


Fig. 3.

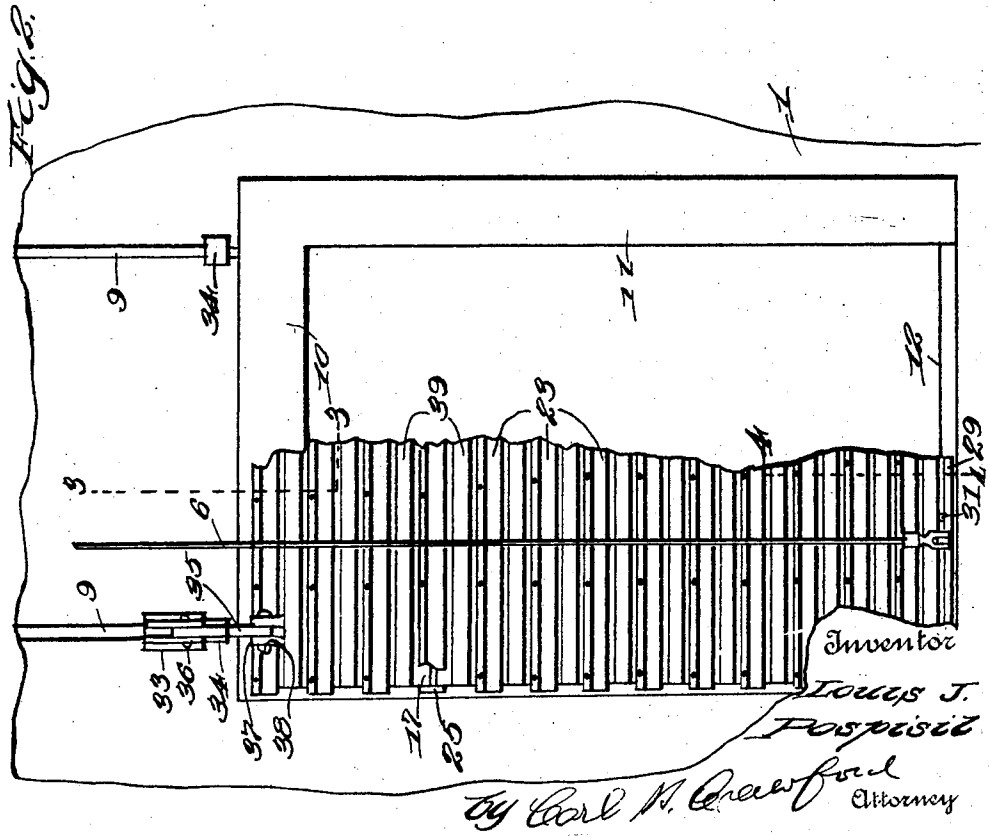


Fig. 2.

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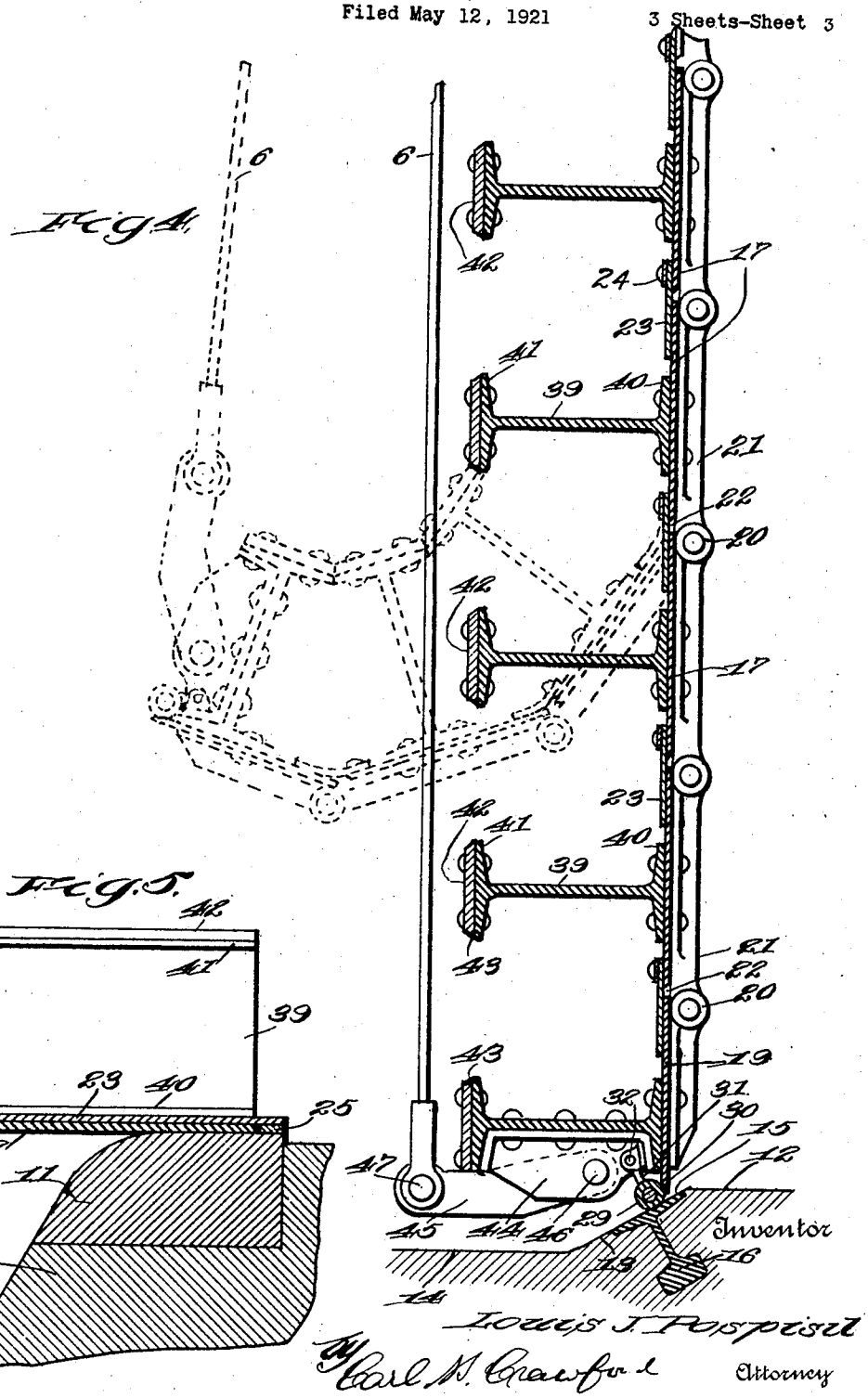
1,533,137

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HYDRAULIC GATE

Filed May 12, 1921

3 Sheets-Sheet 3



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Patented Apr. 14, 1925. 1,533,137

UNITED STATES PATENT OFFICE.

LOUIS J. POSPISIL, OF SPOKANE, WASHINGTON.

HYDRAULIC GATE.

Application filed May 12, 1921. Serial No. 468,898.

To all whom it may concern:

Be it known that I, LOUIS J. POSPISIL, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented new and useful Improvements in Hydraulic Gates, of which the following is a specification.

This invention relates to improvements in hydraulic gates of the curtain type for all of the utilities for which such gates are usually employed.

One of the objects of this invention is to provide a curtain gate formed of hinged or articulated sections with the sections in spaced relation with respect to each other, together with improved means for closing the spaces between said sections against leakage.

A feature of this phase of the invention resides in an improved means in the form of a seal, which is preferably flexible, and which in the most improved embodiment, is in the form of a strip or strips having sliding engagement with certain of the sections and being secured to other sections so that when the sections are shifted with respect to each other, in the operation of elevating the curtain, the seals will flex and will always be acted upon by fluid pressure into a water sealing position.

A further feature of my improved gate consists in extending the sections throughout the width of the gate, likewise, the coacting sealing means, and providing seat portions against which the fluid pressure will seat the sealing means and the sections of the gate, the juncture of the gate sections and said means with said seat portions, forming a substantially tight joint.

A further feature in a gate formed of spaced sections is to provide sealing means extending beyond the sections and engaging the seat portions, especially at the spaced portions of said sections, to cut off leakage therebetween.

A further feature consists in providing a sectional curtain gate articulated to flex in either of two directions from a given plane whereby the sections will afford a flexible gate which will the more readily engage the seat portions effectively, irrespective of irregularities or inaccuracies either in the gate itself, or in the seat engaged thereby.

In my improved gate, I preferably dispose the hinges on that side of the gate opposite to the side subjected to the water pressure; and on the water pressure side, I stiffen the sections with improved beams which are arranged to abut when the curtain is lifted on the "rolling" principle, thereby limiting the diameter of the "roll".

A feature of great importance in my improved gate consists in means for either lifting the gate on the curtain "roll" method, to open the sluice, irrespective of whether the gate is elevated above the water line, or, bodily lifting the entire gate above the water line to expose the gate structure for inspection and repair or for other purposes.

In those installations wherein the bottom of the sluice is below the bottom edge of the gate when the gate is closed, it is a feature of my invention to provide automatic or fluid actuated means functioning to close the space between the bottom of the sluice and the bottom of the gate, such means, in the most improved form of the invention, being carried by the gate.

Other features and objects of the invention will be more fully described in connnection with the accompanying drawings and will be more particularly pointed out in and by the appended claims.

In the drawings:—

Figure 1, is a vertical sectional view of a sluice structure with my improved hydraulic gate shown applied thereto, the gate being shown in full lines in a sluice closing position, and in dotted lines, in an elevated position.

Figure 2, is a view on a slightly enlarged scale looking from the left of Figure 1, and showing a portion of the sluice way and a portion of the gate.

Figure 3, is a vertical sectional view on line 3—3 of Figure 2, showing an upper portion of the gate and a part of the sluice structure on an enlarged scale.

Figure 4, is a sectional view on line 4—4 of Figure 2, showing the manner in which the gate is lifted from a closed position.

Figure 5, is a sectional view of one side portion of the gate showing the manner in which it engages the gate seat.

Figure 6, is a sectional view on line 6—6 of Figure 3.

Like characters of reference designate

similar parts throughout the different figures of the drawings.

1 designates generally a sluice structure having a sluice way or passage 2, the direction of flow being indicated by arrow 3, and the water line 4 being indicated on the pressure side. On top of the masonry of the structure 1, is diagrammatically indicated a hoisting mechanism which may be briefly described as comprising a hoisting drum 5, a cable 6 and a sheave 7 journaled on a tower 8. The cable 6 is trained over the sheave 7; one or more sets of hoisting devices being used as desired. Guides, which may take the form of rails 9, are shown partially imbedded in the masonry of the sluice structure. Bordering the top and sides of the sluice way 2, are seat portions 10 and 11. The bottom of the sluice, as indicated at 12, slopes at 13 to a lower elevation at 14, and the base 15, of a rail 16, forms a juncture wall in the sloping portion 13, for the bottom of the gate, as will later appear.

Reference will next be made to the improved gate, as regards its specific construction.

As illustrated, my improved gate is formed of a plurality of sections which are in the form of plates 17, all of which are identical in form and construction. However, the normally uppermost section will be designated at 18, and the normally lowermost section at 19, to facilitate later description of the operation thereof. As illustrated, the gate sections 17 are articulated or hinged together by hinges 20 having leaf portions 21. It will be noted that the hinges are on that side of the gate opposite the pressure side, and it will also be noted, and here stated, that the hinges are not knuckle hinges, in other words, they have no stops preventing them from flexing in either of two directions from a vertical plane. Therefore, my improved gate is flexible in either of two directions, which is an important feature to be later developed. As will be noted by reference to Figure 4, the adjacent edges of the gate sections are in spaced relation, as indicated at 22, one of the edges being chamfered and the other of said edges being butt edges. Preferably, the uppermost edge in each space is chamfered and the spaces are disposed above horizontal lines intersecting the axes of the hinges. There may be one or more lines of hinges for each gate but in any event, each leaf portion of each hinge is secured to one section 17, as by means of rivets or the like. It will now be clear that the rigid gate sections, having intervening spaces between their adjacent edges, will not prevent the gate from flexing in either of two directions. Furthermore, by disposing the spaces 22, slightly above the hinge axes, the gate will "fold" or "roll" with a lesser amount of space than would otherwise be necessary. In my improved gate, each of the sections 17 extends throughout the entire width of the gate, the end portions of the sections bearing against the seats 11 and the top sections additionally bearing against the seat 10. By means of this construction, the flexible gate, and each section thereof, will effectively bear against its seat irrespective of irregularities of plane of the seats or inaccuracies in the gate itself. This would not be true if the gate were controlled in its open or flat position by knuckle joints or abutment hinges limiting movement of the sections into a given plane, as such plane would necessarily have to accurately coincide with the plane surface presented by the gate seat, in order to afford an effective juncture.

I will next describe the novel manner in which the spaces between the sections, both intermediate and at the end and top edges of the gate, are sealed or packed against leakage.

My improved gate packing means is preferably in the form of sealing means, and as shown, the same consists of a plurality of flexible sealing strips 23, all of which are identical in form and operation and only one of which need be described in detail. The strip 23, is shown anchored at 24, to the upper of the two sections so that said strip will depend in overlapping relation across the space 22 and down over the next lower section. The overlap of the strip is amply sufficient to cover the space 22, irrespective of the relative position of the sections with respect to each other. As will be seen by reference to Figures 2 and 5, the strips 23 extend slightly beyond the side ends of the sections 17 in overlapping relation with the seats 11 but in spaced relation thereto. Sealing strips or blocks 25, are suitably secured to the ends of strip 23 and are of a length equal to the width of such strip. The thickness of the sealing strips 25 is sufficient to close the space between the strip 23 and the seat 11. Thus across the space 22 at each side end of the gate is an effective seal preventing end leakage. As will be seen by reference to Figure 3, the uppermost section 18 carries a sealing strip 26, secured thereto at 27, and which extends above the upper edge of section 18. This strip carries a sealing element 28 extending completely across the gate and engaging seat 10, to seal the normally upper edge of the gate against leakage.

It will now be clear that my improved packing or sealing means is located wholly on the fluid pressure side of the gate and that therefore said means is always actuated by fluid pressure in the performance of its function and is therefore automatic. Reliance is not placed upon any action of the sealing means itself to make the latter func-

tion, and as pressure against the same will always be present when the gate is in a functioning position, the sealing means will always prevent leakage as long as it is in repair.

In some installations, the normally lower edge of a hydraulic gate, which edge will be indicated by section 19, will overlap downwardly beyond the bottom of the sluiceway and therefore such normally lower edge might be provided with sealing means similar to that carried by section 18, of the normally upper edge of the gate. However, in other installations there is a slope leading from the sluice-way bottom 12, as shown in Figure 4, and therefore, a special form of sealing means is required which I will now describe in detail.

A sealing roll 29, which may be flexible or have a slightly flexible periphery, is actuated by fluid pressure to engage the lower chamfered edge 30, of section 19 and the base 15, so that it will not be necessary to lower the gate into actual contact with the bottom of the sluice way. To lower a heavy gate into edgewise abutting relation with a flat or inclined sluice-way bottom would require a too great amount of accuracy of structure and adjustment to prevent leakage. Hence I do not lower the edge 30 into actual abutting engagement with part 15. The flexible roll 29, under water pressure, serves effectively to seal this lower space. This sealing means is preferably carried by the gate and I have shown the same provided with arms 31 pivoted to the gate at 32, the pivotal connection being of a sufficient loose play character to permit the roll 9 to flex into an effective sealing or abutting engagement against the gate and the sluice bottom. By having the roll pivoted to the gate, no fastening means is necessary and the roll will always swing into a sealing position.

I will next describe the manner in which the gate is suspended with a view of either permitting the gate to be adjusted into a sluice closing or opening position and also permitting the gate to be bodily hoisted into such elevation with respect to wherever the water line may be as to fully expose the entire gate structure to facilitate repair and inspection of the latter.

Hanger blocks 33 are slidably mounted on the rails 9 and have flanged engagement therewith to prevent the blocks from being detached from said rails other than being moved endwise off from the latter. Supporting blocks 34 are set to limit downward travel of the hanger blocks 33 whereby the gate may be structurally supported in a lowermost or closing position. Links 35 are pivoted at 36 to said blocks 33. Brackets 37 mounted on the gate structure, in a manner to be presently described, are pivoted at 38 to said links 35. Thus the gate is slidably mounted on the sluice structure. When the gate is lowered to the position shown in Figure 1, it is supported by the blocks 34. However, the slidable hanger blocks 33 permit the gate to be elevated to the dotted line position *a* shown in Figure 1, in which position the gate will be supported by cable or cables 6. However, in the usual opening operation, the gate will only be elevated to the dotted line position indicated at *b*.

While I have shown a sluice disposed wholly below the water line, in some installations the sluice may be extended above the water line.

I will next describe a part of the gate structure which functions not only to stiffen the plate sections of the gate but which also functions to control the diameter of "roll" of the gate when the same is lifted to an open position.

As shown, beams which function as abutments and also as stiffening members, are provided, one being secured to each gate section, and said beams are herein shown in the form of I-beams 39. The flanges 40 of said beams are secured to the plate sections and said beams are preferably equal in length to the sections to which they are secured thereby stiffening said sections throughout their length. It will be noted that the flanges 40, of one beam, are entirely free from mechanical connection with the flanges 40 of the next adjacent beam, and that all of said beams are on the pressure side of the gate, opposite to the side on which the hinges are mounted, and on the same side on which the sealing means are disposed. The outer flanges 41 are the abutment flanges and are provided with abutment strips 42 to increase the areas of the abutment edges 43. The bracket 37 is shown secured to the normally uppermost beam 39. A bracket 44 is secured to the normally lowermost beam 39. An elevating arm 45 is pivoted to the bracket 44, at 46, and has abutting engagement with the surface 43 of the lowermost beam 39. The hoisting cable 6 has a pivotal connection at 47, with arm 45. Thus in the first lifting step, the free end of the lowermost beam will be lifted about the pintle 20 of the lowermost hinge, as an axis, until the upper surface 43 of the lowermost beam 39, abuts the lower surface 43, of the next upper beam. The sections will thereafter be severally and successively shifted on upwardly successive hinges as will be clearly understood by the dotted line position of the gate as shown in Figure 4. Thus the stress in the gate structure is divided between the hinges and the abutment strips. In the elevating position there will be tension at the hinges whereas the free ends of the beams will be under compression thereby dividing

the stresses by not only differentiating the stresses but widely separating the same. The dotted line position shows how the sealing strips 23 will flex to permit the plate sections to assume angular positions with respect to each other without in any way breaking operative engagement therewith. As the cable 6 is wound up, the gate may be elevated without sliding the hanger blocks 33 upwardly, as indicated by dotted line position *b*, thereby fully opening the sluice way 2. Thus the normally uppermost edge of the gate would be below the water line together with an additional portion of the gate. This is usually the extent of movement of an elevating nature which is imparted to the gate. Should it be desired to inspect the gate, the hoisting mechanism would be operated to the extent of elevating the gate to the dotted line position *a* shown in Figure 1, thereby sliding the hanger blocks 33 upwardly along the guide rails 9. In this position, the entire gate would be above the water line and could be freely inspected as regards all parts thereof.

It will now be clear that a gate which is flexible, as is my improved gate, in either of two directions from a vertical plane, has the very great advantage of effectively seating into a sealing position irrespective of irregularities and may the more readily "roll" when being lifted, curtain fashion, from a closed to an open position. When being lowered from an open to a closed position, each suceeding section is free to engage its respective seat portion with an effective sealing juncture independently of its adjacent sections.

Furthermore, the packing or sealing means closes the spaces between the sections irrespective of the folding or unfolding relation of the sections with respect to each other.

In a large measure, many of the advantages of my improved gate are due to the fact that the sections are articulated on one side of the gate and the sealing means is disposed on the opposite side. Advantages also arise from the fact that the gate has its abutment beams or elements on that side opposite to the side on which the hinges are disposed.

It is believed that the advantages and utility of my invention will be clearly understood from the foregoing description and while I have herein shown and described one specific form of my invention, I do not wish to be limited thereto except for such limitations as the claims may import.

I claim:—

1. A hydraulic gate comprising a plurality of articulated sections in normally spaced relation to each other, and packing means disposed exteriorly of said sections and closing the spaces between said sections irrespective of the folding or un-folding or other relation of said sections with respect to each other.

2. A hydraulic gate comprising a plurality of articulated sections in normally spaced relation to each other, a packing means on the pressure side of said sections for closing the spaces between said sections irrespective of the folding or un-folding or other relation of said sections with respect to each other.

3. A hydraulic gate comprising a plurality of articulated sections, and flexible seals at the junctures of said sections, each seal being mounted on one section and overlapping the next adjacent section across the juncture between such sections.

4. A hydraulic gate comprising a plurality of horizontally disposed plate sections with the lengthwise edge margins in spaced relation, and strip seals secured to certain of said sections and operlapping adjacent sections across the intervening space therebetween.

5. A hydraulic gate comprising a plurality of articulated sections in edge spaced relation, and flexible flap seals secured to alternate sections and overlapping sections adjacent to those carrying the seals to close the intervening spaces between said sections irrespective of the position of said sections with respect to each other.

6. A hydraulic curtain gate composed of a plurality of articulated sections in normally spaced relation to each other, and water sealing means extending continuously throughout the length of said spaces exposed to leakage.

7. A hydraulic gate composed of a plurality of articulated sections in spaced relation to each other, flexible sealing devices closing the spaces between said sections, and means for shifting said sections one at a time.

8. A hydraulic curtain gate composed of a plurality of gate sections, said sections being hinged together with the hinges on one side of said gate, and abutment beams mounted on that side of said gate opposite to that side on which said hinges are disposed.

9. A hydraulic curtain gate composed of a plurality of gate sections, said sections being hinged together with the hinges on one side of said gate, and an abutment beam mounted on each section opposite the side on which said hinges are mounted and said abutments being disposed between the hinged edges of said sections.

10. A hydraulic curtain gate composed of a plurality of gate sections, said sections being hinged together, and abutment beams mounted on said sections and being free from engagement with each other when said gate is in an extended position.

11. A hydraulic gate composed of a plu-

rality of gate sections hinged to each other to form a curtain gate, and I-beams secured to said sections and projecting therefrom and the free projecting portions of said beams forming coacting abutments to limit the diameter of "roll" of the curtain when being elevated.

12. A hydraulic curtain gate composed of a plurality of gate sections each extending throughout the width of the gate and being hingedly connected, and an abutment beam secured to each section and extending substantially throughout the width of the gate.

13. A hydraulic curtain gate structure, comprising in combination, slidable means connected with the normally upper edge of the gate to support the latter below the water line and in a downwardly extended position to close the sluice, and mechanism connected with the normally lower edge of said gate for either elevating said gate above said means to open the sluice or bodily elevating said gate and means entirely above the water line.

14. In combination, a curtain gate for closing a sluice, a guide having a limiting stop, a gate block hanger slidably mounted on said guide and engaging said stop to pendently support said gate from its normally upper edge, and mechanism connected with the normally lower edge of said gate for either elevating said gate above the hanger to open said sluice or bodily elevating said gate and dragging said hanger to dispose the gate at an extreme elevation upwardly along said guide.

15. A hydraulic gate structure for a sluice way provided with gate seat portions, a gate composed of hinged plate sections in spaced relation and having ends for engagement against the seat portions to close the sluice way, sealing strips closing the spaces between said sections and extending beyond the ends of said sections, and sealing elements secured to the projecting ends of said strips and engaging said seat portions and the end edges of the sections abreast of said spaces to seal the latter along the side edges of said gate.

16. A hydraulic gate structure for a sluice way provided with gate seat portions, a gate composed of hinged plate sections in spaced relation and having their ends adapted for engagement against the seat portions to close the sluice way, and means for sealing the spaces between said sections at the ends of the latter adjacent the seat portions.

17. A hydraulic sluice structure gate for a sluice way provided with gate seat portions, a gate composed of hinged sections in spaced relation and having their ends adapted to engage the seat portions in closing the sluice way, means closing said spaces along one side of said gate, and means sealing said spaces at the side edges of said gate.

18. A hydraulic gate structure for a sluice way provided with gate seat portions, a gate composed of hinged sections in spaced relation and having their ends adapted to engage side seat portions and its top adapted to engage a top seat portion, and packing devices actuated by fluid pressure for sealing said spaces between said sections and co-acting with a seat portion for sealing said gate abreast of its top and side edges.

In testimony, that I claim the foregoing as my own, I hereby affix my signature.

LOUIS J. POSPISIL.