September 16, 1915.

contract about a sixty-five ten millionth of their length for each Fahrenheit degree change of temperature.

Therefore, a wall built in 30-ft. lineal sections subjected to a change of 50 deg. (Fahr.) rise in temperature will expand as follows:

 $30 \ge 0.0000065 \ge 50 = .0098 = about \frac{1}{8}$ in.

Slab Bridges .- Reinforced concrete slab bridges should be limited to spans of about 35 ft. This is because



Fig. 4.-- A Waterproofed Expansion Joint in an Arched Roof or Side Wall.

it is difficult to allow for free expansion the way that it is done in a steel bridge. The width of a slab bridge rarely exceeds 50 ft. and therefore there need be no provision for expansion in this case. If in a slab bridge it is necessary to provide for expansion and contraction in order to maintain the true alignment of tracks a longitudinal joint similar to the one shown in Fig. 2 might be used.

Fences, Railings, Coping Walls, Etc.-When a fence, railing or coping wall, etc., is restrained or is part of a restrained structure expansion joints should be provided about every 30 ft. Examples of such structures would be a long reinforced concrete fence or a fence, railing or coping on top of a retaining wall.

A railing, coping or parapet wall on an ordinary building need not be provided with expansion joints. In fact it would be useless to provide joints for same when



Fig. 5-Showing Type of Expansion Joint.

there is not provision for expansion made in the roof of said building.

Type of Joint .- Expansion joints in the ordinary retaining wall, parapet wall or fence may be either the rectangular or triangular tongue and groove type. These types of joints insure the wall against lateral movement that would throw same out of line.

The maximum distance that expansion joints should be spaced is 50 ft. (applies to restrained structure). This spacing will be ample for large, gravity retaining walls, etc.

When a wall is not several feet in thickness and is subjected to 50 deg. seasonal change of temperature, joints should be provided at about 30 ft. centres. Joints should always be placed near all corners or turns in a wall, and the corner or turn should be specially reinforced to take care of the greater strain.



To determine the size (width of opening) of joint in ordinary practice it is sufficient to do as follows:

Change in temperature is commonly taken to be 50 deg. and the coefficient of expansion for concrete and



Fig. 7.-Method of Waterproofing Bridge Slab **Expansion** Joints.

steel to be 0.0000065. If the joints are spaced 30 ft. apart and the structure is free to move (unrestrained) then the gap of the joint might be as great as

 $50 \ge 0.0000065 \ge 30 = 0.00975 = about \frac{1}{8}$ in. If joints are 50 ft. apart

 $50 \ge 0.0000065 \ge 50 = 0.01625 = about 3/16$ in.

