ADJUSTMENTS OF THE COMPASS, TRANSIT, AND LEVEL

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PREFACE.

AN examination of those text-books in which this subject is or should be treated, reveals the fact that it is for the most part very meagrely and arbitrarily presented, sometimes dismissed with the statement that the adjustments should be made by the maker of the instrument. The method, when given, is generally without explanation or proof that it will accomplish the desired object, so that the student must either take the author's word for it, get some one to explain it to him, or work it out for himself; and being usually unprepared for such original work, he is in danger of adopting the first course mentioned, or of leaving the matter in doubt and mystery.

A great source of trouble lies in the fact that such authors are expected to express themselves in accurate terms and do not; the word "half," for example, being so often used for that which is at best but approximately so, that the student marvels at the talisman for such diverse operations being so uniformly that particular fraction.

Perhaps the absence of explanation and proofs of the

correctness of some of the methods is largely due to the difficulty of making the subject clear to those who have not studied Descriptive Geometry. It is believed, however, that one whose attainments in the line of mathematics go no further than through Elementary Trigonometry will experience no difficulty with the following discussion of the adjustments of the three principal instruments used by surveyors and engineers.

This little volume has been called forth by the need of such an exposition of the subject, felt by the author for some time past in presenting the matter to his classes in Engineering, and any suggestions in the line of improvement will be acceptable.

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UNIVERSITY OF TEXAS,
AUSTIN, May, 1886.

ABBREVIATIONS.

A, horizontal axis of telescope (Transit).
B, axis of the level bar (Level).
C, line of collimation (Transit, Level).
H and *V*, horizontal and vertical plane of reference.
I, intersection of *A* and *C* (Transit).
R, plane of revolution of adjusted *C* (Transit).
S, axis of spindle (Compass, Transit, Level).
W, intersection of cross-wires (Transit, Level).
Y and *y*, longer and shorter distances from *B* to the centers of the telescope's wye bearings (Level).
l.t., level tube (Compass, Transit, Level).
l.t.c., level tube-case (Compass, Transit, Level).
l.t.c.a., level tube-case axis (Compass, Transit, Level).

I. THE COMPASS.

1. The Plate-Levels, — *to so adjust them that when their bubbles are centered, the plate shall be horizontal.*

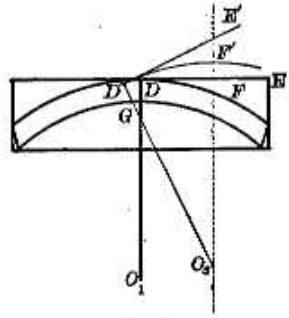

FIG. 1.

Let the *l.t.c.* GE be turned in a vertical plane and about its center G through an angle. The bubble, which was at D, the center of the *l.t.*, will move to a point F' found by raising a vertical through the new position of the center of curvature of the *l.t.* The arc $D'F'$ through which the bubble has moved subtends the angle

$O_2 = DGD' =$ the angle between DE and $D'E'$;