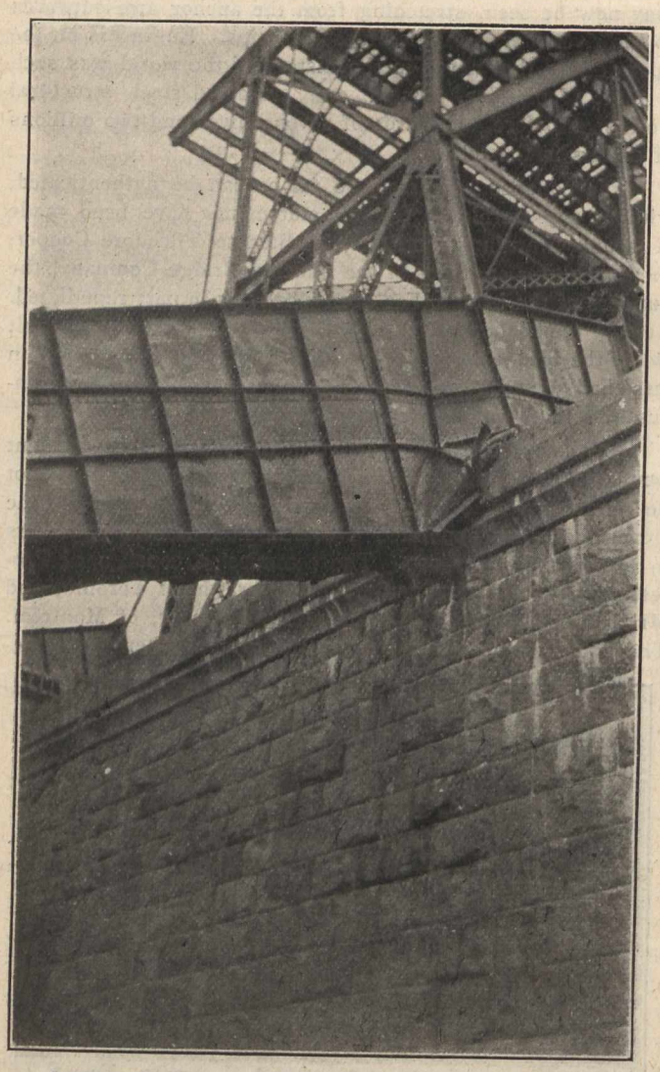
tion, at certain points, but for the most part the drop has been almost vertical. Apparently, there was no connection between the anchor arm and the approach span other than that afforded by the steel rails of the railway track. These were pulled out of the anchor arm portion and are now hanging over the edge of the approach span and swaying over the anchor pier as the wind blows upon them. Standing on the anchor pier, one has rising up behind him the approach span, uninjured and apparently not even scratched. In front is the line of wreckage stretching out to the river pier. Beyond the river pier, little is to be seen, the water being so deep as to swallow up the structural work of the cantilever arm and the portion of the suspended span without leaving any trace of it or even endangering navigation. Running along the top of the scrap heap from the anchor pier to the river pier, can be easily traced two lines of top chord eye bars, connected together save for an occasional outside bar. So far as could be seen, the bars which were twisted off the pins were on the right hand side. These bars lie upon a confused mass of wreckage. Immediately in front of the



Anchor Casing and Outer End of Approach Span.

anchor pier is the portal, with its two tubular columns toppled over, and their summits resting on the ground. Out at the river pier, all is confusion save the down-stream main tower. This fell with its top pointing towards the river and its foot kicked back towards the anchor pier. The outer end appears above the water, the foot being lost in the mass of wreckage which rests on the ground. It is noteworthy that had any one been on the top of the anchor pier during the accident, or had he stood only a few feet from under the bridge, he would have escaped injury. The inclination of the fall was slightly down-stream, the uprights being apparently mostly bent over in that direction.

Where the Failure Did Not Occur.

While it is not possible to say as yet at what point the failure occurred, it is possible to mention several important points where it did not occur. It has frequently been asked if the piers had not in some way become damaged or the anchorage failed. An investigation shows most certainly that neither of these is responsible for the mishap. The piers are of concrete, faced with granite, and an examination shows these to be in perfect condition. Where the heavy members fell across the piers, the coping is slightly chipped, though hardly as much as if struck sharply with a hammer. The weight of the downward pull of the members, however, crumpled the steel as if it had been paper, where it came in contact with the granite pier. The anchorage is perfect. The eye bars constituting the anchorage, after coming up out of the pier, were carried upwards in two tapering steel pillars or shells. When these pillars were forced forward over the edge of the pier they bent necessarily the eye bars at their base. Otherwise the anchorage is practically as it was before the accident.

While it is not so certain that the failure was not due to the quality of the steel members, utter absence of evidence of any fault in these, as they lie in the scrap heap, would almost justify the assumption. Everything points to the excellence of the material used. The top chord eye bars can be seen from one pier to the other, lying along the wreckage. None of these show any indication of damage other than the twisting and bending incident to the wreck. Nowhere was found an eye bar which had failed, though one was spoken of. One exception, however, is of no importance, and neither is the fact that a number have been warped off the pins. Several bottom chord splices have failed, in some cases by tearing the splice plates and others by shearing the rivets. Many of the main posts are bent back upon themselves to an angle of 180 degrees. In the construction of these, channel sections made up of four to eight webs and four heavy angles, were used. During the process of buckling, the rivets holding these together were shorn off in large numbers. In some places, the area so shorn must have contained upwards of 500 rivets—one engineer placed the number at 1,000—not one of the rivets being left. Even the fractures in the field rivets showed good workmanship and an excellent quality of metal was indicated. In some of the built members, the angles were snapped off short, the same members, however, showing at other points no flaw, notwithstanding that they were bent and twisted into every imaginable shape. The fractures could be easily accounted for by the sudden shock to which they were subjected.

The workmanship also gave every indication of excellence. Not an engineer visiting the wreck had any criticism to offer on this point, all allowing that it was admirable.

Design.

Inasmuch as nothing in the foregoing would seem to warrant further attention at the moment, the question of design may be considered. The bridge was designed by Henry Szlapka. It was to have been the longest single span bridge in the world. Its main dimensions were: length of anchor arm, 500 feet; cantilever arms, 562 feet 6 inches; suspended span 675 feet; approach spans, 210 feet; height to top of main towers, 414 feet; clearance above high water, 150 feet; distance centre to centre of trusses, 67 feet; depth of trusses at ends of anchor and cantilever arms, 97 feet; depth over main piers 350 feet; weight of metal, 40,000 tons.

Only those who have had a wide and varied experience in bridge building are in a position to offer any criticism regarding the design. This bridge was constructed on a scale heretofore never attempted. Under these circumstances, although the science of structural engineering is often considered an exact one, the undertaking must be considered largely in the nature of an experiment. It was noticeable that the lattice bars, in many of the large compression members, although in reality heavy, were relatively light. This feature was commented upon by several of the engineers on the ground, although none would go so far as to say this had anything to do with the failure.

A failure in the anchor arm would cause the cantilever arm to drop into the river much as actually took place, while a failure in the cantilever arm would inevitably wreck the anchor arm as well, by relieving the tension on the top