And now as to the ice itself. The formation of ice, as is well known, takes place at a certain fixed temperature (32° Fah.), and which remains constant during the process of solidification. A higher temperature causes ice to melt. Ice must, therefore, at formation, be at its greatest or maximum dimensions, and cover its largest area. The first movement of ice, after formation must necessarily be shrinkage or contraction. There is, however, a peculiarity about the contraction of ice which perplexed me very much for some time, as I could not see any tangible evidence of its contraction.

The ice field does not draw away from the shore during shrinkage, as might be expected, and leave open water to the extent of its contraction.

The expansion of a large field of ice is manifested by its encroachment on the shores of the lake. It fractures at the ripple mark and shoves on to the shore, and when the line of fracture occurs at a distance from the shore, it is evidenced by the appearance of a vertical ridge formed by the fractured ice. Such being the case it would naturally be expected that the ice field, during contraction, would recede from the fracture, whether on shore, or at a distance from it, or that fissures and cracks would be easily observed somewhere in the ice field of widths somewhat commensurate to previous shoves. Such evidence of the contraction of ice does rarely if ever exist. That contraction causes fissures however, is true, but so exceedingly small that they easily escape detection. It was sometime before I discovered this. As I crossed the lake one morning, after a cold snap, a very slight covering of snow lay on the ice, and showing innumerable cracks running in every direction, filled with water, and of widths from one-eighth of an inch to an inch in width. I counted over one hundred in the distance of a mile. The aggregate width of these fissures would fully equal the width of the greatest shove. This manner of contraction is, I think, readily accounted for. If the ice field were equally thick, dense and bare, which it is not, it would contract uniformly towards its centre or centres, and draw away from the shore by the extent of its contraction.

But ice forms in waters with currents, islands, headlands, and perhaps during snow storms. It is not, therefore, equally thick and pure and dense, and has many centres, and in shrinking to them pulls and opens fissures in all directions. These fissures fill with water and freeze, the ice field occupying its original area, but in a state of contraction. When a change to higher temperature occurs or the sun shines, expansion takes place and from a centre towards its circumference, the ice is shoved onto the shore to an extent equal to the width of the fissures.

These shoves sometimes exceed four or five feet in width, and occur on the shores, in the channels, or from headland to headland, it being easier to fracture on the chord than the arc of the bay, and will always fracture on the line of least resistance.

It will be thus seen that the capacity of ice to expand and shove, and shove again, is only limited by its capacity to contract and recuperate. The repeated shoves have lodged ice on top of a high embankment over 30 feet in width and has lifted large boulders and pressed them against the abutments of the bridge. A very slight covering of snow acting as a non-conductor, prevents all movement of the ice from change of temperature, hence all damage from shoves occurs early in the season before the snow falls. The effects which I have endeavoured to describe occur on all Canadian waters in cold climates, but to some extent are governed by the size of the field ice.

Being much interested in the movements of ice from my experience at Rice Lake, I endeavoured one winter after my connection with the Cobourg Railway had ceased, to practically test by experiment the nature of ice movement. I regret that I had not the time or the skill to follow up and solve the question more satisfactorily. The result of the experiment, however, is interesting and somewhat instructive. I built a rough shed on the ice of