

- [54] **AUTOMATIC WATER GATE CONSTRUCTION**
- [75] Inventor: **Jacques L. Dubouchet**, Larchmont, N.Y.
- [73] Assignee: **Societe Generale De Constructions Electriques Et Mechaniques (ALSTHOM)**, Grenoble, France
- [22] Filed: **Apr. 1, 1971**
- [21] Appl. No.: **130,419**

[30] **Foreign Application Priority Data**
 Apr. 3, 1970 France 7012267

- [52] U.S. Cl. 61/25
- [51] Int. Cl. E02b 7/42
- [58] Field of Search 61/22 R, 24, 25, 61/29

- [56] **References Cited**
UNITED STATES PATENTS
- 2,667,748 2/1954 Heath 61/25
 - 2,705,871 4/1955 Kenigsberg 61/25

2,776,541	1/1957	Fortes	61/25
3,066,490	12/1962	Dubouchet	61/25

FOREIGN PATENTS OR APPLICATIONS

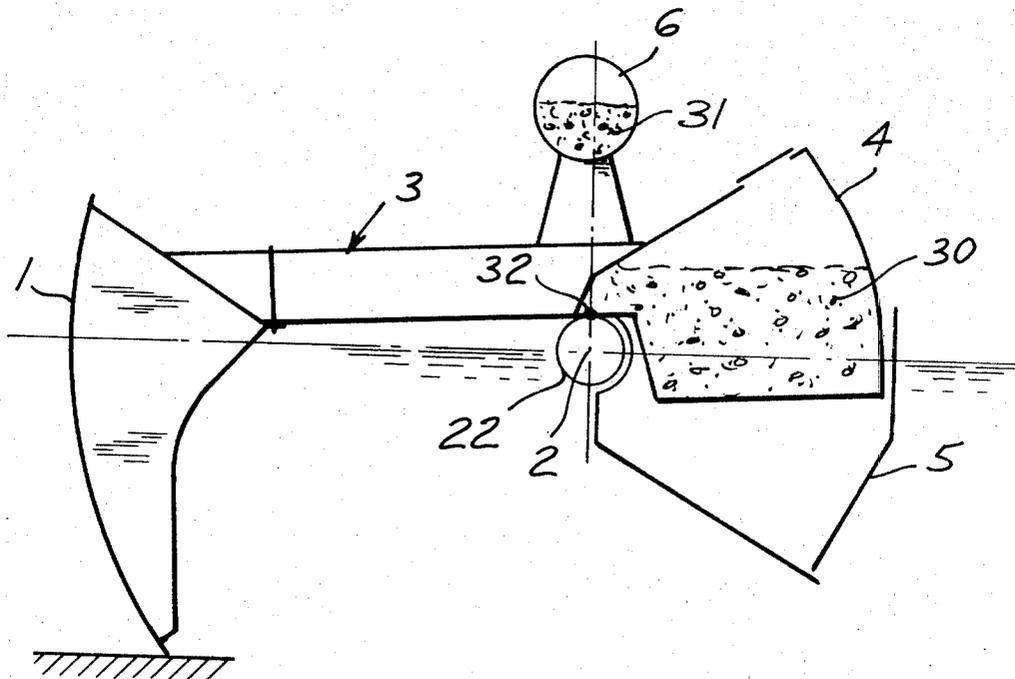
460,719	12/1950	Italy	61/25
---------	---------	-------------	-------

Primary Examiner—David J. Williamowsky
Assistant Examiner—David H. Corbin
Attorney—Liddy, Sullivan, Hart, Daniels & Baxley

[57] **ABSTRACT**

The gate pivot is formed by a rotatably mounted tubular beam on which the frame is mounted by means of bearing members which are provided on the frame and engage peripheral surface portions of the tubular beam spaced apart at a sufficient angle, and which members are locked in such engagement by bolts that are secured to the frame and extend therefrom and into securement with the tubular beam along lines located between radial lines through such surface portions. A tank for the sector float of the gate is supported at one end by the walls of the water course and at its other end by rollers engaging the peripheral surface of the tubular beam.

11 Claims, 4 Drawing Figures



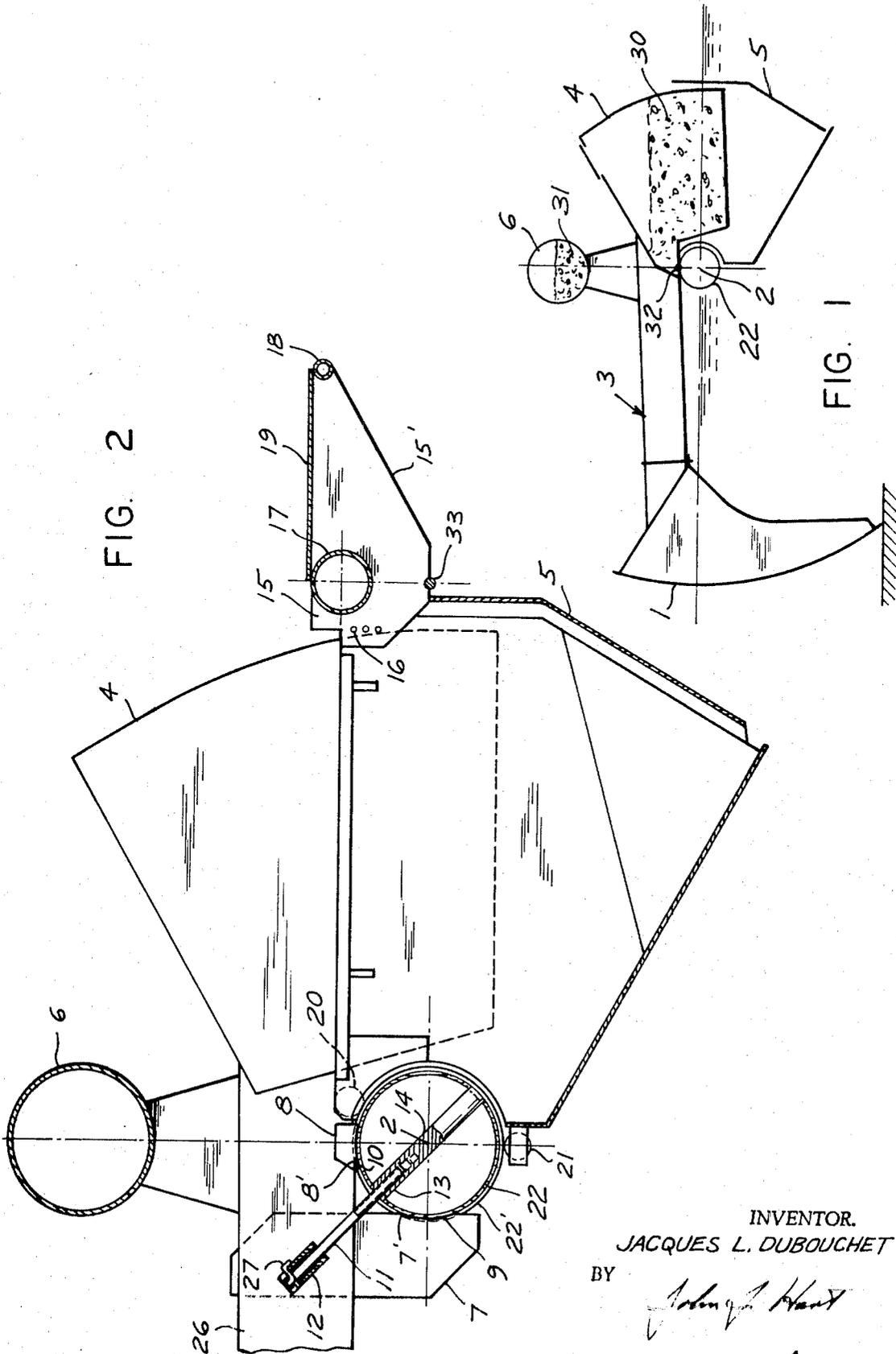


FIG. 2

FIG. 1

INVENTOR.
 JACQUES L. DUBOUCHET
 BY *John J. Hunt*
 ATTORNEY

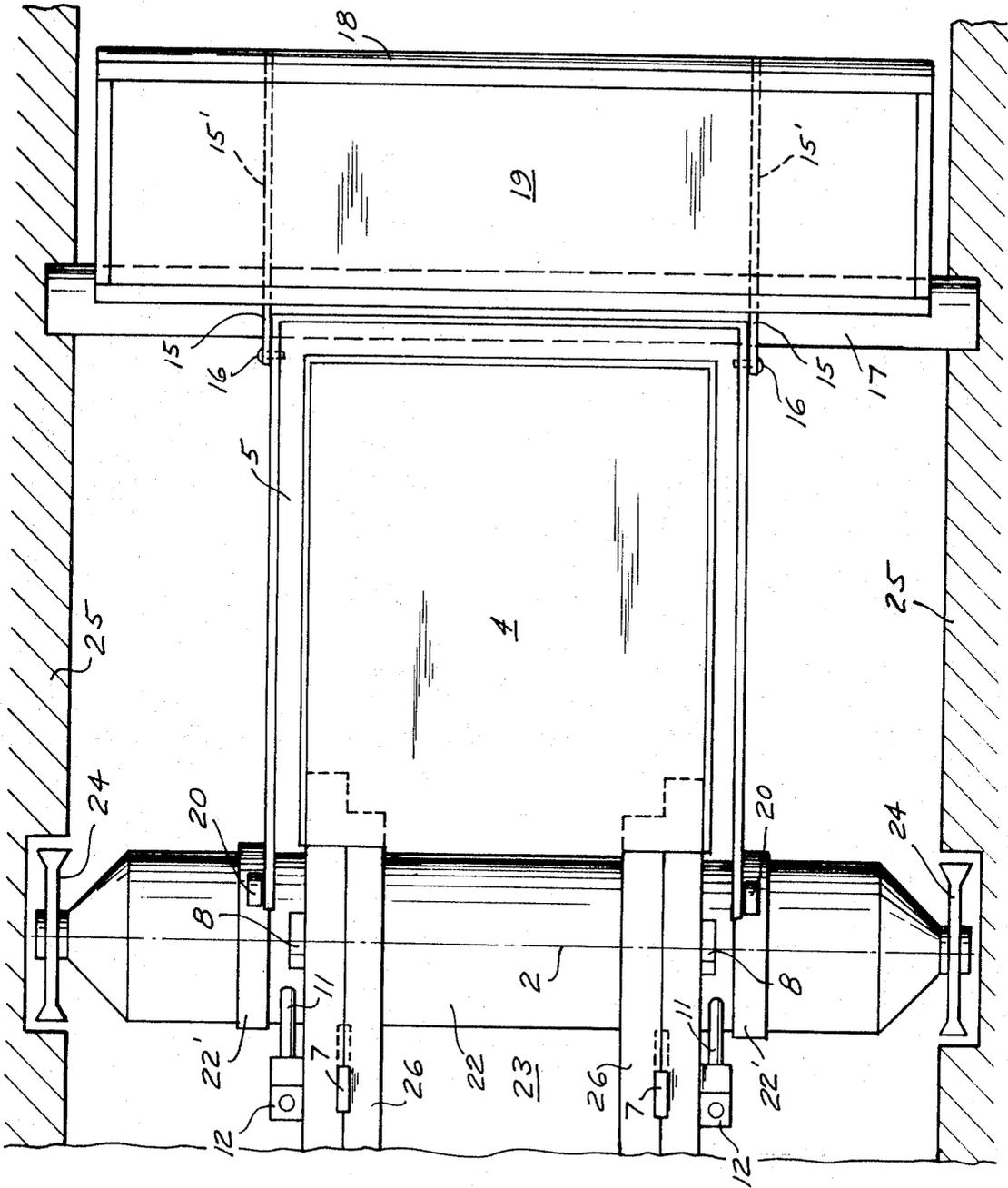


FIG. 3

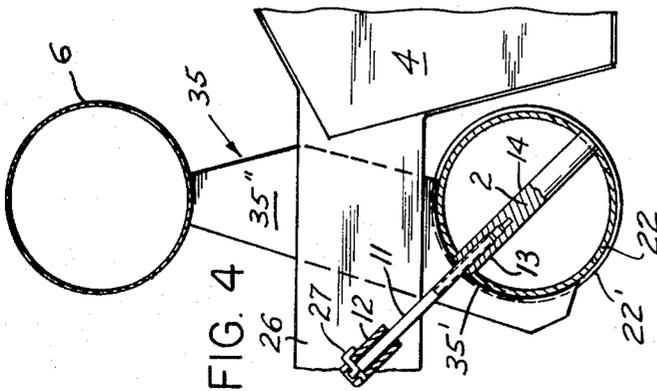


FIG. 4

INVENTOR.
JACQUES L. DUBOUCHET

BY

John J. Hart

ATTORNEY

AUTOMATIC WATER GATE CONSTRUCTION

THE INVENTION

This invention relates to gates for automatically controlling the flow of water in canals, streams, etc., and more particularly to an improved frame construction for the sector type of such automatic gates.

Automatic gates of the sector type with which this invention is concerned are usually constituted of an upstream, arcuately-shaped gate apron centered on the axis of rotation of the gate, a downstream sector-shaped, gate float centered on the same axis, a frame connecting the gate apron and the float, and ballasting means for balancing the gate to effect its automatic operation. In order that this type of gate may function correctly in its automatic operations, it is necessary that certain of its parts be centered on the axis of rotation of the gate within relatively close tolerances. As the assembly of such parts in order to accomplish this result can best be done at the factory and not in the field, this type of gate is usually made as a unit with the frame and float welded to a transverse beam, the longitudinal axis of which is coincidental with the axis of rotation of the unit, and with the gate apron and at least one ballast container welded to the frame. It will be apparent however, that such a unitary gate, especially those which are of large construction, presents many problems during their transportation and in handling.

It is the primary purpose of this invention to provide a gate construction which can be shipped in disassembled condition, and which can readily be assembled to provide a completely rigid gate construction that will perform satisfactorily the automatic operations for which it was made.

In accordance with the invention, the aforesaid purpose is essentially accomplished by making the gate pivot of a tubular beam, providing the frame arms of the gate with protruding parts which bear on portions of such tubular beam spaced apart at a sufficient angle, and locking such parts to the tubular beam by bolts which extend from the frame arms into the tubular beam along lines located between radial lines through such surface portions.

In accordance with another feature of the invention, a tank for the sector float is supported at one end by the walls of the water course and at its other end by rollers carried thereby and arranged to travel transversely of the length of and on the peripheral surface of the tubular beam.

Other features of the invention, as well as the advantages thereof, will appear from the following description when read in connection with the accompanying drawings which show by way of example the invention embodied in a sector type automatic gate constructed to maintain a constant water level downstream of the gate, and in which

FIG. 1 is a schematic, side elevational view of the gate;

FIG. 2 is a partial, vertical sectional view of an enlarged scale illustrating the method of assembling the frame and the sector float tank on the tubular pivotal beam;

FIG. 3 is a top plan view of the apparatus shown in FIG. 2 with the balancing container omitted for the sake of clearness; and

FIG. 4 is a partial, side elevational view of a modified method of assembling the frame on the tubular beam.

As is shown in FIG. 1 of the drawings, the automatic gate includes a frame 3 which extends upstream from the gate pivotal axis 2 and on the outer upstream end of which is mounted a sector-shaped apron 1 radially disposed to the pivotal axis 2. The gate unit further includes a hollow sector float 4 which is also centered for pivotal movement about the axis 2 and which moves in a tank 5 that is in communication with the downstream reach of the canal. The float 4 also functions as a ballasting container for ballast material 30 which is loaded therein when the gate is in its closed position as is shown in FIG. 1 of the drawings. Sufficient of the ballast 30 is added until the gate is just on balance in its closed condition. The gate is then balanced in its open position by loading ballast 31 in a container 6 which is mounted on the frame 3 so that it is located vertically above the pivoted axis 2 when the gate is in its closed position as in FIG. 1. As a result of such balanced condition of the gate, when the level of the water in the downstream reach falls below the level of the pivotal axis 2, the gate will immediately and automatically open to permit a larger discharge of water into the downstream reach until the water in the latter is restored to the level of the pivotal axis 2, whereupon the gate will move to return the apron 1 to closer position.

The pivotal axis 2 of the gate is coincidental with the longitudinal axis of a tubular beam 22 which extends transversely across the canal 23, in FIG. 3, and is rotatably supported at its ends by bearings 24, 24 mounted in the side walls 25, 25 of the canal. The frame 3 mounted on the tubular beam 22 for pivotal movement about its longitudinal axis 2, is constituted of two arms 26, 26 which at their downstream ends rest on the beam 22. Each frame arm 26 is composed of two U-shaped beams welded together to form a hollow rectangularly-shaped arm and is separately connected to the beam 22. The arm connecting means comprises a plate 8 that is welded to the outer side wall of the hollow arm so that its lower edge rests on a surface portion 10 of the beam located vertically above the pivotal axis 2 when the gate is in its closed position as in FIGS. 1 and 2. The bearing plate 8 protrudes below the surface of the frame arm 26 and its lower edge 8' is arcuately-shaped to rest on the peripheral surface of the tubular beam 22. Also fixedly secured to each frame arm 26, as by securing it between the welded flange edges of the U-shaped beams forming such frame arm, is a second bearing plate 7 which depends downwardly from such arm and is provided with an arcuately-shaped downstream edge portion 7' that bears against a beam surface portion 9 disposed upstream of the pivotal axis 2 and at an angle of approximately 90° to the beam surface portion 10. Thus, the plate 7 in addition to serving as a means for securing the frame arm to the beam 22, cooperates with the latter to bear the thrust of the hydraulic forces exerted on the apron 1 and transmitted along the beam 26. It may be noted at this time that at the two surface portions 10 of the beam 22 engaged by the bearing plates 8 will be subjected to lines of force which are predominately of the weight of the frame, whereas the two surface portions 9 of the beam 22 engaged by the bearing plates 7 will be subjected to lines of force which are predominately of the hydraulic thrust on the apron. The angle between the two surface portions 9 and 10 should preferably be sufficient to cover all of the angular travel of the resultant of the thrust exerted by the weight of the gate on the tubular

beam and of the variable hydraulic thrust that is exerted on the apron of the gate and transmitted through the frame 3 to the tubular beam 22.

The tubular beam 22 is locked in the aforesaid relation with the bearing plates 7 and 8 of each frame arm 26, by a threaded bolt 11 whose head end extends through an apertured block or socket member 12 permanently fixed to each frame arm. The threaded end 13 of the bolt 11 is threadedly engaged with a female thread provided in one end of an elongated rod-like nut 14 diametrically arranged within the tubular beam 22 and secured at its ends to diametrically opposed portions of the beam wall. When the bolt 11 is tightly screwed into the threaded end of the fixed nut member 14, it is locked in such position by a flanged lock member 27 in FIG. 2. It will be observed also from FIG. 2 of the drawings, that the opening in the socket member 12 for the bolt 11 is fixed so that its centerline is between the radial lines through the surface portions 9 and 10 of the beam 22 that indicate the two variable component lines of force exerted on the tubular beam by the weight of the gate and the variable hydraulic thrust on the apron. This direction of the bolt may coincide with a line which bisects a bearing angle of 90° as shown in FIG. 2 of the drawings, but it may be positioned at a different angle with respect to such lines of force. In any event, the direction of the bolt should be within the angle formed by the two bearing surfaces 7' and 8' and such as to maintain the bearing plates 7 and 8 firmly seated on the periphery of the beam 22 particularly in the absence of hydraulic thrust. Thus, in the locked, coupled condition of the beam 22 and the plates 7 and 8, the bolt 11 and the nut member 14 will provide a completely rigid assembly of the frame arms and tubular beam that will not be modified during the automatic operations of the gate even under extreme conditions and until it is positively dismantled for purposes of repair, or the like.

As is indicated in FIGS. 1 and 3 of the drawings, the sector float 4 is permanently connected to the downstream ends of the frame arms 26 in any suitable fashion as by welding. The tank 5 in which the float moves, is fixedly secured as its downstream end to the side walls 25,25 of the canal 23 by a unit which is essentially constituted of a transverse beam 17 whose ends may be permanently connected to such canal side walls in any suitable fashion as by sealing them in the concrete material forming such walls, and two parallelly arranged bracket members 15,15 that are permanently secured in spaced relation to the transverse beam 17. In the unit illustrated, the beam 17 is a tubular beam and the bracket members 15,15 form the upstream projecting ends of two plates 15',15'. The illustrated unit further comprises a tubular transverse beam 18, which is supported by the cantilevered ends of plates 15',15', and a cross tension bar 33. Mounted on the upper edges of the plates 15',15' and extending in a longitudinal direction from beam 17 to beam 18 is a platform 19 which extends transversely from one canal side wall to the other so as to afford a service platform for the caretakers of the gate. The tank 5, at its upstream end, is provided with two transversely spaced pairs of rollers, each pair comprising an upper roller 20 and a lower roller 21. The rollers 20,20 of each pair bear on a track 22' formed on the tubular pivot beam 22. It will thus be seen that the tank 5 is fixed at its downstream end with relation to the canal walls, and is supported at its up-

stream end by the beam 22, the pairs of rollers 20 and 21 enabling the gate to pivot freely in its operations with relation to the fixed tank 5. During such displacements of the gate each pair of rollers travels on the peripheral surface of its associated band 22'. The peripheral surfaces of the bands 22', 22' are machined to provide smooth tracks for the rollers 20 and 21.

In the modified form of construction illustrated in FIGS. 4 of the drawings, each pair of bearing plates 7 and 8 associated with each frame arm 26' have been constructed as a single plate 35 provided with one arcuately-shaped edge 35' which extends throughout the range of movement of the resultant of the weight and hydraulic thrusts exerted on the tubular beam 22. Thus, such forces will be distributed over greater areas of the peripheral surface of such beam than when using separate bearing plates 7 and 8. The bearing plates 35 may be secured to the frame arms 26' in the manner of the bearing plates 7 and preferably are provided with upwardly extending extensions 35'' which forms supports for the ballast container 56. In all other respects the construction of FIG. 4 is similar to that shown in FIGS. 1-3 and the gate is secured to the tubular beam 22 by bolts 11 and nuts 14 in the manner described in the discussion of the construction of FIGS. 1-3.

It will be apparent to those skilled in the art that other changes may be made in the constructions disclosed herein without departing from the spirit of the invention, or the scope of the appended claims in which the terms "vertically", "upstream" and "downstream" when applied to the pivotal shaft refer to such shaft locations in the closed condition of the gate.

What is claimed is:

1. A water gate comprising a frame, means for supporting said frame for pivotal movement about a fixed axis, a sector-shaped gate apron mounted on the upstream end of said frame, and a sector float mounted on said frame and disposed downstream of said pivotal axis and rotatable about the same, said supporting means comprising a beam extending transversely of said frame, and means rotatably supporting said beam, and means detachably securing said frame to said beam including seating means fixed to said frame and seated on one portion of the exterior surface of said beam subjected to a line of force that is predominately of the weight of the frame and seated on another portion of said surface subjected to a line of force that is predominately of the hydraulic thrust on the apron, the force acting on the beam through said seating means due to the weight of the frame acting on a line which extends vertically from the pivotal axis, with the hydraulic thrust force acting therethrough acting on a line passing through the pivotal axis and positioned 90° from the vertical on the upstream side of the beam, first connecting means secured to said beam, and second connecting means including a member detachably connected to said frame and connected to said first connecting means, said first and second connecting means being constructed and arranged to press said seating means on the exterior surface of said beam and maintain the same seated thereon and to exert an anchoring force securing said frame to said beam and acting along a line extending through the pivotal axis of the beam and dividing the angle formed by said two force lines of predominant weight and hydraulic thrust.

2. A water gate as defined in claim 1, in which said beam is a tubular beam, and in which said seating

5

means is provided with arcuately-shaped seating portions engageable with the peripheral surface of said tubular beam.

3. A water gate as defined in claim 1, in which said seating means protrude from said frame into seating relation on the exterior surface of said beam, and in which said one beam surface portion is located vertically above the pivotal axis of the beam, said other beam surface portion is located on the upstream side of said beam, and the angle formed by said lines of predominant weight and hydraulic thrust being at least approximately 90°.

4. A water gate as defined in claim 1, in which said seating means is constituted of a first member secured to said frame and seated on said beam on a surface portion thereof located vertically above the pivotal axis of the beam, and of a second member secured to said frame and seated on said beam on a surface portion thereof located on the upstream side of said beam.

5. A water gate as defined in claim 1, in which said seating means is constituted of a single member having a beam seating surface extending from said one beam surface portion of said other beam surface portion.

6. A water gate as defined in claim 2, in which said first connecting means is an elongated nut extending diametrically within said tubular beam and secured at its ends to diametrically opposed wall portions of such beam, in which said second connecting means is a bolt having a threaded end screwed into said nut, and including a projection on said frame having an opening through which said bolt extends.

7. A water gate comprising a frame, a cylindrically-shaped shaft supporting said frame, means securing said frame to said shaft, means rotatably supporting said shaft, a sector-shaped gate apron mounted on the upstream end of said frame, a sector float mounted on

6

said frame and disposed downstream of said shaft and rotatable about the pivotal axis of said shaft, a stationary tank containing said float and communicating with the downstream reach of the water course in which the water gate is mounted, means for fixedly securing the downstream end of said tank to the side walls of the downstream reach, and tank supporting means fixed to said tank and engaging the peripheral surface of said shaft, said tank supporting means providing a rotatable connection between said tank and said shaft and supporting the upstream end of said tank on the exterior surface of said shaft while permitting rotatable movement of said shaft surface relative to said tank.

8. A water gate as defined in claim 7, in which said upstream tank supporting means comprises a roller bearing on the exterior surface of said shaft above the axial center thereof and a roller bearing on the exterior surface of said shaft below the axial center thereof, said rollers traversing said exterior surface during the pivotal movements of the gate.

9. A water gate as defined in claim 8, in which said shaft is provided with a smooth track on which said rollers move during the pivotal movements of the gate.

10. A water gate as defined in claim 7, in which said downstream tank supporting means is a unit constituted of a transverse member spanning the water course and secured at its ends to the walls of the downstream reach, and a pair of spaced parallelly arranged plates secured to said transverse member and having upstream ends projecting beyond the transverse member, and means securing the upstream ends of the plates of said unit to the side walls of said tank.

11. A water gate as defined in claim 10, including a platform mounted on said unit and spanning the water course.

* * * * *

40

45

50

55

60

65

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,739,585 Dated June 19, 1973

Inventor(s) Jacques L. Dubouchet

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 59, the word "of" should be --on--.

Col. 3, line 5, the word "an" should be --and--.

Col. 4, line 21, the number "56" should be --6--;

Col. 4, line 66 (Claim 2) the word "gas" should be
--gate--; and

Col. 5, line 23 (Claim 5) the word "of" should be
--to--.

Signed and sealed this 27th day of November 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents