Martens' Extensometer was first used in the Testing Laboratory of McGill University, in 1906, for such work as is here described, but, owing to the fire of 1907, research work was considerably delayed, and has only lately been resumed.

The present paper gives an account of experiments made at McGill University to determine, by means of strain measurements with the Martens Extensometer, the distribution of stress in single and double angles with riveted end-plates loaded in tension, and to compare it with the theoretical distribution under different assumptions. Experiments are still in progress on similar members in compression and on built up members, and it is hoped that the present paper may be only a first contribution on the subject.

The experiments on built up members indicate that these do not, in general, act as one solid piece, but that the separate parts must be considered as eccentrically loaded members subject to constraints. From this it appears that the only way to build up a satisfactory theory of the action of such members is to commence with the problem, which is important in itself, of a uniform piece subjected to an eccentric load, and to work up gradually to more complicated members. This preliminary problem, with its application to the simplest form of compound member made from two angles placed back to back, is the subject of the present discussion.

Theoretical Considerations.

The method of finding the distribution of stress in a piece of uniform cross section, subjected to a load which is eccentrically applied, but which lies in an axis of symmetry of the cross-section, is well known and need not be considered in detail here. In this case the resultant stress at any point of the cross-section, the lateral deflection due to eccentricity being neglected, is given by the formula

$$f = \frac{N}{A} \pm \frac{Ney}{I} \qquad \text{1}$$

Where N is the normal load, A the area of cross-section, I the moment of inertia of the cross-section about an axis in its plane through its centre of gravity and perpendicular to the line of symmetry on which the load axis lies, y the perpendicular distance of the given point from this axis, and e the eccentricity of the load, *i. e.* the distance of its point of application from the centre of gravity of the section. The + sign must be taken for points on that side of the centre of gravity on which the loading axis lies, and the — sign for points on the other side of the centre of gravity.

The equally, if not more important case of a load applied eccentrically, and not in a line of symmetry of the cross-section