cal, in certain cases, as for railroad bridges, requiring great strength. I will first describe the former.

Aonm, Fig. 13, Pl. 1. presents a top view of the arch from the end to the centre, \( x \) and \( y \) represent enlarged cross sections at \( p \) and \( q \). Each piece consists of two side portions, of \( \tau \) formed section, connected by 3 or 4 cross bars of a \( \tau \) formed cross section; those at the ends being so broad and thick as to possess sufficient transverse strength to sustain any weight that may be brought upon the bearing points, and having a semi-circular notch in each, so as to form a round hole where they meet, for the vertical bolt to pass through.

For a bridge of 72 feet span, in which the arch pieces are from 11 to 12 feet long, the depth of the section should be at least six inches, the top cross of the \( \tau \) on each side about 3 inches wide, and the thickness of metal, average about \( \frac{5}{8} \) of an inch, so as to give about 12 square inches of cross section. The endmost arch pieces should also have diagonal bars from 1 to \( 1\frac{1}{4} \) inch square. The mid rib of the intermediate cross bars of the arch pieces, should have a depth from \( \frac{1}{2} \) to \( \frac{3}{4} \) that of the side portions. The end cross bars should be from 4 to 6 inches wide, and from 1\( \frac{1}{2} \) to 2 inches thick in the middle, according to their length; or greater depth and less width would be better economy.

The cross bar \( c \) should be about a foot from the end, and the side portions formed into a sort of foot, (see \( a \), Fig 14, Pl. 2,) with a shoulder, \( a \). for the chord chain, hereafter to be described, to act against.

The ends of the pieces are beveled according to the radius of the arch, so as to form a fair joint, and one or both of contiguous ends should have projections lapping by the joint, to assist in keeping the ends in place.

The width \( ab \), should be a little more than \( \frac{3}{4} \) the height of the arch, and the width in the centre, should be not less than \( \frac{1}{3} \) the length of the piece.

LIII. The chord \( ah \), (Fig. 8, p. 19,) is a chain composed of two sets of long links, extending from \( a \) to \( b \), from \( b \) to \( c \).