

device and some tacheometers of Swiss construction with adjustable stadia wires, as regards the intervening space, so as to secure a constant generating number for one and the same distance, whatever the inclination of the line of sight.

Finally, there have been brought out since 1865, a few instruments which effect the reductions to the horizon entirely automatically, that is to say: where the positions to be given to the telescope to attain the desired end are determined by purely mechanical means, without one having to make either special readings, adjustments or other operations or computations.

In 1865, Mr. Sanguet, the inventor of the instrument which forms the subject of this Memo., constructed a distance measuring instrument to which he gave the name of "Longimètre." Finding that this instrument had certain drawbacks, he modified it in several particulars and then gave to the public in 1866, his self-reducing tacheometer as first constructed by him. Again, at the Universal Exposition held in Paris in 1889, an instrument called Charnot's tacheometer was exhibited which much resembles Mr. Sanguet's original "Longimètre," and although an ingeniously contrived, accurate and fairly serviceable self-reducing instrument in the true sense of the word, presents still some of the defects found to be inherent to the "longimètre," and to the original model of the Sanguet tacheometer, and does not permit of combining hitherto unattained precision with complete and unfailing control of the results in the ordinary run of field operations, with the same extreme facility and feeling of satisfactions as with the more recent perfected self-reducing tacheometer known under the name of "Tachémètre auto-réducteur Sanguet." For this perfected instrument the inventor was justly rewarded with a gold medal at the same International Exposition of 1889, thus receiving the highest honour conferred on exhibitors in recognition of the merits of their contributions.*

After receiving from the Department the necessary authority for the purchase, direct from the makers, of one of these unquestionably original, ingenious and on the whole truly remarkable instruments modified as I had suggested, I lost no time in placing the order for the new "Tachémètre Sanguet" with Mr. Cabasson, of Paris, who is the sole agent for the same.

This gentleman placed me in direct communication with Mr. Sanguet, the inventor himself, with whom I entered into a full discussion of the pros and cons of the proposed modifications and additions to the original model of his instrument as got up for general use in France, with a view of securing a tacheometer: (a.) That would prove especially serviceable for precision levelling and for measuring correctly greater distances than those falling within the every day practice of a surveyor or an engineer at work in thickly settled countries, more particularly such long

* A few years ago a new surveying instrument called the "Universal Tacheograph"—the joint production of Professor Victor Ziegler, widely known as a writer on geodesy, and Mr. C. Hager, a reputed scientific instrument maker of Luxemburg—was introduced into continental Europe and there received with much favour by surveyors and engineers. As its name indicates, this instrument belongs to the class of plane table theodolites, which instruments are intended for use only where the surveys required are of such a nature that the results of the operations performed can be plotted with advantage on the field, directly after being secured. It is stated, however, that there are various forms of such instruments made for special purposes.

The Ziegler-Hager Tacheograph is constructed in some respects on the same lines or according to the same principles as the "Tachémètre Sanguet auto-réducteur," and the chief merits of the two instruments are nearly alike. I am doubtful, nevertheless, whether, on the whole, the former would prove as serviceable as the latter to meet the requirements of the engineering profession in a new, sparsely settled country of large extent.