have half the thickness of the piece attached, that it may not bend with less force than the ends of the severed fibres can bear; and should extend into the thicker timber at least 6 times its diameter. For, as

the inner portion of the pin or spike, must act upon the wood in the same direction as the part through the attached piece, it requires the same amount of surface to act upon, while the intermediate portion requires a surface equal to that acting upon the two end portions. And, even in this condition, the pressure is not uniform upon all parts of the length of the pin, since there is a neutral point, as represented by the upper dotted line (lower diagram, Fig. 55), where the pressure changes from one side to the other, and, near this point, must be very light in both directions. Hence, for the most perfect results, in such cases, the pin should probably enter the thicker timber to a distance of 7 or 8 times the diameter of the pin.

When the end bearings of the pin act transversely to the grain, they require at least 50 per C. more extent of bearing, or even twice as much, when practicable. At 50 per C. \( l = 1\frac{3}{4}t \), and the effect of the pressure exerted by the middle piece, is \( \frac{5}{4} \)ths that of the same force at the centre of the pin. The equation for the proper diameter of the pin, then, is

\[
4 \times \frac{3}{4} \times 5,000ad + 1\frac{3}{4}t = 1,000td;
\]

whence, \( d = 0.288t \), and length of pin = \( 2\frac{1}{2}t \).