amount of left deflection given—the amount can easily be determined thus:—

The height of tangent scale for any degree of elevation is given with sufficient accuracy by the rough rule for circular measure λ X R

⅞ = ———- where *a* is the angle of elevation in minutes, *h* the height of the tangent scale, and R the sighting radius; thus for ι0r ⅛ Now supposing the sight is inclined 1° to the left,

which will move the notch from H to H' (see fig. 6); as before HH'=^, but in this case r=⅞°⅞∙'∙hh'=~~6~~~~0~~~~×60~~, the resultant angle of deflection is HFH', and this can be determined by the same formula but in this case *h* = HH' = ~~6~~~~0~~~~χ6~~~~θ~~

=1', so that if the sight is inclined to the left 1° it will R x 3600

give 1' deflection for every degree of elevation. By the same formula it can be shown that 1' deflection will alter the point of impact by 1 in. for every 100 yds. of range; thus the proper in­clination to give a mean correction for drift can be determined. In the early R.B.L. guns this angle was 2° 16'. With rifled guns deflection was also found necessary to allow for effect of wind, difference of level of trunnions, movement of target, and for the purpose of altering the point of impact later­ally. This was arranged for by a movable leaf carrying the sighting V, worked by means of a mill-headed screw provided with a scale in degrees and fractions to the same radius as the elevation scale, and an arrow­head for reading. Other improvements were : the gun was sighted on each side, tangent scales dropping into sockets in a sighting ring on the breech, thus enabling a long scale for all ranges to be used, and the foresights screwing into holes or dropping into sockets in the trunnions, thus obviating the fouling of the line of sight, and the damage to which a fixed muzzle sight was liable. The tangent sight was graduated in yards as well as degrees and had also a fuze scale. The degree scale was subdivided to 10' and a slow-motion screw at the head enabled differences of one minute to be given; a clamping screw and lever were provided (see fig. 7).

Fore-sights varied in pattern. Some screwed in, others dropped into a socket and were secured by a bayonet joint. Two main shapes were adopted for the apex—the acorn and the hogsback. Instruction in the use of sights was based on the principle of securing uniformity in laying; for this reason fine sighting was discountenanced and laying by full sight enjoined. “ The centre of the line joining the two highest points of the notch of the tangent sight, the point of the fore­sight and the target must be in line ” *(Field Artillery Training,* 1902) (sec fig. 8). Since the early days of rifled guns tangent sights have been improved in details, but the principles remain the same. Except for some minor differences the tangent sights were the same for all natures of guns, and for all services, but the develop­ment of the modern sight has ‘followed different lines according to the nature and use of the gun, and must be treated under separate heads.

*Sights for Mobile Artillery.*

With the exception of the addition of a pin-hole to the tangent sight and cross wires to the fore-sight, and of minor improvements, and of the introduction of French’s crossbar sight and the reciprocating sight, of which later, no great advance was made until the introduction of Scott’s telescopic sight. This sight (see Plate, fig. 9) consists of a telescope mounted in a steel frame, provided with longitudinal trunnions fitting into V’s in the gun. These V’s are so arranged that the axis of the sight frame is always parallel to that of the gun. By means of a cross-level the frame can be so adjusted that the cross axis on which the tele­scope is mounted is always truly horizontal. Major L. K. Scott, R.E., thus described how he was led to think of the sight : “I had read in the *Daily News* an account of some experimental firing carried out by H.M.S. 'Hotspur ’ against the turret of H.M.S. 'Glatton,' At a range of 200 yds. on a perfectly calm day the ‘ Hotspur' fired several rounds at the 'Glatton’s’ turret and missed it.” Major Scott attri­buted this to tilt in the sights due to want of level of mounting *(R.A.I. Proceedings,* vol. xiii.). Tilt of sights in field guns owing to the sinking of one wheel had long been recognized as a source of error, and allowed for by a rule-of-thumb correction, depending on the fact that the track of the wheels of British field artillery gun-carriages is 60", so that, for every inch one wheel is lower than the other, the whole system is turned through one degree—

α = ~~^X~~ ~~1~~~~2θ~~~~θ~~ ~~—~~ = ⅛χ6o = 6oz or ι0, as *h* is 1 inch.

Referring to the calculations given above, this is equivalent to 1' deflection for every degree of elevation, which amount had to be given towards the higher wheel. This complication is eliminated in Scott’s sight by simply levelling the cross axis of the telescope. Other advantages are those common to all telescopic sights. Personal error is to a great extent eliminated, power of vision extended, the sight is self-contained, there is no fore-sight, a fine pointer in the telescope being aligned on the target. It can be equally well used for direct or indirect, forward or back laying. A micrometer drum reads to 2', while the vernier reads to single minutes so that very fine adjustments can be made.

Disadvantages of earlier patterns were, the telescope was inverting, the drum was not graduated in yards, and drift not allowed for. These defects were all overcome in later patterns and an important addition made, viz. means of measuring the angle of sight. In speaking of quadrant elevation a brief reference was made to the necessity for making an allowance for difference of level of gun and target. Figs. 10 to 13 explain this more fully, and show that for indirect laying the angle of sight must be added to the angle of elevation if the target is above the gun, and subtracted if vice versa. In Scott’s sight, mark iv., there is a longi­tudinal level pivoted at one end and provided with a degree scale up to 40; the level is moved by a spindle and micrometer screw reading to 2'. If now the telescope be directed on the target and this level be brought to the centre of its run, the angle of sight can be read— if afterwards any range ordered is put on the sight and the gun truly layed, this bubble will be found in the centre of its run—so that if thereafter the target becomes obscured the gun can be relayed by elevating till the bubble is in the centre of its run, or at a com­pletely concealed target the angle of sight can, if the range and difference of level are known or can be measured from somewhere near the gun, be put on by means of the micrometer screw, and the gun subsequently layed by putting the range in yards or degrees on the sight drum and elevating or depressing till the bubble is central. The disadvantages that still remain arc that the sight has to be re­moved every time the gun is fired, and the amount of deflection is limited and has to be put on the reverse way to that on a tangent scale. Scott’s sight, though no longer used with quick-firing guns, is the precursor of all modern sights.