

formed and packed it is the easiest way of obtaining vent, thus all the winter the ice level is continually changing in proportion as the ice or the water gets the mastery in the channels.

In the spring when the ice runs are augmented by additional packs from above, and the channels below are still more gorged with ice, the river rises higher and higher until the pressure or head breaks or overflows the dam.

The Niagara river at Fort Erie, at the site of the International Bridge, has a width of 1850 feet, and a depth of water at its centre of 45 feet. Through this channel there passes per second 1,535,040 gallons (see Colonel Gzowski, M.I.C.E. & M.A.S.C.E. on International Bridge, 1873.)

This is equivalent to 884 millions of cubic feet per hour. Now the Niagara river at this point does not freeze from shore to shore; in fact only shore ice is formed and that by reason of the Bridge works; and Colonel Gzowski says the variations in its surface (leaving out of consideration the sudden rises and falls caused by storms, etc.,) are not more than two feet.

Here we have an example of the kind of channel required to pass ice, viz., a deep one, and it is this depth, added to the current, that enables the Niagara river to discharge its waters in winter without affecting its height.

Take the great rivers of the North, the St. Clair, the Niagara, and St. Lawrence, and it will be seen that they plough for themselves channels of depth, rather than spread out into additional surface area to pass their discharges; and this element of depth varies with the velocity of the stream.

The St. Clair Flats are remarkable examples of this power of ice to cut out channels. The clay is hard and indurated, yet the ice has carved out passages thirty feet deep and these apart from the main river, or International