

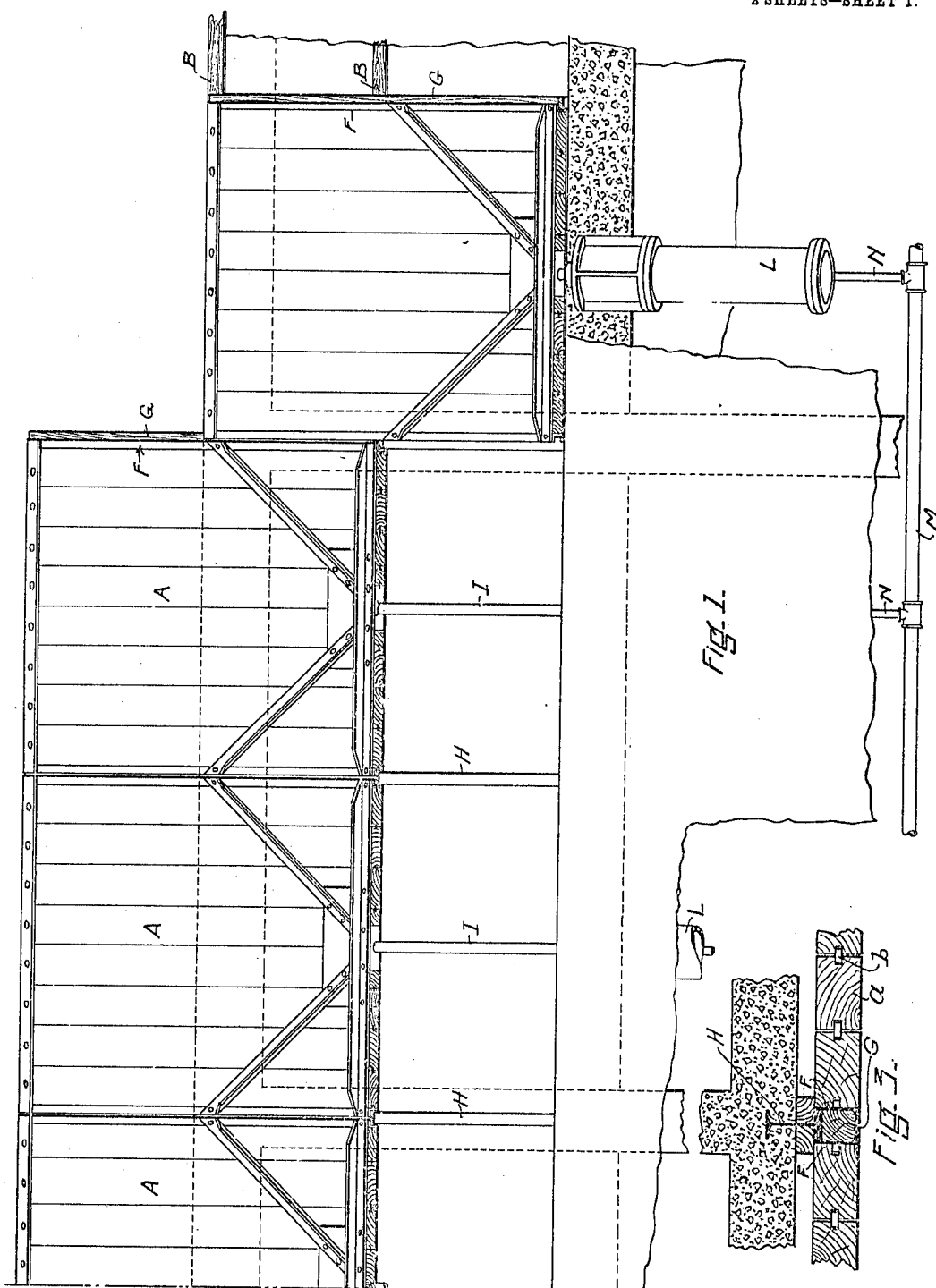
FLASHBOARD.

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954,257.

Patented Apr. 5, 1910.

2 SHEETS—SHEET 1.



WITNESSES:-

L. H. Pezzotti
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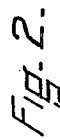
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FLASHBOARD. .

954,257.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

HOWARD L. COBURN, OF BOSTON, MASSACHUSETTS.

FLASHBOARD.

954,257.

Specification of Letters Patent.

Patented Apr. 5, 1910.

Application filed February 25, 1908. Serial No. 417,650.

To all whom it may concern:

Be it known that I, HOWARD L. COBURN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Flashboards, of which the following is a specification.

In the construction of dams for hydraulic power purposes it is nearly always necessary to limit the height of the weir or spillway in order that during flood periods of the river the back water caused by the dam may be kept below certain elevations fixed by the rights of owners of adjoining land or by the tail water level of the development immediately up stream, from the one under construction. Owing to the very great range of flow between low water and high water periods the result of this limitation of the height of the dam in times of normal flow and minimum flow is a considerable loss of head, which might otherwise be available. Frequently in a stream which would just supply water enough to operate the plant and keep the water level in the pond even with the crest of the dam during low water periods, there will be a depth of ten feet or even more over the crest of the dam during flood times and it will be seen that there may be a very great variation in the working head in such a plant. It has therefore been found desirable to provide some means for increasing the height of the weir or spillway during low water periods in order that a portion of this range of head may be utilized. The structure which is thus used to increase the height of the dam is commonly designated by the term "flashboard" or "movable crest."

My invention embodies a form of movable crest, which form is particularly adapted to be used in connection with hollow reinforced concrete dams but may be used in any type of dam construction.

The accompanying drawings illustrate in general the construction and application of this invention.

Figure 1 represents an elevation of a portion of crest of the dam with flashboards in place thereon, this elevation being taken looking down stream and showing the water bearing side of the structure. Fig. 2 represents a cross section of the crest of a reinforced concrete spillway with the flashboard applied thereto. Fig. 3 represents a sectional view showing the joint between two adjacent sections of this flashboard.

This flashboard or movable crest consists in general of a series of inverted rectangular gates A resting against the upstream face of the dam and projecting above the crest for approximately one-half their height. These gates bear against sills B B making watertight connection therewith. It will be readily understood that the pressure of the water on the upstream face of this flashboard will hold the same in position against turning over as the pressure against the lower half is much in excess of that in the upper half, owing to the difference in hydrostatic head on the centers of pressures of the two sections. In order that this self-sustaining capacity may be increased or rendered more positive against any possible leakage and hence an accumulation of pressure in the space C between the sills back of the flashboard, the said space C is vented or drained by means of a pipe D and a three-way cock E to the space below the dam, said pipe D being large enough to readily drain off any possible leakage into the space C.

The adjoining edges of adjacent gates are, as shown in Fig. 3, constructed of two channel irons F with their concave sides toward each other. In the space thus formed is placed a spline G secured to one gate and free to slide in the channel iron in the other gate, thus making a tongue and groove joint. This should be substantially water-tight. As an additional security against over-turning of these gates about the crest of the dam when in their normal position I-beams H are secured in the face of the dam and project into the channels F, the flanges of which at the edges of the gate lock around the flange of the said I-beam, as shown in Fig. 3. The gates, as shown in these drawings, consist of frame work filled with wooden needles *a* connected by splines *b* to allow for shrinkage and swell. This is probably the most desirable form of construction, but obviously the whole gate might be made of metal if desired. The raising and lowering of these flashboards is performed by any suitable means. I have elected to show hydraulic operating mechanism for operating the same substantially as follows. To each independent gate is attached a stem I passing down through a stuffing box J into the interior of the dam. A piston K attached to the lower end of this stem works in its cylinder L secured to the structure of the dam. A pressure main M running through the

dam is connected by feeder pipes N to the several cylinders. These feeder pipes are divided into branch pipes O and O' to the upper and lower ends of the cylinder, respectively, which branch pipes are controlled by valves P and P'. The cylinder is also provided with drain cocks R.

The operation is then as follows: If, with the gate in its normal position, as shown in Fig. 2, it is desired to lower the same so that the upper edge shall be level with the crest of the dam, the lower drain cock R is opened, the valve P' closed and valve P opened, admitting pressure either hydraulic or pneumatic, to the upper end of the cylinder above the piston K. This pressure causes the piston to move downward drawing with it the gate. The operation of raising the gate again is obviously the reverse of this. That is, the lower drain cock is closed, the upper one opened, valve P closed, and valve P' opened, admitting pressure to the lower end of the cylinder, which pressure pushes the piston upward and with it the gate. Obviously a number of these cylinders may be connected with a one-pipe system operated by a single valve is desired.

In order to facilitate the operation of the gates by reducing the effective normal pressure on the upstream face, I have provided a by-pass Q which together with the three-way cock E and drain pipe D performs the desired service. When the three-way cock E is turned into such a position as to admit water through the by-pass Q to space C back of the flashboard, the same pressure is obtained in this space and against the back of the flashboard as exists on the upstream or front face of the same, thus obviously reducing the net pressure on the guides.

I claim:—

1. A dam having a crest variable in height, said variable crest consisting of an inverted gate mounted slidingly on and resting against the upstream face of the dam so as to be projectable above the crest thereof.

2. A dam having a crest variable in height, said variable crest consisting of an inverted gate mounted on the upstream face of the dam with provision for sliding in a generally up and down direction, and subjected to the pressure of the water on the portion below the crest of the dam structure.

3. A dam having guides on a face thereof, and a plurality of gates held between said guides, interlocked at their adjacent edges and each independently movable to project their upper edges above the crest of the dam.

4. A dam, a flashboard adapted to vary the effective height of the dam and consisting of gates movable upon the face of the dam, and guides for the gates consisting of I-beams partially embedded in the material of the dam with part of the web and one pair of flanges projecting from the dam

face wherewith the edges of the gates are engaged and whereby they are guided.

5. In connection with a dam, a flashboard consisting of gates mounted to slide in an up and down direction and arranged on the upstream face of the dam, whereby the hydrostatic pressure is enabled to hold the gates in position and prevent them from overturning above the crest of the dam.

6. A dam and movable gates arranged to be projected above the crest of the dam and to be lowered to the level thereof, said gates being mounted on the upstream face of the dam and limited in movement so that the portion thereof below the crest of the dam is at least as great as that projecting above the crest, whereby a greater hydrostatic pressure due to the difference of head is applied on the lower section of each gate to prevent overturning of the gate about the crest.

7. In connection with a concrete dam, upwardly-movable gates constituting a flashboard, and sills between the face of the dam and the gates against which the latter are pressed by the water back of the dam and caused to make a tight connection.

8. In connection with a concrete dam, upwardly-movable gates constituting a flashboard, and sills between the face of the dam and the gates against which the latter are pressed by the water back of the dam and caused to make a tight connection, said sills being of compressible and elastic material as wood or the like.

9. A dam, upwardly-movable gates arranged on the upstream face of the dam to constitute a flashboard whereby the effective crest of the dam may be elevated, and a vent connected with the space between the gates and the face of the dam to lead away water leaking into such space, whereby back pressure tending to overturn the gate about the crest of the dam is prevented.

10. A dam, upwardly-movable gates arranged on the upstream face of the dam to constitute a flashboard, whereby the effective height of the dam may be increased, a vent leading from that portion of the face of the dam which is covered by the gates, whereby accumulation of water and hence pressure between the dam and gates is prevented, and a by-pass for admitting pressure through said vent to counterbalance the pressure which tends to hold the gates against the dam and allow the latter to be raised or lowered.

11. In connection with a dam, a flashboard adapted to be elevated above the crest of the dam and consisting of a plurality of gates having grooves at their adjacent edges and tongues or splines inserted in the grooves of adjacent gates to make a sliding water-tight connection between them.

12. In connection with a dam, a flash-

board adapted to be elevated above the crest of the dam and consisting of a plurality of gates, channel irons secured to the lateral edges of the gates with the concave side of each turned toward the next adjacent gate, and splines arranged between the gates passing into the channels to provide a water-tight sliding connection between the gates.

13. A dam, I-beams partially embedded in the face of the dam with the flanges on one side of each beam projecting slightly therefrom, gates arranged to rest against the face of the dam, channel irons secured to the lateral edges of the gates, with their flanges engaged inside the flanges of adjacent I-beams, and packing pieces contained within the channels of adjacent gates, whereby a water-tight flashboard consisting of independently-movable sections is provided.

14. In connection with a hollow concrete dam, a flashboard consisting of a series of interlocking sections mounted externally on the water bearing face of the dam and

adapted to be projected above the crest thereof, and mechanism inside the dam structure connected with the flash-board sections for raising and lowering each independently of the others.

15. In connection with a hollow concrete dam, a flashboard consisting of sections mounted externally on one of the faces of the dam and adapted to be projected above the crest thereof, plunger rods engaged with the several sections of the flashboard passing through the structure of the dam, and hydraulic mechanism in the interior of the dam engaged with said plunger rods for reciprocating them to raise and lower the flashboard sections.

In testimony whereof I have affixed my signature, in presence of two witnesses.

HOWARD L. COBURN.

Witnesses:

S. E. ROCKWELL,
N. F. AMBURSEN.