

An unmistakable proof of this intermittent and instantaneous action of water, and of the fact of its thus acting during only a second or fraction of a second, is still to be seen along the rear face of Dufferin Terrace, Quebec, where, in an illustrated paper read before this Society in the early nineties, and published in its Transactions, it was shown by the writer that an open fissure in the cliff in rear of the terrace had, under a persistent and heavy rain of several days' duration, in September, 1889, become filled with water; when, due to the thrust from the rear, an outward portion of the cliff fell forward with the destruction of much property and the loss of some 52 lives. The crevasse alluded to, thus filled with water to a depth of over one hundred feet, exercising a hydrostatic pressure which pushed the intervening rock forward by some six inches.

Could this pressure have been continuous, the thrust of the cliff forward would also have followed suit, or been continuous, the aperture widening more and more till the whole cliff fell forward; but it was not continuous, nor could it be, for the moment the fissure became enlarged the water level fell, and the pressure ceasing, the motion forward stopped short at the same time.

In addition to this action of a fluid or waterlogged substance against a retaining wall, there is also, in this climate, the yearly action of frost, which, in expanding the back filling, as water does in freezing, also pushes a wall forward or towards the open, and though but as little as the eighth or even the sixteenth part of an inch at a time, finishes in course of years by effecting its overthrow.

It is therefore seen that all retaining walls are liable to become like unto dam walls, which have to stand the pressure of water, and that as such the same rules as to strength and thickness should apply.

Also that where ice may or might form in rear of a wall, and where this ice in forming can not spend its effort on compressible material towards the rear, as where such substance is solid rock or equivalent thereto, the whole effort is then against the wall, and, if repeated from year to year, the wall must go, as nothing can withstand or nullify the effect of ice expansion; since, as is well known, if an iron shell, a bomb, be filled with water, hermetically plugged, and then exposed to frost, the shell, however thick it may be, will burst. The only remedy, then, in such a case, the only safeguard for the retaining wall, is to so roof in or impermeably cover the surface of the back filling with asphalt or other watertight substance, that no water can get at it, or penetrate the soil in rear of the wall in a way to run the risk of any ice forming as said above.

It may also be remarked here that a Mr. Bone, engineer of the Oregonia Bridge Co., has recently patented and built at Columbus