Frederick P. Leavenworth Papers.

[redacted]

vol.5

1853
December
17th — To Madeline

" — et me linger yet a moment longer
" — not hence depart while thou doth stay;
stronger
" — each glance I feel the chain grow
" — inds thee to me—cast me not away!

———•———

beaming
" — et me linger yet, thine eyes stars
rest
" — Love's own sweetness when on me they
seeming
" — t me not away—though careless
breast
" — heart is throbbing wildly in my

———•———

" — t me linger yet, thy lip is wearing
we met
" — inning smile it wore when first
" — t me not away—my heart is breaking
get
19th — e linger, let me — let me linger yet.
Δ.
" — bry }
" — 17, 1854 }
"
"
20—23
"
"

w. Con-
to the
Poom
the Cap-
father
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"Deliver
terrible
~~but~~
L. Perry
rder,
good
to as far

To Madeline

Oh! let me linger yet a moment longer
I cannot hence depart while thou doth stay;
For in each glance I feel the chain grow stronger
That binds thee to me—cast me not away!

Oh! let me linger yet, thine eyes are beaming
With Love's own sweetness when on me they rest
Oh! cast me not away—though careless seeming
My heart is throbbing wildly in my breast

Oh! let me linger yet, thy lip is wearing
The winning smile it wore when first we met
Oh! cast me not away—my heart is breaking
Let me yet linger, let me—let me linger yet.

Δ.

Petersburg }
Jan 7th 1854 }

Jan
13 Wrote to Mrs. C Apperson about the
" school
16th Went to Richmond. Saw Wm R.
" Drinkard. Lewis McKenzie Mr Paxton
" Hon Wm Smith (Extra Billy) and others.
" Returned to get a hearty wel-
" come from all at home
21st Richmond Saw Chs Ellet
Mr Manning McKenzie
C. B. Fisk & others Col Crou-
Phil Harrison C. Engs &c

26th Thursday. Peace and Quiet, and
" no disturbing causes at work.

1854
Feb 4th
"
"
"
"
"
"
"
"
"
5th
"
"
"
"
"
"
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6th
"
"

23rd Arrived mission
25th Sent money

Frederick P. Leavenworth
Jan 23rd 1856

.25
.08
.12
.28
.12½
.05
38
25
25
50
200
.05
.12½
10
37½
12½
10
.08
25

unions documents see
company examined" further in libray

(See about Baxter
chinecl porkag
Tract for do)

11.00	Habits	Shafer
1.50	do	
1.50	Hosiery	Jim a
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See about Baxter
See about negroes
See about

Dan

Dr Mallory
Post Ave PPR

T. The Georges Pinch.

II.

The most perfect alignment of a R.R, is that in which the termini are connected by a straight line.
As from the irregularity of the surface of ground, &c this condition can seldom be answered, the alignment is usually composed of a number of straight lines, the connection between which is formed by arcs of circles. to which, the straight lines are Tangents

When the ground is of such a nature that a continuous arc will not intersect the required points, a compound curve is used. formed by connecting two or more arcs of different radii, and having a common normal at their point of connection.

Art. II

A Knowledge of the following properties of the circle, is necessary to the proper understanding of the subject.

Fig1. Theor.I

The angle of Deflection between two equal and continuous chords, is measured by the arc which is subtended by either of the chords:

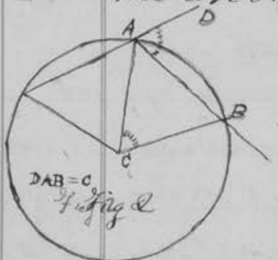


Fig 2

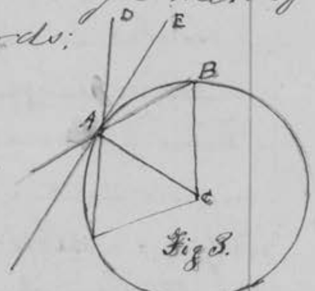


Fig 3.

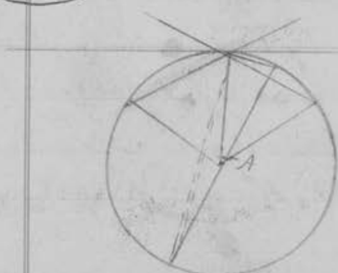


Fig 1

Theor 2 Fig 3.

If there be a tangent line and a chord from the touching point, the angle of deflection from the chord into the tangent is one half the angle of deflection between two such equal chords.

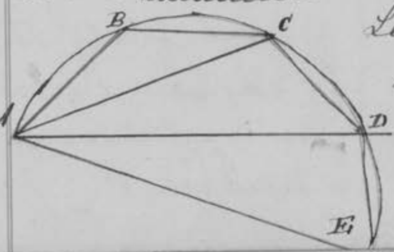
II III.

Theor 3.

Any line bissecting an angle of deflection formed by any two equal chords, is tangent to the arc at the point where the chords meet, and such angle thus formed, will be measured by one half the arc of either chord, when the arc does not exceed a quadrant

III Tangent lines from the two extremities of any arc, form equal angles with the connecting chord; each being equal to one-half the intercepted arc.

Any angle at the circumference standing upon a given chord will have a constant value for all positions of that chord upon the circumference; and this constant value is equal to one-half the arc subtended by the given chord. Art. II III.



Let any number of straight lines AB. BC, CD &c be connected in such a manner at their extremities that the angles at A, may be equal each to the other; it then follows from Theor. IV Art 2nd that the points A. B. C. &c will all be in the circumference of the circle. This is the method by which curves are traced with a Transit Instrument, with a chain whose length is AB, BC, CD &c, the Transit setting off the equal angles at A, and as many stations as may be set, as may be seen from it.

Art 4

In the succeeding articles, all the measurements are supposed to be made in chains and decimal parts of a chain so that the curvature of a line traced as in the last article can only be made variable by changing the values of the equal angle at A. These angles therefore are called the modulus of curvature, and will always be denoted by T.

Practical Rules for running Curves with the Transit.

Notation

T = The Modulus of Curvature.

D = The Number of Degrees in a given curve

n = The number of chains in a given curve.

m = The number of chains in a second curve, when two curves are under consideration.

E = The degrees of inclination of any chord to the original tangent (The original tangent is that on which a curve commences.

L = The degrees of inclination of two Tangents

K = The approximate departure or distance of any point in a curve from the tangent produced

q = 0.01745 = sine of 1°

W = The distance between the m^{th} and n^{th} chain of two curves having a common radius

T' = The modulus of a second curve when two curves are under consideration

H = The distance on the same tangent between the origin of the two curves

D' = The angle of inclination of one straight line to another straight line.

DEFINITIONS

ANGLE OF DEFLECTION

An angle of deflection is an angle made at the touching point by a line with any other line, Fig 1.

produced. Thus, D, is the angle of deflection of BC from AB.

The Tangent point (TP) is the point in the straight line, at which a curve commences. A curve takes its name from the number of degrees deflected by one chord, one chain in length from another chord; one chain in length; thus, if the deflection is one degree, the curve is called a one-degree-curve, if 3°, the curve is called a 3°-curve, and generally if the deflection = D', the curve is a D' curve (we will call it the

RATE OF CURVATURE

rate of curvature. All dimensions are given in chains

Chain-100 ft

and decimals of a chain, which is 100 ft. long 2x. 240 ft = 2.4 ch.

TANGENTIAL ANGLE.

A Tangential Angle is the angle of deflection of a chord from the tangent, and vice-versa.

MODULUS OF CURVATURE

The "Modulus" of Curvature is equal to the Tangential Angle. It is also equal to one-half the rate of curvature; also to one half the angle of deflection between two chords each one chain in length.

COMPOUND CURVES

A Compound Curve is composed of curves of different "Moduli" or "Radii", turning in the same direction, and having a common normal, or common Tangent at their points of change. This point is designated by P.C.C.

REVERSED CURVES

A Reversed Curve consists of two curves going in different directions, and having a common tangent at their point of reversion. This point is designated P.R.C.

ORIGIN OF A CURVE

The Origin of A Curve is the point in the Tangent at which it commences. It is designated by T.P.

Fig 7. Suppose that having traced a straight line to station 10th it becomes necessary to change the direction and curve to the right. We set the instrument plumb over Station 10. and having levelled it and adjusted the telescope glasses we sight back to some point in the straight line, (say to the flag held at station 8) the further back the better. The index standing at zero. Clamp the instrument and reverse the telescope, and it will now point in the direction of the tangent produced.

PRACTICAL WORKING OF CURVES

The Rate of Curvature being ascertained, deflect its half - that is, deflect the Modulus - In Fig 1 the rate is 20°. Modulus = 10° Deflect then 10°, and measure one chain, one end of the chain being held at Sta. 10. and the other carried round (Keeping the chain stretched) till it coincides with the cross hair at sta. 11. Repeat the deflection 10°, and the index will read 20° chain in the same manner from sta 11 to 12, and another point is determined. Again repeat the deflection (10°) - the index will now read 30°, and another point is fixed at sta. 13. Repeat the deflection 10° the index will now read 40° - another point is fixed at sta. 14.

MOVING UP THE INSTRUMENT

We will suppose that the next point cannot be seen from the instrument; it will therefore be necessary to move up. Set up the level, and adjust the transit over sta 14. Set the index back 40° the other side of zero

INDEX BACK

INDEX

Sight back to sta. 10. Clamp it. Reverse the telescope, and set the index at zero, you will then be in the direction of the tangent, having deflected 40° = the inclination of the new to the original Tangent (vid Theorem IV.

The instrument being in the direction of a tangent is evidently in readiness to run a straight line; to run a new curve to the right or left, or to continue the same curve; in the present case we do the latter.

COMPOUND CURVES.

Work from the new tangent precisely as you have done from the original tangent and continue the curve to station 17 which we propose to make a P.C.C., and alter the rate of curvature to 10°. Set up the instrument on station 17 and sight back to any station in the curve, having first moved zero on the plate back of zero on the limb, the number of degrees deflected from a tangent at that station, to sta. 17 — in the present case we sight back to sta. 14. = 3 chains (300 ft) — the deflection is 3 × 10°. Therefore set the plate at 30° and deflect to the right, into the new tangent, the instrument will stand at zero, and we are ready to continue the line.

We now propose to make the rate of curvature 10° — we therefore deflect 5°, and measure one chain (100 ft) which will fix station 18. Repeat this operation and fix sta. 19

At sta. 19 it is proposed to

REVERSED CURVE

reverse the curvature to

INDEX

the left. Therefore move the instrument, set it over ~~sta.~~ station 19, adjust it, set the index back 10° the other side of zero. sight to sta. 17 and turn the plate 10° (to) Right, which will bring it at zero. We are now in the direction of a new tangent, run from this tangent precisely in the same manner as from the others, with the proper rate of curvature, which is in this case 20°. The total deflection from the tangent to sta. 22. (for a 20° curve = 30°. Move up, and sight back to any point in this new curve — say station 19. Move the plate back so as to read 30° the other side of zero, and deflect 30° to zero — and you will be in the tangent — in that direction run the straight line.

CHECKING THE OPERATIONS WITH THE NEEDLE.

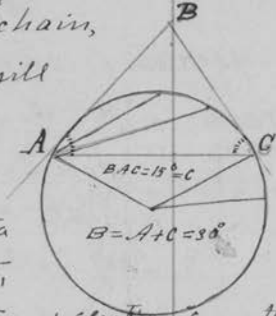
Whenever the instrument has been moved up, observe the Magnetic bearing of the New Tangent. Compare it with the magnetic bearing of the last tangent, and if any material mistake has occurred in deflecting it will, thereby, be detected. This should never be neglected, as much trouble will thereby be saved

EXAMPLE OF VERIFYING WORK BY THE NEEDLE.

For example, suppose that from a tangent, the bearing of which is North, You run five stations of a 6° curve, to the right the bearing of the Tangent at the end of the 5th chain in the curve is N. 30 E. If the needle points thus the work is very nearly correct, if not go over the curve again, and detect the error

TO RUN CHORDS LESS THAN ONE CHAIN IN LENGTH.

Should it be necessary to run chords less than one chain, the deflection will be proportional; for example, in a 4° curve with a chord of 25 feet,



= 0.25 chains the deflection from the tangent is 1/4 of the modulus 2° = 0°30'.

BACK SIGHTS

In taking back sights, a point as remote as is convenient, should be selected for the reason that small errors may occur in plumbing the Instrument, and in taking the Back sight to the centre peg the probability of which errors will evidently be diminished as the distance is increased.

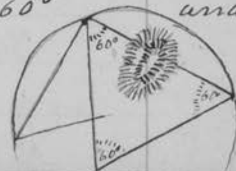
TRANSIT MUST BE CAREFULLY LEVELLED

In sighting at a point out of the horizontal plane of the instrument, care should be taken that the plate is level as otherwise it is obvious that the telescope will not revolve in a vertical plane, and more or less error would result.

INSTRUMENT NOT ADJUSTED USE FORE-SIGHTS

Should it be ascertained that the transit is out of adjustment and cannot conveniently be adjusted in the field — foresights should be used in place of back sights that is send the flag ahead before moving, and produce the line to be deflected from at the next setting of the instrument.

Suppose that in Fig — some obstacle (presents itself) prevents the continuation of the curve in the usual manner. Move up to the nearest practicable station and then deflect as (the next setter) usual. one chain from this line deflect 60° and make a point 1 chain distant,



and

move up, sight back to the last point, and deflect 60° and measure 1 chain (100 ft) towards the point in the course which is sought, measure one chain and the point will be determined. At this point a deflection of ——° (degrees) will be in the direction of the next chord in the curve.

USEFUL FORMULAS.

I.

TO FIND NUMBER OF DEGREES IN A CURVE.

$$D = N \times 2T$$

Num. of Deg in a Curve = Num. of ch × Twice the Modulus

This Formula gives the number of degrees contained in any arc when the modulus & number of chains (100 ft) are known.

Example: In 10 chains of 2° curve, there are 10×2° = 20°

II.

$$\tfrac{1}{2}D = n \times T$$

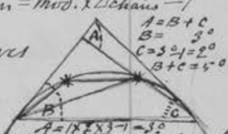
Half the Deg. in a curve = chains × by Modulus of curve

This formula gives the number of degrees of deflection from any chord into a Tangent. Example: If I sight back to a point in a 2° curve, 10 stations back from the Transit (standing upon a point in the curve) the deflection into the tangent will be 10×1° = 10°

III

$$E = T \times 2n - 1$$

Deg. of incl. of chord to orig Tan = Mod. × 2ce chains in curve − 1



This Formula gives the inclination of any chain to the original tangent. Example. The inclination of the 10th chain in a 2° curve to the original tangent $= 1° \times \overline{2 \times 10 - 1} = 19°$

IV

$$D = 2T'n$$

Num of Deg. in a curve = 2ce the Mod. into num. Ch.

This formula gives the degrees of inclination of one tangent to another. Ex. Having run from a Tangent 10 chains 1000 ft of 2°, curve, the inclina

-tion of a new tangent at the end of the 20th chain, to the original tangent, is $10 \times 2 \times 1 = 20°$

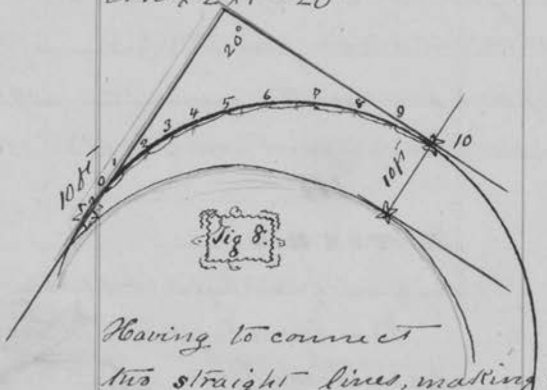


Fig 8.

Having to connect two straight lines, making with each other, an angle of 20° I commence a 2° curve at 0 and run ten chains to sta. 10. On moving up my instrument, I find my deflection has been correct, that my tangent has the proper direction and is parallel with the line required, but does not coincide with it agreeably to Formula V. I turn in the direction of the original tangent, and on that line measure off the distance to the required

Point of CURVE

line. If I find it 10 feet, I go back and commence the second curve 10 ft. back or forward, (as the case may require) of the point first assumed (0) and having run 10 chains of a 2° curve I will come into the required line

To find the P C or the distance CB.

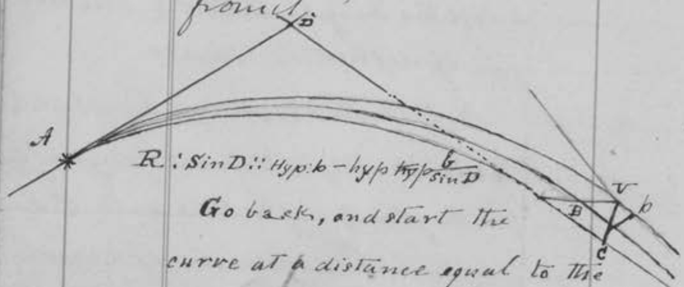
The angle BAD is equal to the angle of deflection ECD and the angle $BAC = \frac{1}{2}$ the angle of deflection – hence

R : to AB :: Tang ½ Ang of Def : BC

Rule, Multiply Natural Tangent of 1/2 Angle of deflection into Radius. If the circumference of a circle be divided into 360 parts. The Radius will contain 57.3 of these parts nearly, for a

Circ : 2 Radius or Diam. :: 3.1416 : 1, or $R = \frac{360°}{2 \times 3.1416} = 57.3$ If each of the 360 parts contains 100 ft. then Radius = 5730. Hence, in running a line, an off-set of 1 in 57.3 or 7 in 400 nearly, or 1.75 in 100 ft is equal to a deflection of 1°.

Suppose that the curve comes out beyond the tangent in a tangent parallel to the proper one at a distance, b, point, D



$R : \sin D :: Hyp : b \quad hyp = \frac{b}{\sin D}$

Go back, and start the curve at a distance equal to the hypoth., back of the station point or you can obtain the same distance by placing your Inst, at the point V, and sighting it along a line parallel to tangent A. The distance from V, to where the line intersects the proper tangent is the required distance.

Angle at V = 90° − D, hence R : Tan V :: Side b : Side C

c = b × tan V. Hence start the curve at a distance C, back of the foot of the perpendicular b, and run it backwards. It will prove the same as above.

CUT & FILL.

<u>Formula for finding</u> <u>cut or fill</u> when the area in sq. feet is known

$y = \sqrt{\frac{4}{3}\,\text{area} + 144} - 12$ in Excav.

$y = \sqrt{\frac{3}{2}\,\text{area} + 16} - 4$ in Embank.

y = representing cut or fill.

ELEVATION OF RAIL.

For different degrees of curvature: In a 10° curve, the outer rail is to be raised 0.20 above the inner or raised ~~the inner~~ 0.10, and the inner depressed 0.10.

8° & 5½° curve, same as above

3°	the outer rail elevated	0.20
2°	" " "	0.18
1½°	" " "	0.15
1°	" " "	0.06
½°	" " "	.04

Intermediate curves proportional.

GAIN IN LENGH OF RAILS IN A CURVE

In a 10° curve, the outer rail gains 0.872 per station or 0.1744 or 2 inches per 20 feet, ¼ inch per tie (2½ ft from centre to centre.

8° curve — pr 100 ft —	0.698
" " " 20 " —	0.140
" " 2½ " —	0.017
5½° curve — pr 100 ft —	0.48
" " " 20 " —	0.096
" " " 2½ " —	0.012
3° curve — pr 100 ft —	0.262
" " " 20 " —	0.0525
" " " 2½ " —	0.00655
2° curve pr 100 ft —	0.1715
" " " 20 " —	0.0355
" " " 2½ " —	0.00444
1½ curve " 100 ft —	0.1309
" " 20 " —	0.0262
" " 2½ " —	0.0033
1° curve " 100 ft —	0.08727
" " " 20 " —	0.01745
" " " 2½ " —	0.00218

RULE FOR THE DISTANCE

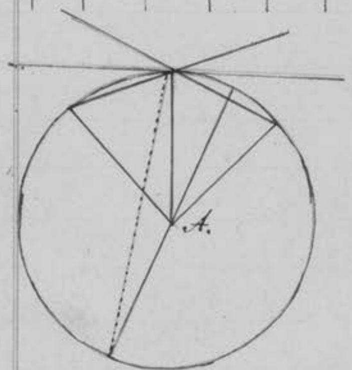
When the distance between the rails is 5 ft, to ascertain the difference per 100 ft of curve, between the inner and outer rails. RULE.

D being the difference pr 100 ft or deg. of curve. $(3.1416 \times 10 \div \frac{360}{D})''$

If g = gauge and n = No of frog, then Lead = 2 g n

Table of Ordinates.

Deg.	5	10	15	20	25	30	35	40	45
1°	.04	.07	.11	.14	.16	.18	.20	.21	.22
1½°	.06	.10	.16	.21	.25	.28	.30	.32	.33
2°	.08	.14	.22	.28	.33	.37	.40	.43	.44
2½°	.11	.20	.28	.35	.41	.46	.50	.54	.55
3°	.13	.24	.33	.42	.49	.55	.59	.65	.66
4°	.17	.32	.44	.56	.66	.73	.79	.86	.87
5°	.21	.40	.56	.70	.82	.92	.99	1.08	1.09
5½°	.23	.43	.61	.77	.91	1.01	1.09	1.19	1.20
8°	.33	.63	.89	1.13	1.31	1.47	1.59	1.74	1.75
10°	.42	.79	.111	1.40	1.64	1.83	1.98	2.15	2.19



N.Y. R R Comr Report Vol 1892
Bridges in good life
" " poor "
P 165. The Rule for elevation
on N.Y. Central RR, Hudson R. Div.
is 1 inch elevation per degree
for 60 miles an hour