In the triangle I a I′, being given the side a I and the angles a I I′ and I a I′, it is required to find the side I I′.

$$I\,I' = \frac{I\,a \sin I\,a\,I'}{\sin I\,I'\,a}$$

I a = 29.97 ..... log 1.476687
I a I′ = 1° 20′ 44″ .....log sin 8.370740
9.847427
I I′ a = 170° 29′ .....log sin 9.218363
I I′ = 4.256 ..... log .629064

On the gauge of the engine track this distance was laid off **back** from the intersection point, giving the point of frog one for the turntable track.

The frog points for the water and coal tracks, numbered respectively J and K, were staked according to the table, the hypoteneuse distance being used. Then came about the alteration in plan which has been mentioned. The distance between the turntable and water tracks, originally 14 feet, was changed to 15 feet. This would require that the distance between frog points J and K should be 105.6 instead of 98.5, and the point K moved ahead 7.1 feet. This could not be done, owing to the fixed position of Frog L leading on to the repair track, which point was found by intersecting the gauge-lines of the engine and repair tracks. By allowing the shortest possible distance between heel of frog and point of switch the frogs J and K were both moved back towards I, so that only a surplus of 0.5 feet was left. This was eliminated by shortening the lead of Switch L.

Point of Frog M was next set by allowing the switch to lead off at a convenient distance from the heel of Frog L, and Frog N staked similarly.

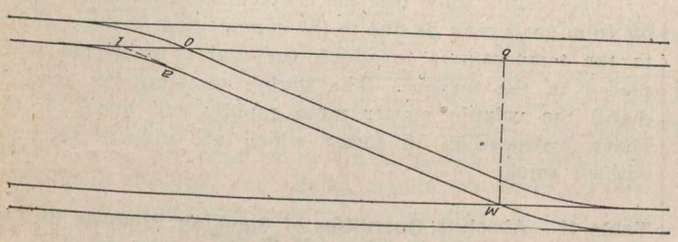

Fig. 7.

The cross-over from Frog M to Frog O was laid out as follows: The transit being set on Frog M, the angle 8° 10′ was deflected and an intersection made with the gauge of siding No. 8 at I′.

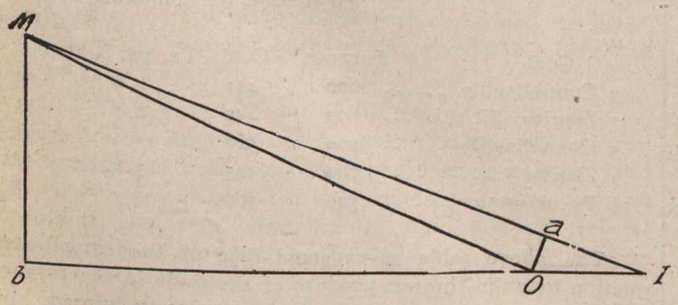

Fig. 8.

In the triangle a O I given a O and the angle a I O it is required to find O I.

$$O\,I = \frac{a\,o}{\sin a\,I\,O}$$

a O = 4.708 ..... log 10.672836
a I O = 8° 10′ 16″ .....log sin 9.152685
O I = 33.13 ..... log 1.520151

This distance (3,373 feet) was measured back from I on the gauge line setting the point of Frog O. The method of measuring b O as given in text books is only applicable when the parallel tracks are already in and level to centre. If no instrument is available, the point can be accurately set by measuring the three sides of the triangle M b, M O and b O.

In the triangle M I b the perpendicular M b and the angle M I b are given it is required to find the side b I.

$$b\,I = \frac{M\,6}{\tan M\,1\,6}$$

b 1 = 26′ 4.70 = 21.3 ..... log 11.328380
M 1 b = 80° 10′ .....log tan 9.157116
b 1 = 148.34 ..... log 2.171264
b O = b t — O_1 = 148.34 — 33.13 = 115.21.

In the triangle M O b—

$$M\,O = \sqrt{M\,6^2 + 6\,O^2}$$
$$= \sqrt{(21.3)^2 + (115.21)^2} = 117.16$$

For Frog P the transit was set over the centre of the pit and the frog angle deflected from the centre line of the turntable track; then the gauge line was offseted and an intersection made with the gauge of the water track, the distance being checked as per table.

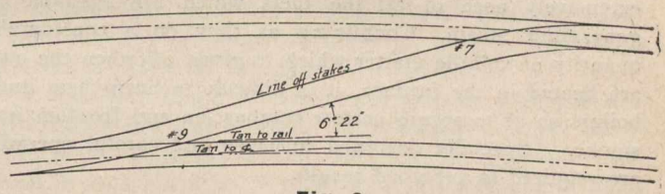

Fig. 9.

The cross-over on the south side of the station was staked out as on repair track, but the one on the north end was rather complicated. These cross-overs were not shown on the original plan, and Frog H came on the easement curve, so, to simplify the laying out, it was considered as being on tangent, necessitating about a hundred feet of 2° curve to connect with the central curve of 3°. Afterwards this proved rather awkward, as it brought the siding frog on a 2° curve, with 16½-foot centres and the main line frog on a 3° curve with 15-foot centres.

There appeared to be no simple mathematical solution, so careful platting was tried. This was not quite a success, owing to the difficulty of working with such small angles and flat curves, as, on a scale of 10 feet per inch, a 2° curve is practically a straight line. Recourse was then made to a method of trial and error in the field. Centre stakes were set on each of the two curves, 10 feet apart, and at the probable position of frogs the gauge of rail was laid out every two feet by ordinates offset from the 10-foot chords, and the Frog S set at a safe distance from the switch points on the siding. A tangent to the 3° curve at the centre opposite the point of frog was run and a parallel line offset through the same point, from which the frong angle 6° 22′ was deflected, as shown in Fig. 9, and stakes set to sight by.

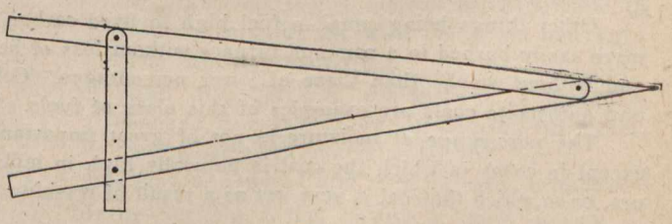

Fig. 10.

A frog-board, adjustable to a spread of 1′.7 and 1′.9 was moved too and fro on the gauge of the siding. The spread of 1′.7 fitted best at a certain point, and a stake was set for a No. 7 frog, and carefully referenced. The distance