METHODS OF LOCATION, OR, MODES OF DESCRIBING AND ADJUSTING RAILWAY CURVES AND TANGENTS, AS PRACTICED BY THE ENGINEERS OF PENNSYLVANIA

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RAILWAY CURVES AND TANGENTS,

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ENGINEERS OF PENNSYLVANIA,

BY SAMUEL W. MIFFLIN,

CIVIL ENGINEER.

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PREFACE

TO THE FIRST EDITION.

In submitting this work to the public, I do not wish to claim for myself its exclusive authorship. A few of the first solutions were the work of my comrades on the Pennsylvania Railway; these falling into my hands suggested the idea of a complete series of Geometric solutions applicable to all cases that might occur.

In such a work I considered it of importance to dispense with all difficult calculations, and even with tabular statements, which cannot be committed to memory. In this I have fortunately succeeded; there is nothing in the following pages which may not be remembered by an assistant after a short practice, and executed in the field *even if the book be left at home.*

There are a few instances, however, in which a table of chords may facilitate operations, and one has therefore been placed upon the last page for the use of those who prefer it.

EXPLANATIONS.

1. Since all the curves described in this work are circular, the words curve and circle will be used indiscriminately.
2. All measurements are referred to some chord of convenient length as a unit, which may be either the common four pole chain of 100 links, or one of 100 feet, and for brevity sake, the word chain will be used to designate such chord.
3. The angle subtended by the above chord at the centre of the circle is called the degree of curvature, or simply the curvature. A. F. B. Fig. 1.
4. The letters *m* and *n* are used to express degrees of curvature, and when both are used, *m* is the greatest, that is, it belongs to the smallest circle.
5. A central angle is that which a chord subtends at the centre of the circle. A. F. B. Fig 1.
6. A circumferential angle is that which a chord subtends at any point in the circumference. A. E. B. Fig. 1.
7. A tangential angle is the smallest angle made by a chord at its extremity, with a tangent to the curve at that extremity. G. A. B. Fig. 1.
8. A compound curve is composed of two curves of different radii turning in the same direction, having a common tangent at their point of meeting.
9. This point of meeting is called the point of com pound curvature, or simply P. C. C.
10. A reversed curve is composed of two curves turning in opposite directions and having a common tangent at their point of meeting.

11. This point is called P. R. C., or point of reversed curvature.
12. A differential curve is one whose radius is equal to the difference between the radii of any two curves to which it is applied.
13. An integral curve is one whose radius equals the sum of the radii of two other curves.
14. Equivalent arcs or curves are such as subtend equal central angles.
15. Corresponding points in different circles are any points, where the tangents and of course the radii are parallel.
16. The terms origin and termination are used in reference to the course of location. The termination of a tangent being the point where a curve is commenced, and the origin of the next tangent the point where the curve terminates.
17. The origin is also called the point of curve, or point of tangent, or simply P. C. or P. T.

8. If from a point without a circle there be drawn two lines one of which touches the circle and the other cuts it, the rectangle of the whole secant line and the part without the circle is equal to the square of the tangent.

The following Propositions, although not strictly correct, are sufficiently so for all purposes of Location.

9. The central, circumferential, and tangential angles of chords of unequal lengths are directly as the lengths.

10. The radii of circles are directly as their degrees of curvature.

11. The radius of a circle is half the circumference divided by 3.1416.

12. If the chord of one degree be taken as a unit, the circumference may be considered equal to 360.

Hence, the radius is equal to $\frac{180}{3.1416} = 57.30$ and by proposition 10 the radius of any other circle is $\frac{57.3}{m}$

NOTE.—The 9th, 10th and 12th propositions are true to the second place of decimals, so long as m is not greater than 10°, which is double what is required in ordinary cases.