The control gate herein embodies a sector float immersed in a container which is in communication with the tailrace through an opening formed between the lower end of the downstream wall of the container and its base which projects downstream beyond such opening to shelter the latter from the tailrace current.
AUTOMATIC CONSTANT DOWNSTREAM LEVEL GATE

This invention relates to gates for automatically controlling the flow of water in canals, streams, etc., and more particularly to control gates designed to maintain automatically a constant water level downstream therefrom.

Gates of the type with which this invention is concerned are usually of unit construction and mounted for pivotal movement on a pivot axis. A common pivot unit is provided with an upstream gate apron centered on its main pivot, and a downstream float for controlling the operations of the gate in maintaining the downstream water level.

The primary purpose of the instant invention is to provide an improved means for dampening the oscillations of the gate during the latter operation and for sheltering the downstream float thereof from the effects of the tailrace and from foreign bodies carried by the tailrace.

Other objects of the invention, as well as the features and advantages thereof will appear from a consideration of the following description read in connection with the accompanying drawings in which

FIG. 1 is a schematic view of an automatic constant downstream level gate having its downstream float encased in a container embodying the invention; and

FIG. 2 is a partial view of the bottom end of the container on an enlarged scale.

The automatic gate unit, which is shown in its fully opened position in FIG. 1 of the drawings, comprises a frame arm 3 which extends upstream from a fulcrum 2 about which the whole of the gate pivots and on the outer upstream end of which is mounted a sector-shaped apron 1 radially disposed to the pivot axis 2. The unit also includes a hollow sector float 4 which is centered on the pivotal axis 2 so as to be in opposing torque to the apron 1.

As indicated in FIG. 1, the gate is mounted in a canal 12 so that the apron 1 coacts with a sill 11 formed in such canal to control the flow of water so that there is maintained in the tailrace 13 downstream of the gate a constant level N which is the elevation of the main pivot 2 of the gate. The gate is balanced by a weight 7 adjustabley positioned on a post 8 carried by the frame arm 3 so that when the downstream water level N is at the elevation of the gate pivotal axis 2 and the gate is completely closed, the torque generated by the hydraulic thrust on the float 4 will balance the torque generated by the weight of the gate. So long as the condition is maintained the gate will remain closed.

When, however, the downstream water level N of the tailrace falls, the gate will automatically, immediately open to permit a larger discharge therethrough sufficient to restore the water level of the tailrace to the level N.

In order to dampen the oscillations of the gate during its operation and to isolate the float 4 from disturbances in the surface of the tailrace 13 at the level N, the float 4 is immersed in a fixed container 5 which projects above the tailrace level N and which is carefully matched in configuration to that of the float so that the chamber defined thereby is only slightly greater in volume than the volume displaced by the float. The container 5 is provided with a transverse slot or opening 6 affording communication between the bottom of the chamber therein and the tailrace so that the water can flow into the container chamber and be discharged therefrom during the oscillating movements of the float 4 in the operations of the gate. It will be noted in the drawings that the opening 6 is formed by a space between the lower end of the downstream wall of the container and the base or bottom wall 9 of such container. The base 9 of the container 5 has an extension 10 projecting downstream beyond the opening 6 in downwardly inclined relation to the current flow. This extension 10 shelters the slot 6 from the current F produced by the apron 1 and the sill 11. This result is accomplished because the downwardly inclined extension 10 creates in the tailrace a zone 15 of relative negative pressure in front of the opening 6. This depressurizing of the zone 15 in front of the opening which may be termed a "suction effect," causes the level N' in the float container or tank 5 to be slightly lower than the level N of the tailrace, improves the dampening of the float 4 by the container 5, and improves the stability of the gate for equal effective adjustments of the decrement of the gage (the term "decrement" being here used to designate that variation in the downstream or tailrace level which causes the gate to move over the full range of travel for which it was designed and adjusted). The thus created depressurized zone has been found to provide a further advantage in that it prevents the movement of foreign bodies that may be carried along by the current through the opening 6 and consequentlly the entry of such bodies into the container 5.

1. An automatic control gate for maintaining a constant downstream water level comprising a frame, means on said frame for mounting said gate for pivotal movement about an axis located at the level at which such water level is to be maintained, a sector-shaped gate apron radially disposed to said pivotal means mounted on the upstream end of said frame, a sector float on said frame centered on said pivotal means and extending downstream therefrom, and a container fixed with relation to said sector float and adapted to be submerged in the tailrace water downstream from said pivotal means, said fixed container having an upper open end receiving said sector float and projecting above the downstream water level, said fixed container having a contour substantially matching that of said float, having an opening bringing the interior of said container into communication with the water in said tailrace, and including means associated with said opening to produce a depressurized zone located adjacent it in front of said opening and exteriorly of said container.

2. An automatic control gate as defined in claim 1, in which said opening is formed by a space between the lower end of the downstream wall of said fixed container and the bottom wall thereof, and in which said associated means is constituted of an extension of said bottom wall projecting downstream beyond said opening.