No. 768,717. PATENTED AUG. 30, 1904.

N. F. AMBURSEN & W. L. CHURCH.

SHELL DAM.

APPLICATION FILED JUNE 23, 1904.

NO MODEL.

Fig. 1.

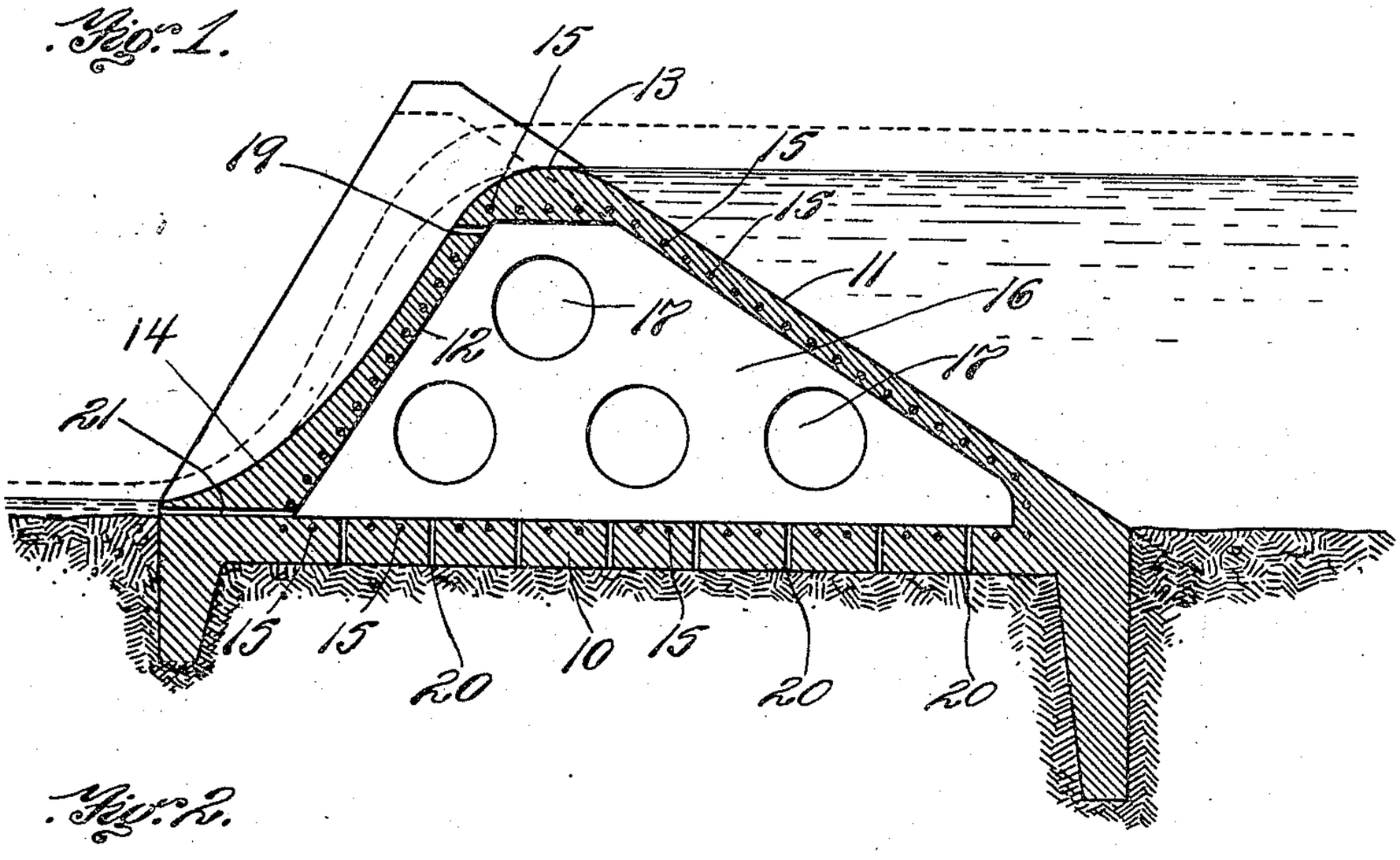
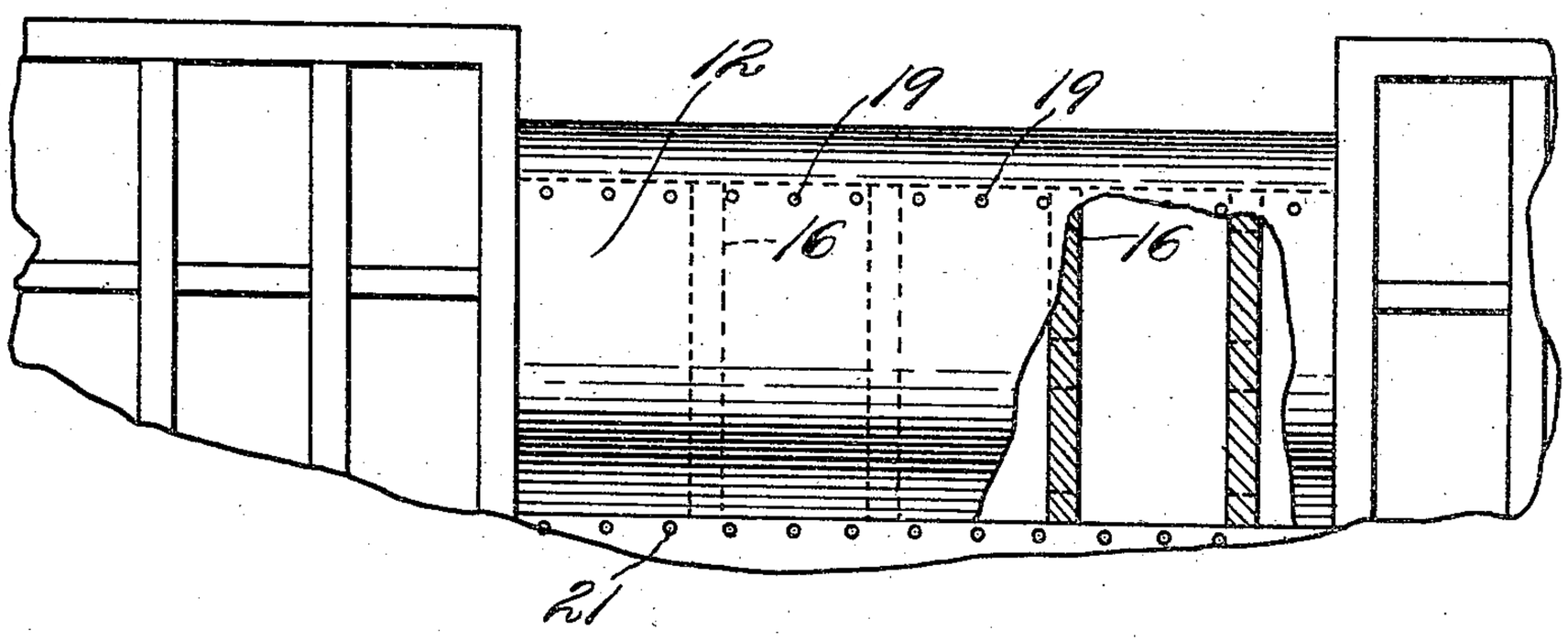


Fig. 2.



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UNITED STATES PATENT OFFICE.

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SHELL-DAM.

SPECIFICATION forming part of Letters Patent No. 768,717, dated August 30, 1904.

Application filed June 23, 1904. Serial No. 213,790. (No model.)

To all whom it may concern:

Be it known that we, NILS F. AMBURSEN, of Watertown, in the county of Jefferson and State of New York, and WILLIAM L. CHURCH, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Shell-Dams, of which the following is a specification.

This invention relates to dams of concrete and metal construction, and particularly to the type of dam described in United States Letters Patent No. 734,796. The dam shown in that patent makes no provision for guiding the water as it flows from the crest of the dam on the downstream side, and as a free fall of the water is objectionable with certain kinds of foundations of moderate hardness on account of its effect on the foundations and for other reasons it is desirable to provide means for suitably guiding the water and delivering it parallel to the bed of the stream. This is accomplished, according to our present invention, by means of a sloping downstream wall or apron, which has an additional effect of aiding in the support of the upstream wall, thus increasing the strength of the dam.

A further improvement consists in the provision of novel means for admitting air to the rear side of the sheet of water falling from the dam-crest, and thus avoiding the formation of a vacuum which would tend to increase the unbalanced atmospheric pressure upon the exterior of the hollow dam and also cause trembling of the sheet of water, tending to set up an injurious vibration in the dam.

Further features of the invention consist in novel means for relieving upward static pressure on the bottom of the dam and draining off the water which flows into the interior from the apertures provided for such purpose and also in novel means for strengthening the crest and lower part of the apron in a dam of the described character.

Of the accompanying drawings, Figure 1 represents a vertical section of a dam constructed according to our invention. Fig. 2 represents a front elevation thereof.

In the drawings, 10 is the floor or bottom wall of the dam, and 11 is the upstream wall thereof sloped at such an angle as to bring the lines of pressure of the water on said wall mainly within the base 10 of the dam, which is substantially equal in length to said upstream wall, as more fully described in the aforesaid patent, No. 734,796.

12 is a downstream wall or apron having a slope opposite to that of the upstream wall 11 and also a suitable curvature convex at the upper end of the apron and concave at the lower end, said slope and curvature being such as to conform substantially to the average natural slope or flow of the stream from the crest of the dam and properly guide said stream and direct it with minimum friction and disturbance into the tail-race. It will be noted that the crest portion 13 at the junction of the upstream and downstream walls 11 12 is made of a thickness greater than the average thickness of said walls, whereby to give added strength and resistance to wear and impact and also a more stable union of the materials of said walls at their point of junction, where the strains are more or less opposed and different in character. At the junction-point 14 of the downstream wall 12 with the floor there is a similar portion of increased thickness.

The walls of the dam are made of concrete or equivalent material strengthened, reinforced, and locked together by means of self-locking bars 15 15 of any of the well-known types embedded therein, the projections or other locking features of said bars being firmly embedded in and interlocked with the concrete. A number of these bars are shown extending longitudinally of the dam or crosswise of the stream-flow and located nearest the inner surfaces of the walls at uniform distances from said surfaces, so as to form truss-chords properly disposed to withstand the bending and other strains imposed upon the walls. The three walls are integrally united, as seen. They are further connected by vertical buttresses 16 at suitable intervals, said buttresses preferably formed, as shown, with apertures 17 to save material.

At 19 in the downstream wall 12 are formed

a series of apertures whose object is to admit air to the rear of the sheet of water flowing over said apron and destroy or minimize any vacuum which may tend to form behind said sheet, particularly when the latter stands away from said apron during a flood. In this way we overcome trembling of the sheet of water and the injurious vibration incident thereto.

For overcoming any upward static pressure of the water upon the bottom floor 10 this floor is formed at frequent intervals with through-apertures 20 20, giving a drainage-inlet to the interior of the dam, and the downstream wall 12 is formed at its lower end with outlet-apertures 21 to take off this drainage. We do not herein claim as a separate feature the means 20 20, as said means is claimed in a copending application, Serial No. 202,158, filed by W. L. Church.

It will be understood that various modifications may made without departing from the spirit of our invention.

We claim—

1. A hollow concrete dam having an upstream wall so inclined that the lines of pressure thereon fall mainly within the base of the dam, a downstream wall sloped to substantially conform with the natural fall of water thereover, and a floor, all integrally connected together.

2. A concrete dam having oppositely-sloping upstream and downstream walls and a hollow interior, said downstream wall being apertured below the crest of the dam to admit air to the rear of the overflow.

3. A hollow concrete dam having oppositely-sloping upstream and downstream walls and a floor, the latter provided with a drainage-inlet from the bottom face of the dam to the hollow interior, said downstream wall provided with a drainage-outlet in its lower portion.

4. A hollow concrete dam having oppositely-sloping upstream and downstream walls and a crest portion at the junction of said walls whose thickness exceeds the average thickness of said walls, and self-locking bars embedded in said walls and crest portion at a substantially uniform distance from the inner faces thereof and extending in a cross-stream direction.

5. A hollow concrete dam comprising oppositely-sloping upstream and downstream walls and a floor, all integrally connected together, said down-stream wall increasing in thickness immediately above its junction with the floor and having a curved concave outer surface, and self-locking bars embedded in said thickened portion.

In testimony whereof we have affixed our signatures in presence of two witnesses.

NILS F. AMBURSEN.
WILLIAM L. CHURCH.

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