struction. The amount, position, and direction of resultant pressures depend on the exact shape of the water-tight surface. The vertical water pressure may be made 1.5, 2 or even 3 times the horizontal pressure, depending on the width of base: and the resultant pressure of all, weight of water and structure, may be brought as near the centre as desired. In Fig. 7 is shown a dam of considerable height, and in Fig. 8 one of moderate height.

The limits of this idea are shown in Fig. 9. Suppose we have a dam built of a small bent plate: calling the height 24 in., the base 14 in., the horizontal water pressure would be 2,

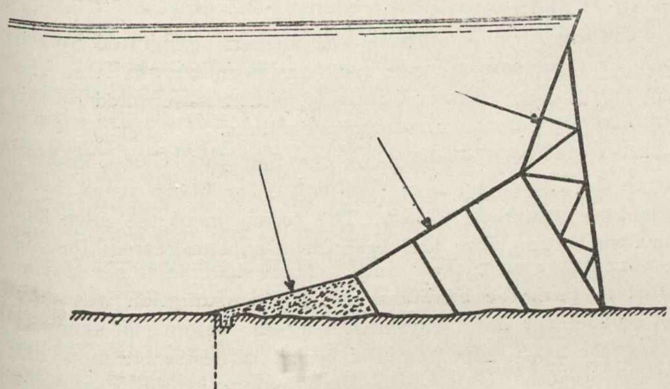


Fig. 7.

Cross Section of Suggested Concrete and Steel Dam.

applied at 8 in. from the base; the vertical pressure would be 2.33, applied at 7 in. from the bend. The resultant would be 3.1, applied practically at the bend. The structure would be just a little more than stable against overturning, and a friction coefficient of 0.86 would be sufficient to prevent its sliding.

In case the base were 24 in. and the height 24 in., as in Fig. 10, the horizontal water pressure would be 2 as before, and the vertical pressure would be 4, and the resultant 4.5, falling at a point one-third of the distance from the bend to

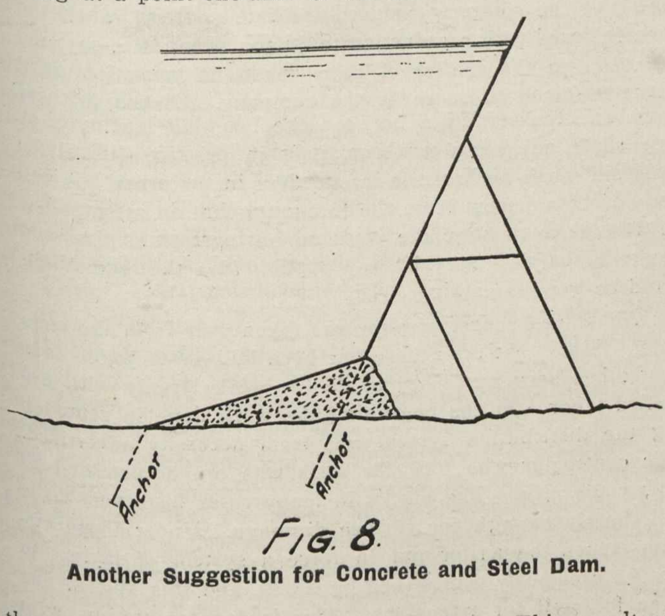


Fig. 8.

Another Suggestion for Concrete and Steel Dam.

the upstream edge of the horizontal plate. This resultant would stand two vertical to one horizontal, giving a coefficient of 0.50 to just prevent sliding. If you prevent leakage at "A" and your plate is stiff enough to prevent bending, you will have, due to water pressure alone, a small dam as safe against overturning and safer against sliding than the standard profile. It is evident, then, that in a dam having a base equal to its height, the sum of all horizontal pressures is exactly that due to the depth of the water, no matter what the shape of the water-tight surface, and it is possible to utilize the vertical pressures from a minimum of zero to a maximum of two times the sum of the horizontal forces, and to bring the resultant of both forces from a horizontal direction to an inclination of two vertical to one horizontal, as shown. Of course, in the practical structure of steel of the Bainbridge type or of concrete, wood, or other material, we would curve the tension face in some manner, and in making our calculation add the weight of the structure itself.

In Fig. 11 is shown the proposed section of a reinforced concrete dam having a concave water-tight face. Please note the position and direction of the resultant of the water pres-

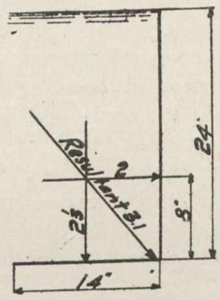


Fig. 9.

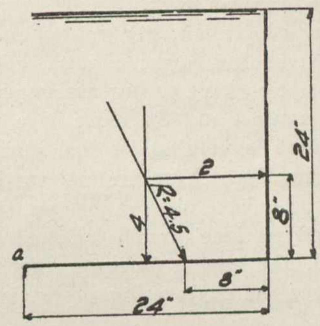
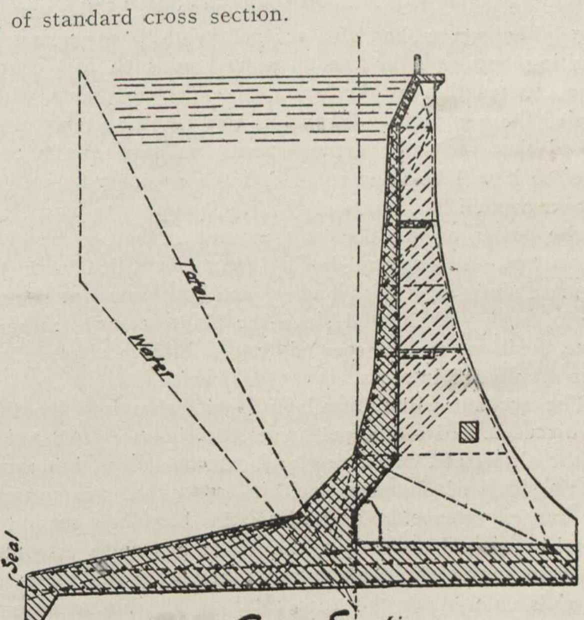


Fig. 10.

Cross Sections Showing by Bent Plates the Principle of Dam Suggested by Author.

sure and also note that the total resultant falls about half way between the centre and the 1/3 point. It is designed to be a very heavy and substantial structure, but contains only about one-half the amount of concrete of that required in a dam of standard cross section.



Cross Section
Fig. 11.

Proposed Typical Section of Reinforced Concrete Dam Suggested by the Author.

In this particular case the water pressure resultant stands at an angle of five vertical to four horizontal, and the total resultant at eleven vertical to five horizontal, and the structure very evidently has some stability against both overturning and sliding. A spillway section employing this principle also works out very favorably in either steel or concrete.