joints given by the diagram of deformation in which the joints were treated as hinged. It will not be accurately so, because at each joint the web members and the boom act on each other with equal and opposite couples, and also the curvature of any web member, by shortening the distance between its ends, tends to elevate the lower boom and depress the upper, but the effect of these forces will not modify the form of the boom to any great extent compared to the whole deformation.

It follows then from the similarity of the figures that in the two cantilevers compared, the radii of curvature of the booms at corresponding points are as $m_1 : m_2$. Let ρ be the radius of curvature, r the distance from the neutral axis of the boom to its most strained edge, t the stress per sq. inch. at that edge due to flexure, and let the subscript figures [1] and [2] in all cases, refer respectively to the two cantilevers under comparison.

$$\text{Then } t = \frac{E.r}{\rho}$$

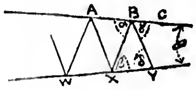
$$\text{(6) Therefore } \frac{t_2}{t_1} \quad \frac{r_2}{r_1} \times \frac{\rho_1}{\rho_r} = \frac{r_2}{r_1} \times \frac{m_1}{m_2}$$

Now confining ourselves to the compression boom in which r (and therefore t) is of course much greater than in the tensional boom, r will in general be made a certain proportion of the panel length, since the boom has to be treated as a column with fixed ends, from which we see that if the panel-length increase in proportion to the size of the bridge $\frac{r_2}{r_1} = \frac{m_2}{m_1}$, and (6) becomes $t_2 = t_1$, i.e. the stress due to flexure is constant. In any case if the depth of all individual members of the webs or booms is proportional to the span, the stress per sq. in. due to deformation is the same in corresponding members in all spans. This is an important fact, because, with very large bridges, pin connections become difficult, owing to the large size of pins and eyes required, and therefore it is important to know that the objections to rigid connections founded on the secondary strains they give rise to, do not become greater as the span increases.

In order to ascertain the changes of figure due to deformation (on which depend the secondary stresses in the structure the changes of angle must be investigated.

Let Δ_1 be the increase in the angle AXW due to deformation if the joints were frictionless hinges Δ_2 the increase in AXB and Δ_3 in BXY.

Fig. 8.



Assume for simplicity, that K is the same for all members and that W is parallel to B X, and A X to B Y.

Then $\Delta_1 = K \{\cot(\beta + \delta).\}$

$\Delta_2 = 2 K \cot \alpha.$

$\Delta_3 = 2 K \cot \delta - \cot(\beta + \delta)$

If Δ be the angle between WX α XY after deformation

$\Delta = \Delta_1 + \Delta_2 + \Delta_3 = 2 K (\cot \alpha + \cot \delta).$

Suppose now θ to be the angle between the booms (supposed to be straight). Then $\alpha = \beta + \theta$ and $\Delta = 2 k \cot(\beta + \theta) + \cot \delta$.

If then β and δ be given Δ is a maximum when the booms are parallel and diminishes continually as θ increases, thus showing that the distortion of the booms is less for a cantilever of varying depth than for one of uniform depth.

For a given value of θ, if β and δ vary, it will be found that Δ is a