48 ft., gradually rising from a height of 36 ft. at the abutments to 60 ft. at the centre pier, giving a grade of 1 in 132, or 40 ft. to the mile. The centre span is level. Each pier is furnished with a solid cut-water, or ice-breaker, which forms a portion of the pier itself. They are of wedge form & slope from their foundations upwards, terminating in an angle 30 ft. above the summer level of the river. The dimensions of the pier at the junction, with the cut-water, are 16x48 ft., but the whole transverse side of the pier at the foundation, including the cut-water, which extends up the stream, is 16x90 ft. The foundations, of course, vary; some are as low down as 20 ft. below the water. The whole of the ashlar is laid in hydraulic cement, in the proportion of 1 part sand to 1 part cement. The backing from the level of the surface water upwards is in common mortar. A section of a pier & of the tube is given in fig. 1, page 89.

The plates of the tubes are of various dimensions & thicknesses. Those forming the sides are reduced in thickness from the ends towards the middle, varying from 4-16 to 12-16 of an inch. The joints are strengthened with tee irons. The kelsons are placed transversely across the bottom of the inside of the tubes, & are 10 ins. in depth. They are spaced 7 ft. apart, & are secured to the tee bars by gussets, & support the pine longitudinals, or stringers which carry the rails. The longitudinals are about 12x12 ins. in section, & are kept in place by wrought iron flanges, which are bolted to the kelsons. This arrangement allows the tubes to contract & expand without disturbing the pine longitudinals & the rails which rest upon them. They move freely between the flanges which form their lateral support. The plates are all butt-jointed, having a covering plate over the joints on the outside, which is firmly riveted through to the tee iron on the inside of the tube; & covering plates, both inside & out, are placed over all the horizontal joints.

The centre tube, being so much longer than the others, has an additional thickness in the plates, & longitudinal kelsons are riveted to the top in place of the tee bars used in the small tubes. The tee bars & gussets are also considerably larger. This tube is connected, at one end, to one of the large piers; the other end is left free, resting upon the iron rollers. The iron brackets protecting the exposed surface of the top of the two large piers are partly glazed, & at the sides of the brackets are iron blinds, through which a splendid view of the massive masonry of the piers & ice-breakers can be obtained. Between the bottom of the tube & the stone work of the pier is introduced creosoted tamarac, covered with asphaltic felt. The object of this is to give elasticity between the iron work & the stone. On one side of the interior of the bridge is a planked footpath 3 ft. in width, resting on the kelsons. It is only intended for the use of the employes in charge of the bridge. There is no footway for passengers on the outside of the bridge.

The greatest difference caused by expansion in the length of a tube 260 ft. registered between the greatest extremes of temperature, is under 3 inches. At one end of the bridge is placed an indicator for registering the daily expansion & contraction of a tube. The telegraph wires pass underneath the tubes. The deflection of a single tube, under the severest test that could be brought to bear upon it was 7-8 of an inch; that of the largest tube was 1 7-8 ins. Upon the load being removed, the tubes return immediately to their original level.

The following was the method adopted for putting the tubes together:—After the staging or scaffolding was completed, upon which a tube was to be built, blockings, supporting cross ties, were placed at intervals of about 4 ft. for the whole length of a tube, & were raised sufficiently above the floor of the scaffolding to admit of the riveters working between this floor & the bottom of the tube; at the same time the requisite camber of the tube was carefully preserved, to allow of its settling down to a level when the scaffolding was removed. The centre line of the tube was then carefully struck on the cross ties which were placed to support the bottom plates. The plating was then commenced, either at the "bearing" or "roller," end as the case might be. As the plates were already marked, punched, & numbered, each plate having its own particular place assigned for it in the tube, it was but a simple process to place them in position, which was thus performed:—

1st. The "bottom strips" a on figure 2, page 89, which join the plates making up the width of the tube, were laid down; then the "bottom plates," d; next the "cover plates," c; the packings, b; the angle irons, e; the cross kelsons, f; & the tee irons, i. As the plating proceeded, the riveters followed up their work here & there with rivets, to keep the pieces together; & when the bottom was completed, the side plates which were riveted into large sheets on shore, were commenced at the centre of the tube & proceeded with towards the ends. As fast as these large sheets, h, were placed together, the bottom "gussets," g, which joint the sides with the