to measure horizontal distances expeditiously with the degree of precision and reliability required for the field work, whatever its nature, which is nowadays generally exacted of them to keep pace with the advancement of science in every other walk of life.

This statement may, perhaps, appear a little overdrawn to civil engineers and surveyors generally, as many have, no doubt, availed themselves, to a greater or less extent, of the facilities afforded by properly mounted stadia wire telescopes for making distance measurements with the aid of a suitably divided rod, or used such instruments as Edgeworth's stadiometer, Eckhold's omnimeter, or one or the other of the various kinds of ordinary or improved tacheometers of the Porro type with stadimetrical telescopes having supplementary lenses, such as Richers', Colonel Goulier's and other similar distance measuring theodolites which have been brought out since about 1860, or may be the more recent "Milner distance measurer and level." In this connection I would point out, that notwithstanding the superior mechanical skill displayed in the construction of most of the distance measuring instruments hitherto devised, and the fact that many of them have rendered good service when used for reconnaissance field work, and preliminary surveys for projected lines of railways, canals and other important public works, it cannot be denied that they have all proved to be sufficiently wanting in one particular or another, to prevent them from being extensively taken up by professional men, for use in their general practice for the purpose they were chiefly intended by their inventors and constructors, viz., measuring horizontal distances.

I do not intend to describe here in detail the short-comings of each one in particular of the class of instruments referred to so far as I might be in a position to do, for that would be a big undertaking, and I see no practical advantage to be gained by following such a course. I will content mysef by pointing out:

1. That, as a rule, the distances measured with those instruments are not the horizontal projections of right lines drawn between two stations, which alone are necessary for plotting purposes; but distances measured in each case in the direction of the line of sight, which have to be reduced to the horizon and otherwise corrected by means of computations more or less complicated according to the degree of accuracy aimed at.

2. That in nearly all such instruments the measurement of a distance is effected by comparing the micrometrical interval which separates two stadimetrical wires stretched on a diaphragm, with the distance or height intercepted on a carefully divided rod by the visual rays determined by the said wires.

Now, the height intercepted on a rod by two visual rays determined by stadia wires, is directly proportional to the distance from the rod to the anterior focus (in front) of the objective, when an ordinary astronomical stadimetrical telescope is used, and to the distance from the rod to the centre of the instrument, when such centre is rendered anallatical, that is to say, when the summit of the diastimetrical angle is moved from the anterior focus of the objective to the centre of the instrument, viz., by means of an extra lens interposed between the objective and the eye-