

For a "rise" reading (uphill), divide the distance measurement by either of the pair numbers used; add height of instrument to quotient; deduct the rod reading belonging to the pair number used as divisor, and the result will be difference in elevation between ground surface at instrument and ground surface at rod. For a fall (or downhill) reading, the same formula applies, except that the rod reading is added and the height of instrument deducted. The reasons on which this calculation is based are quite obvious, and can be readily grasped from the diagram A.

A most important automatic check on each pair of readings, together with the calculated result, can be obtained by unclamping the index and swinging the telescope until the horizontal cross-hair intersects the rod at the exact height of instrument, which is measured by a tape with a plumb-bob attachment hanging beneath centre of instrument. Assuming the H.I. to be 4.85', the leveler moves telescope around gradient limb until he obtains this reading on rod; the vernier is then clamped and the reading on 8. limb taken; this reading is the distance in which a rise or fall of one foot occurs between ground at instrument and ground at rod, so that the difference in elevation (between these points), divided into the distance, should give gradient reading as quotient. This check is especially valuable in tracing clerical errors where the pair numbers are correctly entered, etc., and in obtaining the grades of country traversed with rapidity.

In telemeter work it is necessary to reduce the levels as they are taken in the field. This of course involves constant calculation all day long, but a little practice soon renders it a mechanical process performed mentally, and the prospect of reducing several miles of telemeter levels after reaching camp is a strong incentive to rapid field-work.

As regards the distance that can be covered in a day with the telemeter, the writer has completed nine miles through fairly rough country, but this included the picketing of a line by the writer and his rodman, and the sketching of all topography along the line in a specially designed field book. Generally speaking, the telemeter is at a slight disadvantage with the level in level country, as two readings must always be taken, but this is more than compensated for by distances being obtained without the aid of chainmen; also, all the information is entered in the leveler's field book, and thus condensed. In rough country, however, the telemeter (being able to negotiate vertical heights up to 140 feet in one sight) can leave any level a long way behind, to say nothing of the chainmen. Of course, to obtain a large vertical difference in one sight, a long base is necessary, owing to the fact that the vertical angle increases in direct proportion to distance between rod and instru-