To find the pressure upon the supports when a beam is framed as a cap upon the tops of several vertical posts, and a weight applied directly over one of the posts.

This is a case which may be of use in proportioning the timbers for bridges when the supports are close together.

Fig. 41.

If we suppose the material of the posts to be perfectly inelastic, the middle one would bear the whole of a weight applied at C and no part of it would be sustained by A and B: but if the beam be flexible and the substance of the posts elastic, the pressures upon A and B would depend upon the relative degrees to which these properties were possessed. If the beam be very stiff and the posts elastic, a large part of the pressure will be thrown upon A and B, and if the beam be very flexible and the post but slightly elastic, nearly all the weight will be sustained at C.

When the distance between the supports and the dimensions of a beam are known, the flexure caused by a given weight is readily calculated: and when the length of a support is known, the reduction in length due to a given weight can also be determined.

If \( w \) represent the weight at \( C \), \( d = \) the deflection which would be produced if the support were removed, \( e = \) the reduction in length by the same weight which the post would experience. Then if \( x \) represent the actual deflection, we will have, since the deflection is always proportional to the weight, 

\[
d : x :: w : \frac{wx}{d} = \text{weight sustained by the beam and which is transmitted to the points A and B.}
\]

Also, \( e : x :: w : \frac{wx}{e} = \text{weight sustained by post C, the} \]