ever, was this undesirable from the standpoint of waste of water. The tilting dam was arranged so that a portion would tilt when the water reached an elevation of 193.5 ft. A.M.T., a depth of 1.5 feet of water on crest of movable dam. If the flood continued to rise, other portions tilt in turn at different elevations.

The width of spillway was divided into 27 units or separate dams, numbered from 1 to 6. Each numbered section is arranged to tilt at a different height of water over crest. The summary below shows the number of each kind of unit and head under which they are designed to tilt:—

No.	Units.	Designed to tilt at elevation	Elev. of water at crest line (basin's curve)
1	5	194.0 ft. A.M.T.	193.64 ft. A.M.T.
2	6	193.5 ft. A.M.T.	193.27 ft. A.M.T.
3	4	194.0 ft. A.M.T.	193.69 ft. A.M.T.
4	4	194.5 ft. A.M.T.	
5	4	195.0 ft. A.M.T.	
6	4	195.5 ft. A.M.T.	

It should be noted that all sections are four feet high (top of spillway to crest of movable dam) except section No. 1, which is 3 ft. 9 ins. in height. The reason for making section No. 1 (composed of four 12-ft. and one of 9-ft. sections, a total length of spillway of 57 ft., all at elevation 191.75 ft. A.M.T.) lower than the others was because of the desire to confine the normal water flow up to 192.0 ft. A.M.T., also logs, etc., to centre of stream. Section No. 2 was designed to tilt under the minimum head of 1.5 ft. because the intake channel, having an approximate elevation of 170.0 ft. A.M.T. at the gate house, starts opposite this location (Sec. No. 2), and therefore by an increased velocity, due to the water being confined to this location, the deposit of silt at end of tilting dam will be kept away from this channel, also channel to 48-in. sluice gate, whereas if section No. 1 was made to tilt at the minimum head the deposit of silt would fill the entrance to channel.

Form of Dam Chosen

The original topography of the river necessitated the excavation of a channel from original stream bed in order to bring the water to gate house at the lowest elevation. The form of dam chosen was that of an obtuse triangle, pivoted at the obtuse angle, and forming a typical hollow or framed dam. As the water rises on a section its centre of pressure on the inclined dam surface also rises, and eventually the pressure normal to the back will strike through the hinges. At this time neglecting the weight of dam, the structure will be in neutral equilibrium. As the pressure rises still further, the normal strikes above the hinge, and tilting takes place, the dam falling to its second or open position.

Under High Water Conditions

It is significant that since these dams were installed they have been subjected to high water conditions, and sections No. 1, No. 2 and part of No. 3 have tilted. Upon subsidence of the water these dams returned to their normal positions. In many cases the elevation varied from 0.3 ft. to 0.6 ft. lower than that for which they were designed. There can be numerous reasons for this, *i.e.*, as the water subsides and reaches near elevation 188.0 ft. A.M.T. foreign matter lodges at the toe, and when dam drops back it sets on this obstruction, thereby throwing it forward. This is also the case when warping of timber decking at toe and at ends of section takes place. In both cases the tendency is to decrease the head necessary for tilting. The friction and corrosion at pin also offer resistance to tilting. It is interesting to note that, as dams tilt, I-beams and timber decking offer some obstruction to stream. This is especially true as the water subsides. The free waterway from bottom of lower I-beam to concrete top of dam (elevation 188.0 ft. A.M.T.) is 1 ft. 2¾ ins., giving an opening of 1.2 ft. x 321 ft., or 385 sq. ft., obstructed only by upright framing of dam. The tilting dam usually drops back when water reaches an elevation of 188.75 ft. A.M.T. or slightly lower. This proves conclusively that the dams are entirely automatic in their action.

Form of Casting Used as Bearings

The casting used as bearings for the dams has several unique features. The centre keyway on top dam was utilized for the anchoring of castings. It was necessary to cut groove to 14-in. width at anchor blocks, as the 12-in. original groove was irregular in alignment and did not give room for lining up casting. The castings for anchor blocks are different for each section of frame. Distance from back face of keyway to pivot for frame No. 1 is 4 5/16 inches, and for No. 6, 8½ inches. The groove for a width of 6 inches having been lined up on the deep stream side, the castings were all set with reference to this edge. The castings are three in number—a centre block with hole for pin, and two side-setting pieces and wedges. The centre block was first set to position, then the side pieces slid in and tightened against the sides of groove by wedges. After aligning and wedging in position space under castings were filled with 1:2 grout, and spaces between side pieces and block were filled with lead. This gives absolutely rigid construction, limited only by the strength of the concrete in grooves of present masonry dam.

Cost of Construction

Tht total cost of the construction of these tilting dams amounted to approximately $3,700. This work was originally let for contract, two bids being filed, one for $5,275 and the other $9,280. Since the estimate made by the water department amounted to $3,200, the bids were rejected, and the work done by the department's forces at the above-mentioned figure.

By the construction of this tilting dam and the consequent raising of the water surface from elevation 188.0 ft. A.M.T., a considerable saving in electric power consumption at the low-lift pumping station was realized, *e.g.*, with an assumed pumpage of 90,000,000 gallons per day the saving was approximately 1,500 kilowatts per day, or 547,520 kilowatts per year, and at a cost of 0.8 of a cent per kw. we have a saving of $4,380 per year. These assumptions do not allow for water surface lower than 188.0 ft. A.M.T. nor higher than 192.0 ft. A.M.T., and therefore I would say that the tilting dam paid for itself in at least a year and a half.

The Course of the Water

The water impounded behind the new Loch Raven Dam flows through a 10-ft. circular steel conduit, paralleling the Loch Raven drive, until it intersects the 12-ft. circular tunnel at the old Loch Raven gate house; thence through 12-ft. circular tunnel to the low-lift pumping station at the Montebello filter, a distance of seven miles. It is of interest to note that, although the 12-ft. circular tunnel was built in 1881, when the amount of water consumed by the city was very small in proportion to the present consumption, it was designed and built of such liberal dimensions that it will be capable of supplying water to a population of at least 1,500,000, and is