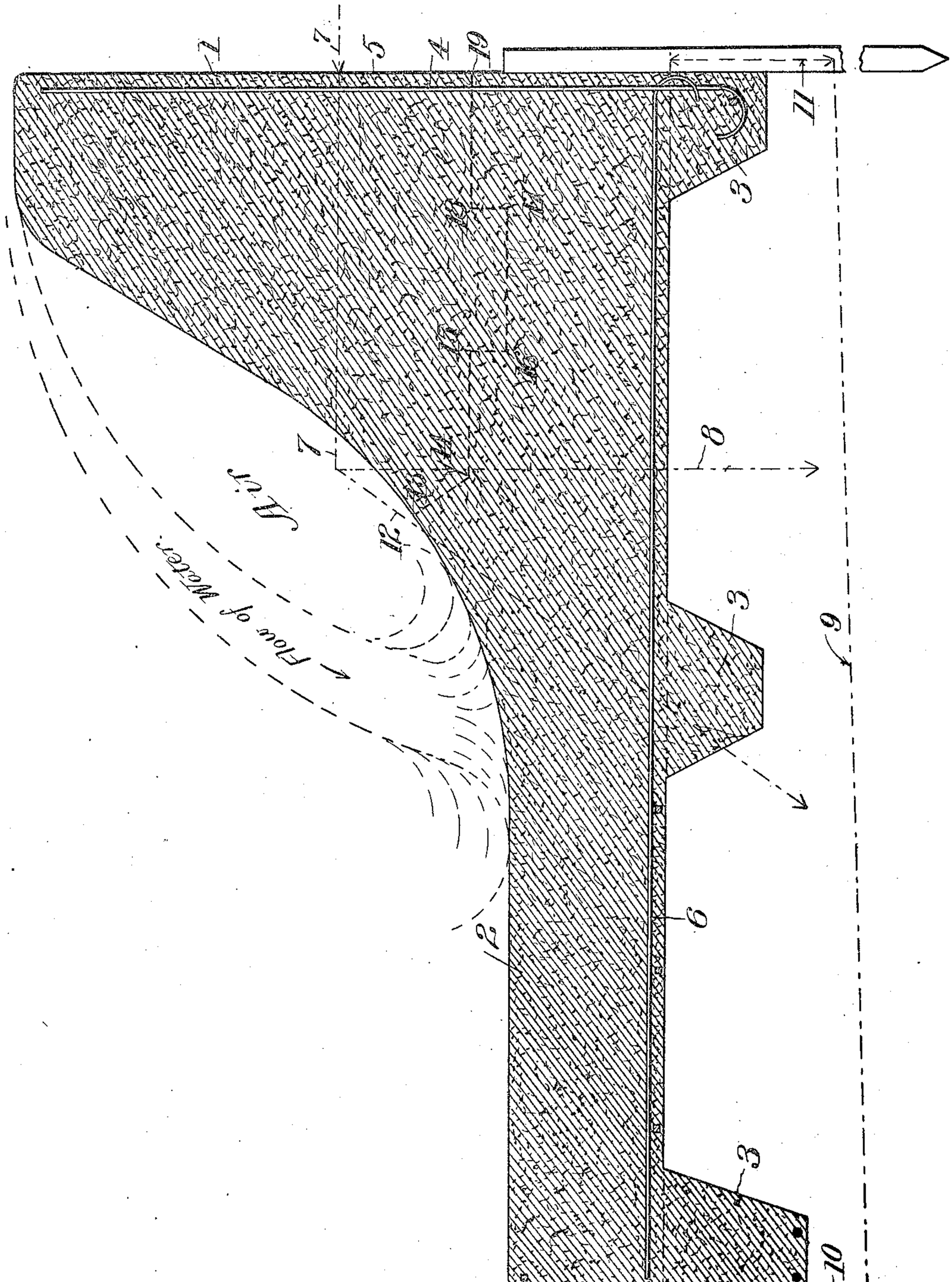
W. G. FARGO.

DAM.

APPLICATION FILED JUNE 19, 1908.

914,559. Patented Mar. 9, 1909.



Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM G. FARGO, OF JACKSON, MICHIGAN.

DAM.

No. 914,559. Specification of Letters Patent. Patented March 9, 1909.

Application filed June 19, 1908. Serial No. 439,447.

To all whom it may concern:

Be it known that I, WILLIAM G. FARGO, a citizen of the United States, residing at Jackson, in the county of Jackson and State of Michigan, have invented certain new and useful Improvements in Dams, of which the following is a specification.

This invention relates to dams.

One object of the invention is to provide a dam particularly adapted for streams whose bottoms are of soft material, either of rock or soil.

Another object of the invention resides in the provision of a dam embodying such characteristics that its base slab will act both as a cantaliver to distribute pressure and as a bottom protection to resist impact and scour of the falling and swiftly moving water. The apron being built integral with the dam contributes its weight toward holding the dam from sliding on its base by means of friction.

With the above and other objects in view, the present invention consists in the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that changes may be made in the form, proportion, size and minor details, without departing from the spirit or sacrificing any of the advantages of the invention.

The accompanying drawing illustrates a transverse sectional view of a dam embodying my invention.

Referring to the accompanying drawings, it will be observed that wall portion 1 and base slab 2 are of cementitious material and so formed to act together in compression and shear. They may be molded in any well known manner, as with construction joint in compression and shear at 13—14—15—16—17—18 and 19. The base slab is comparatively long and is directed downstream in direct contradistinction to those structures wherein the base slab is directed upstream.

The structure is provided with downwardly directed toothing portions 3 adapted to resist sliding of the dam on its foundation, and it is also reinforced, the reinforcement 4 in the wall of the dam being preferably adjacent the flat vertical face 5, while the reinforcements 6 are preferably disposed in the material along the lower or base edge of the structure. The reinforcing feature of the invention is immaterial in this particular application, and it will be understood that any character of reinforcement may be employed. However, one of the essential features of the invention resides in the approximately vertical face 5. Thus the water pressure will be approximately horizontal and in coöperating with the downward pressure incident to the dead weight of the masonry, the resultant or combined direction of these two forces acting approximately at right angles will be intermediate between the directions of the two forces and in a direction nearer the greater force of the two. If the two forces were equal the resultant would bisect the angle between the two forces and would be approximately at an angle of 45 degrees inclining downstream when the water pressure is horizontal, as indicated along the line 12.

In order that the resultant of the horizontal water pressure and the downward pressure resulting from the dead weight of the structure may be thoroughly understood, it will be noted that the resultant of all of the horizontal water pressures is 14,000 lbs. per linear foot of the dam illustrated, at flood of 8 feet over the crest, as indicated along the dotted line 7. The dead load per linear foot is 19,780 lbs. per linear foot of the dam, as indicated by the line 8. The load diagram has its upper boundary at the base of the dam for convenience of representation.

The inclined load line 9 indicates that the pressure at downstream edge of the dam is 900 lbs. per square foot, as indicated at 10 and 750 lbs. per square foot at upstream edge, as indicated at 11. The intermediate pressure varies uniformly between these two limits and may be found by scaling the load diagram 9 proportionately. By extending the base slab further downstream the assumed load on the base may be made uniform for the section.

By virtue of the approximately vertical face 5 and the comparatively long base slab extending downwardly of the stream, there is such distribution of pressures as to provide with friction for a firm and safe mounting of the dam upon its foundation. The base slab, by reason of its extending downstream, resists impact and scour of the falling and swiftly moving water, and prevents undermining of the foundation material under the downstream toe. The metal rein-

forcings 4 and 6 are designed to resist the tension stresses.

With a proper relation between the height of the wall of the dam and the depth of water passing over the wall or crest the falling sheet or jet of water approaches the vertical as it strikes the base slab or apron and its velocity is checked and its energy dissipated to a considerable extent by impact on the apron. The jet is intended to spring clear of the downstream face of the wall and aeration to prevent vacuum between the sheet and the wall has been found by full size experiments to be accomplished by entrained air arising from the eddies on the apron. Therefore the passage of flood water over this type of dam is essentially different from the type of dam having its downstream face curved to secure adherence of the sheet of falling water.

What is claimed is:

1. A concrete dam comprising a wall built in combination with a base slab, the slab extending a comparatively long distance down stream to equally distribute over the base the resultant of the horizontal and vertical pressures for any average assumed pressure loading to which the dam is subjected.

2. A concrete dam reinforced with metal to resist tension stresses and comprising a solid wall built in combination with a solid slab integral therewith, one face of the wall having an approximately vertical face and the base slab forming an apron extending a comparatively long distance down stream.

3. A reinforced concrete dam comprising a wall and a base slab forming an apron disposed on the downstream side of the dam, and a plurality of downwardly projecting toothings built with the structure to resist sliding of the dam on its foundations, the apron being integral with the wall and extending down stream a comparatively long distance to receive the falling water in substantially a vertical plane beyond the downstream side of the wall.

4. A reinforced concrete dam comprising a head wall provided with an approximately vertical face to receive the horizontal water pressure and having a base slab forming an apron directed a comparatively long distance down stream, whereby the apron will resist scour and impact of the water passing over the dam and onto the apron in substantially a vertical plane.

5. A reinforced concrete dam comprising a wall and a base slab, the wall having its up-stream face substantially vertical and its down-stream face formed to prevent the falling sheet of water from adhering to said face and allowing the sheet of water to pound upon the apron beyond said face of the wall and at the natural inclination due to its velocity.

6. A reinforced concrete dam comprising a solid wall and a base slab integral therewith and forming a cantaliver-apron, the apron being disposed on the down-stream side of the wall and extending a comparatively long distance therefrom and acting to distribute the resultant pressures of the water and the dead weight of the masonry, the apron also resisting scour and impact of the water passing over the dam.

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

WILLIAM G. FARGO.

Witnesses:
G. S. Beasley,
Nannie King.