Note.—The sum of the short tangents has no relation to the sum of the sub-tangents to the curve.

You will have noticed that the stakes were offset to the curve, if required; that has not been the custom; on the contrary stakes are set in the lines as cut, but with the initial letter before the station numbers omitted, and with the words "offset Left — ft." written on the back of the stakes, except on those stakes set where the tangents touch; these are fully marked, thus, L. 326 + 62.

The reasons for this: Offsets at an exact right angle are often not practicable because of the trees. (For this reason also a close calculation of abcissa is not made, that for the nearest five-foot being deemed sufficient.) The rodman and leveller readily find the stakes in this position, and use them—which is, perhaps, doubtful in the case of stakes hidden in underbrush; the topographer also has definite points and elevations to work from. The rear chainman has an undisturbed point at which to hold the chain; these stakes are left standing and are verified by the topographer; the chainmen know that this will be done. Foremen of clearing gangs, when properly instructed, have no difficulty in laying out the right-of-way correctly.

The chief instrumental advantages of this method, in rough ground covered by trees or broken by water, cliffs, etc., are the avoidability of short sights and the latitude possible in the choice of ground for the transit points. Curvature being introduced, largely to avoid obstructions, and the curve running around the hills, the tangents are often in better ground, being outside the curve, whereas the long chords being inside often cut across very bad ground, indeed.

It might be noted, too, that for equal lengths of abcissa to a curve, there is always one less transit point by this method than by that of a chord method.

Other advantages are: The picketman and axemen do not wait for the chainage, but cut ahead to any point at the discretion of the picketman. The chainmen have plenty of time to properly do their work, and do not delay others, as the chainage of the hub at the end of the line is not required until the transit is brought forward and set up, except in one case, ie., the final hub.

One transit point alone, no matter how long the curve (except it be compounded, when two are set) demands exact placing, and, that being an unusual operation, is more likely to be properly performed. A chainman who will insist on and will secure the exact setting of a point when it is a duty repeatedly performed is a jewel rare. Errors of considerable magnitude are liable to occur, especially when one of the party is an habitual talker, the fascination of a joke completely dulls the fine edge of observation; a hub may be driven plumb, or when driven be several inches out of place, and the point taken on it anyhow, so that the point of the joke be not missed.

The procedure, to emphasize the idea in all minds, that this is an important duty and one that must be done properly, has been as follows: When a hub is to be set to chainage, the chainmen first lay off the correct plus; the picketman drives the hub, the chainmen lay off the plus again, marking a line at right angles to the transit line across the hub; the picketman takes point therein; if for any reason the hub does not contain both, the operation is repeated until it does. The essential feature of this is, that the chainmen, who are held responsible, shall repeat the measurement as often as necessary, and shall remain in position to repeat it until after the signal has been given for the transit to come ahead.

The transitman, when in position to look back along the line, sets his vernier at 180°, sights back, and revolves the upper limb, but does not plunge the telescope; his vernier is now at 0°, and the angle is set off by direct reading. This was found necessary, as the cross-hair diaphragms of the instruments supplied were much too thin, and in the extreme changes of temperature (often 40° in a morning and as much in the afternoon) considerable hourly variations in the line of collimation were found.

The chainmen have been required to blaze a large tree on that side facing the hub, and to mark thereon all information, as at P C.: "P. C. 3° C. Left 50°," or as at transit point: "T. P. A. Left 18°.09′. 323 + 62.1 = 323 + 56.9."

The picketman's instructions included the following:—

Hubs shall not be set, where avoidable, in soft ground or in ground that is worked by the roots of a wind-swayed tree, nor point taken on a stone nor on bare rock. (It is possible that tangential transit points, being, as they are, distant from centre line, may remain through construction days and furnish permanent reference marks.)

Hubs shall not be set, when approaching a steep rise, close up to the foot of it, but far enough back therefrom so that the transit may be able to see to the top of it, nor so far beyond the crown of the rise that more than two feet, at the foot of the picket, is hidden from the transit thereby.

A general order to all: No one shall stand in the line, neither between the picket and the transit, nor behind either, that their signals may not be obscured.

This method may be combined with the chord method by setting a hub at any C. P. and then proceeding in the usual way, and may be used at any time in avoiding obstructions, etc.

In the event of an inaccessible P. C., the tangent is produced to a convenient point, the proper angle turned there and a point on curve set; thence the remainder of the curve is run in.

Should an obstacle cover the P. C. and prevent the production of the tangent, a hub is set in the tangent, an angle turned, and the proper tangential distance set out therefrom; through the latter point a line is run parallel to the tangent, whose length is equal to that tangential length already laid out, plus the distance from hub on tangent to P. C. This is now a point on curve, and a line through it parallel to the sight line off the tangent is also tangent to the curve, so that the remainder of the curve may be laid out therefrom as desired. An obstacle within the curve may be avoided by following a tangent from any suitable point on the curve until that obstacle is passed, thence setting a point on the curve and continuing as usual.

The field book published by Edward Butts contains a table of tangents and arcs for each minute of deflection for curves of whole degrees from this by inspection or by simple multiplication one obtains the angle and arc corresponding to the stated tangent.

PLANS FOR CONSERVATION OF SWEDISH FORESTS.

The Swedish Central Statistical Bureau has sent in to the Government a very extensive report about the state of the Swedish forests. From this it appears that the lumber cutting has been exceeding the growing capacity of the forests, and that the stock of raw material is steadily sinking. The yearly gross capacity of the forests is calculated at 34,530,000 cubic metres. All of this, however, cannot be utilized, partly on account of too expensive transport and partly for other reasons. Enormous quantities of the wood rot away in the woods, in some distant districts even from 20 to 40 per cent., reducing the effective production thereby to 29,336,000 cubic metres.

According to investigation, it is calculated that the yearly consumption amounts to at least 3,300,000 cubic metres, partly for home use and partly for export. Quite a considerable overproduction thus takes place, and this is the case especially with the forests of the farmers, as the cutting there goes on without system and without thought of the future. The Bureau, therefore, points out the necessity of special laws for the maintenance of the forests, and urges the Government to buy up as much of the forests as possible.

The quantity of timber cut in the forests of Japan during the year ending March 31, 1907, was valued at $17,004,288 currency. As might be expected, the public treasury has considerable interest in the receipt of dues on all timber that is cut.