SWITCHES AND CROSSINGS. FORMULAE FOR ASCERTAINING THE ANGLES OF CROSSINGS, THE LENGTHS OF SWITCHES, AND THE DISTANCE OF THE POINTS OF THE CROSSINGS, AND THE HEELS OF THE SWITCHES FROM THE SPRING OF THE CURVE

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Switches and Crossings. Formulae for Ascertaining the Angles of Crossings, the Lengths of Switches, and the Distance of the Points of the Crossings, and the Heels of the Switches from the Spring of the Curve by William Donaldson

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FORMULÆ

FOR ASCERTAINING

THE ANGLES OF CROSSINGS, THE LENGTHS OF SWITCHES, AND THE DISTANCES OF THE POINTS OF THE CROSSINGS AND THE HEELS OF THE SWITCHES FROM THE SPRINGING OF THE CURVE.

BY

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RECAPITULATION OF FORMULÆ IN CHAPTER IV., AND REMARKS ON THEIR PRACTICAL USE.

INTRODUCTION.

In the following investigations, a symbol is used to denote every element, so that the formulæ will be applicable to every gauge, and to every section of rail.

The formulæ are based on the assumption that a sufficient degree of approximation to exactness is obtained by making the sine of the angle of the crossing equal to its circular measure. They have been still further simplified by leaving out all squares, products, and terms of higher dimensions, of the spaces between the centre lines of contiguous rails, when these are not multiplied by factors greater than unity.

All the ordinary cases of junctions, three throws, cross-over and through roads, have been discussed, so that no one who has mastered the method adopted will have any difficulty in making out similar formulæ for any special cases which may arise.

rail of the main line by the n^{th} rail of the branch, the suffix n referring to the number of the branch rail, and the power m to the number of the main-line rail. Thus, the symbols denoting the crossings of the main-line rails by the branch rails, will be:

Single-gauge Roads.

Case I.—Single-line junction, c_1^2.

Case II.—Double-line junction, $c_1^2\ c_1^3\ c_1^4$, $c_2^3\ c_2^4$, c_3^4.

Double-gauge Roads, one Rail common to both Roads.

Case I.—Single-line junctions, $c_1^2\ c_1^3$, c_2^3.

Case II.—Double-line junctions, $c_1^2\ c_1^3\ c_1^4\ c_1^5\ c_1^6$, $c_2^3\ c_2^4\ c_2^5\ c_2^6$, $c_3^4\ c_3^5\ c_3^6$, $c_4^5\ c_4^6$, c_5^6.

Although in a single-line junction there cannot be more than two or three, and in a double-line junction more than four or six, branch-road rails, since the branch-road rails after leaving the main-road rails which they touch, may cross other roads parallel to the first, there may be any number of main-road rails. These are numbered in sequence after those in contact with the branch-road rails.

The symbol c_n^m is likewise used to designate the circular measure of the angle of the crossing of the m^{th} main-line rail by the n^{th} branch-line rail, and also its position on any plan of the roads.

The points, where the centre lines of the 1st, 2nd, 3rd, &c., rails of the branch road touch the centre lines of the 1st, 2nd, 3rd, &c., rails of the main line at the springing of the curve, are designated by the symbols S_1, S_2, S_3, &c., and the positions of the heels of the switches of the 1st, 2nd, 3rd, &c., main and branch rails by the symbols H_1, H_2, H_3, &c.

The points, where normals through the springing of the branch curve and through the heels of the switches cut any main-line rails parallel to those, which the branch rails meet at a common tangent, are likewise designated by the symbols S_m, &c., H_m, &c., respectively, the suffix m referring to the number of the main-line rail.

Symbols which have the same Meaning for both Single and Double-gauge Roads.

R = radius of main-line curve.
r = radius of branch-line curve.
s = interval between the centres of the contiguous inner rails of a double line, commonly called the six-foot.
t = thickness of upper flange of rails.
c = clearance between the rails at the heels of the switches.

Special Symbols for Single-gauge Roads.

g = interval between the centres of the rails, which regulates the gauge, hereafter called the gauge.

Special Symbols for Double-gauge Roads, in which one Rail is common to both Roads.

g = interval between the centres of the rails, which regulates the gauge of the wider road, hereafter called the gauge.
d = interval between the centres of the two rails which are not common to both roads.

Other symbols occur, which refer to special cases, and are explained in the sections, which discuss those special cases.

CHAPTER II.

SWITCHES.

SECTION I.—LENGTH OF SWITCHES AND POSITION OF HEELS OF SWITCHES.

IT is in practice impossible to use switches of the length theoretically required to make both roads perfect, unless the curve of the branch line is very sharp, or is leaving a main-line road which curves in the opposite direction. A limit of deviation from correct curvature must therefore be fixed upon, and the condition which determines the minimum length of switch is simply that this amount of deviation is not to be exceeded.

Whatever length of switch may be adopted, the heel of the switch must be in its proper position; that is, at the point where