with great severity, was one cause why the inundation at Montreal was less than usual,—was unaccompanied either on the formation or departure of the ice with any "shoves"—and that the surface of the river, opposite Montreal, presented the evenness of a mill pond instead of the ragged quarry aspect of broken ice usually seen.

The St. Lambert Approach to the bridge, in conjunction with the work of the Champlain Railroad Company, will have the effect of retaining in its place the ice formed between Moffatt's Island and the south shore, and thus prevent the descent of a bordage of equal width as high up, at least, as a point abreast of Nun's Island. The retained bordage above Moffatt's Island, with that resting on Nun's Island and the south-western abutment of the bridge, will increase in width so as gradually to narrow the passage between the Nun's Island and the eastern shore, and will thus aid in arresting the descending field of the upper bordage and close the Laprairie basin at the earliest date. A few ice breakers judiciously distributed over the shoals, while they would break the shock of fields descending against the bridge, would aid in retaining the bordage and thus expedite the freezing over of this basin.

The solid approaches will be cheaper and more substantial than any other portion of the bridge of equal length; and in fact no substitute which will bring the rails down to the level of Point St. Charles can be devised for them, except that of extending the piers and bays to the shore and carrying the masonry up to the level of the rails. A system of masonry arches giving free passage to the water, would be exposed to the risk of being blocked up and overthrown by the "shoves" of the ice.

To carry out the arrangement of descending from the central arch to each shore on the top of the tubes; it is evident (since the depth of these are 30 feet under the rails) that as the shore is approached the lower side of the tubes would be brought within the reach of the winter flood. Before this point is reached, therefore, the arrangement and character of the structure must be changed, and as it would destroy the effect of the bridge again to elevate the tubes and run *through* them—the solid causeway is necessary. It is true that by abandoning the proposed arrangement of running on top of the tubes, raising the masonry of all the piers to the level of the rails, and continuing the piers and tubes to the shores—the solid approaches can be dispensed with; but I consider that there are objections to such an arrangement exclusive of economical considerations and the loss of the effect of the solid approach in retaining the bordage. If the spans are such that tubes whether of iron or wood are required,—passengers would be confined in a tunnel two miles in length with all its disagreeable connections, and if the spans are so narrow as to admit of an iron bridge open at the top—the side trusses would yet be necessarily so high that it would become a long trough which unless open at the bottom would fill with snow, while it would effectually deprive the passengers in summer of that view from the windows of the train which will constitute one of the great attractions of the bridge. On the other hand by the arrangement proposed, the appearance of the bridge with passing trains is improved—the snow is avoided—the monotomy of the outline is broken by the single elevated tube in the centre, and the channel is thereby clearly displayed to the navigation. The pleasure and comfort of the passengers enhanced—economy and safety to the structure are secured—and, if built of wood, the risk of fire is greatly diminished.

The Piers. The most important question in connection with the structure is that of the piers. The superstructure and approaches are simple matters, and so would the piers be were it not for the ice phenomena. Many persons (astounded by the commotion when a "shove" takes place) entertain the belief that piers cannot be made to stand in the river below the Lachine rapids, or at least below Nun's Island; but the simple contrivance described by Mr. Logan shows how easy it is to *elude* the effects of the ice however difficult it may be to *oppose* them. That the ice is not, as is often remarked, "irresistible," may be proved from the fact that the islands, rocks, wooden wharves and stone quays have not been removed by it. Probably there is no point where the ice strikes with greater force than against the long wharf at the Bonsecour Market—but this cribwork has resisted the shock, and forced into the air a broken heap of fragments. The power required to crush a cubic inch or foot of ice is very much less than that required to crush stone, iron or wood. If therefore there is mass enough or support enough, as is annually proved by the stone quays of Montreal, the ice is broken into fragments or ground into powder; but the simpler, more economical and effective method is that universally employed where ice is to be encountered of *turning the ice back upon itself* and leaving the first arrivals to take the shock of all that following after. By sloping the up-stream face of a pier or ice-breaker so that the ice will ride up upon it, the stability of the pier is increased by the additional weight piled upon it and a heavy rampart of ice receive all future assaults.

But it is to be expected that the violence of the ice shocks will be diminished rather than increased by erection of a bridge. At present when the dam slips and the ice begins to move it is carried on with increasing momentum until it strikes the shore. But if sustained at intervals of 100 yards or less across the stream by piers, the initial velocity would be checked and the ice would rise and fall *in situ* with the variations of the water level.

The plan I have proposed contemplates the planting of very large "cribs" or wooden "shoes," covering an area of about one-fourth of an acre each, and leaving a clear passage between them of about 240 feet —a width which will allow ordinary rafts to float broadside between them. These islands of timber and stone will have a rectangular *well* left open in the middle of their width toward their lower ends, out of which will rise the solid masonry towards supporting the weight of the superstructure, and resting on the rocky bed of the river. The enclosure of solid crib work all round the masonry yet detatched from it, will receive the shock, pressure, and "grinding of the ice, and yield to a certain extentby its elasticity without communicating the shock to the masonry piers. These cribs, if damaged, can be repaired with facility; and from their cohesive powers will resist the action of ice better than ordinary masonry. During construction they serve as coffer dams, and being formed of the cheapest materials—their value as service ground or platforms for the use of machinery, the mooring of scows, &c., during the erection of the works will be at once appreciated. Their application to the sides of the piers is with particular reference to preventing the ice from reaching the spring of the arches which will be the lowest and most exposed part of the superstructure if wood be used.

The class of superstructure proposed for these wide spans, if of wood, would be a strong rectangular open built hollow beam, assisted by a deep open built arch. The two systems of arc and truss, however objectionable in iron bridges, have been proved to be susceptible of advantageous combination in the numerous and excellent bridges built on what is known as the "Burr" or Pennsylvanian principle— decidedly the best class of wooden bridges in existence. The elasticity of timber permits both systems to come into play without injury to either when a strain is upon them, (which is not the case with iron) while the two great elasticity of the wooden arch is counteracted by the rigidity of the truss to which it is attached,

Experiment at Menai proved the superiority of the rectangular form for hollow beams in iron. It is somewhat singular, that the best form of wooden bridge in America for wide spans was, long previous to the Menai experiment, a type in wood of the celebrated tube. The strength of both bridges is collected near the four angles; the sides top and bottom, in the iron wonder, serve chiefly to maintain the relative position of the vital parts. The strength of the wooden tube must be wholly in the top and bottom chords—the inferior capacity of wood for the connection of its parts being in some measure compensated for by the practibility of employing the auxiliary arch.

The wooden railway bridges of America are progressive improvements upon the ordinary road bridges of Pennsylvania and New England, in which there was apparently an excess of strength:—the arc carrying the load and the truss (with plates instead of chords for the top being a mere frame work to preserve its shape. In adapting these structures to the passage of railway trains every part has been from time to time increased in weight and size as experience dictated, but it is questionable whether as a class they are not generally too light, and wanting in that inertia which attempts at stiffness cannot compensate for, and which is requisite to absorb a portion of the momentum communicated to the structure by the sudden impact of locomotives weighing twenty-five to thirty tons, and moving at a speed of thirty miles the hour. These wooden bridges with arcs included, are not more than one-third or one-half the weight of tubular iron ones for the same span.

I have proposed a class of superstructure more weighty than usual, and while recognising the objections to the extra weight to be sustained, I conceived it practicable to build a truss of the long span proposed which shall sustain at least its own weight, and to apply an auxilliary arc to that truss which can at least resist the effect of the load.

While instances are numerous of the failure of wooden bridges not supported by arches, by their in time sinking below the horizontal line, I am not aware of any well built "Burr," bridge having failed from this cause, although many have spans of 200 feet.

Mechanics' Institute New Hall.

We understand that contracts have been entered into by the Committee of the Institute, for the erection of their New Hall, according to plans furnished gratuitously by F. W. Cumberland, Esq., and which we have no doubt will be highly creditable to that gentleman, and also