COMPUTATIONS

OF

LATITUDES AND DEPARTURES,

OF

TOPOGRAPHICAL MEANDERS.

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY.

TOPOGRAPHICAL RECORDS,

Book No. 10, 187 .

U. S. ENGINEER OFFICE.

GEOGRAPHICAL AND GEOLOGICAL EXPLORATIONS AND SURVEYS WEST OF THE 100th MERIDIAN.

Corps of Engineers,

IN CHARGE

Party No. 1, 2? Bri

From

To

Date: Oct 7 nov 13

Gilbert Thompson
Topographer.

REMARKS.

(a) Includes all data of the Measurement of the Santa Fé Base.

(b) Connection of Astronomical Sta at Santa Fe, with △ Ast. Sta and levels.

(c) All data of Las Vegas Base.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

E F
G H
I J
K L
M N
O P
Q R
S T
U V
W X
Y Z

I J
K L
M N
O P
Q R
S T
U V
W X
Y Z

M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z

Q
R
S
T
U
V
W
X
Y
Z

Las Vegas Base.

mean	I + II	8570.1178
"	II + III	.0391
"	I, II + III	.0737
		.2306
Grand Mean and Value taken		feet- 8570.0768

U
V
W
X
Y
Z

Y
Z

Camp 46 — Laying of Levels — , Computer. — 1

DATE. 1874	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.
Oct. 7	measured		left-front-wheel of			
	wagon		= 11'.8			
			447.4 Rev = 1 mile			
			table			
		1	447.4			
		2	894.8			
		3	1342.2	1893 / 1789 / 1040		
		4	1789.6			
		5	2237.0	1893 / 1342 / 2510		
		6	2684.4			
		7	3131.8			
		8	3579.2			
		9	4026.6			
		10	4474.0			
					wagon Od. miles.	
	Read at	lamp	6300			
	— " —	A	7858	1558	3.55	
			9193 − 200	1893	4.25	
		B	9557	3200	7.00	
	Chain. 2	B	9662			
1880.4		A'	9815	153	1805.4 ft	
1939.6		B'	74	159	1908.	
		A	1340	1578	(3.52 miles) n. to a.	
		Camp	2463			
		A	~~1240~~			

NORTHING.	SOUTHING.	~~EASTING.~~ Lev's Set Level Pegs.	~~WESTING.~~ Level Peg.	ANEROID NO.	REMARKS.
Lev's.	0000	000	Sta A		Sta A of Base W. end
		200	1		
		200	2		
		200	3		
		200	4		
		200	5		
		200	6		
		200	7		
		200	8		
		200	9		
1880.4		200	10		A' = 9 + 80.4
		200	11		
		200	12		
		200	13		
		200	14		
		200	15		
		200	16		
		200	17		
		200	18		
		200	19		B = 19 + 20'
		200	20		
		200	21		
		200	22		
		200	23		
		200	24		
		200	25		

Camp Obs. at Statius — Oct. 7

Distance between level Pegs 20.05 Level Peg

124 / 11.8 / 992 / 124 / 124 / 1460.2

, Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING. Mean	SOUTHING. Cd. 174	EASTING.	WESTING.	ANEROID NO. Ad.	REMARKS.
A of Base			B of Base		A	B	1460.3	194 124	200	20	1468.2	C' = 267 80.3
	Base		a_3 =	72°38'15"	6°06'45"	16°22'05						
128°19'35" = B			A	125 31 55	49°31'05"	64°12'45"						
26° ~~44'35"~~ 43'55"		south-	Cone	162 47 55	93 55 05	110 28 55						
30°33'35"		bodyt	~~Tatia~~ Cone	176 2 35	106.6 35							
67°52'~~25~~ 15"			Placer.	229 39 10	158 46 35	174 42 05						
183°03'45"			Tatia	69 48 05	352 12 10	360 25 05						
260°58'20" = a_3.												

229 39 10
125 31 55
104°07'15"

128° 19' 35"
67 52 15
60°27'20"
104°07 15
(15°25 25) Placer
A
B
D. 180 00 00

183 03 45
128 19 35
54 44 10
A 55 43 50
B
Tatia 79 32 00
180 00 00

125 31 55
69 48 05
55 43 50

182 47 55
125 31 55
57 16 00

176 02 35
125 31 55
50 30 40

128°19' 35"
26 43 55
101°35'40"
37 16 00
(41 08 20) good
A
B
cone 180 00 00

128 19 35
30 46 40
97 30 20
50 43 00
A 31 00
B
cone bad 180

Camp 46 Measurement of Base, Laying out of Line. , Computer. 3

1874 DATE.	NO. OF— Camps.	Station.	Camp, DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.
Oct	+ Hom.		~~2480~~			
8	7h 30' 46		2480		Miles	
	8h 30'	A	3590	1110	2.48	
	9h 00	C'	4750	1160	2.59	A to C' 13688.0
chk 3m from C' to H' via	after Salia	H	6864	2114	4.72	
		I.	7142			
		A	7315	451		
	5:35 P.M.	Camp	8450			

11.8
1160
118
9280
1160
1160
1368 8.2
2.5

1160
892
2680
2237
4430

Odometer on Wagon.

1923) 23354 (12.14 Cir. of Wheel on road.

436.4 = 1 Mile

2114
1789
3250
3132
118

Aber D & measure
Inst. pegs put at level
peg points as peg 38 = D

1180
892
2680
1768
912

2650

	Bds NORTHING.	SOUTHING.	Bds. EASTING.	Level peg WESTING.	Inst. ANEROID NO.	REMARKS.
	B to —		to —	no.	Pegs.	
					C +	
C'	5280.3		200	26	26+80.3	Begin 9h 25' near C Road
			250	27+50		
			150	28		
			200	29		
			200	30		
			200	31		
			200	32		
			200	33		
			200	34		
			200	35		
			200	36		
			200	37		
7600'			200	38 = D		(1h 10h 25' = 2520')
			200	39		
			200	40		
			200	41		
			200	42		
			200	43		
			200	44		
			200	45		
9200'			200	46 = E		11 hr. 20 min 55 min = 1600

Over to page 5.

1894 DATE. Oct	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER. Objects	BEARING. ~~Magnetic.~~ C′	BEARING. ~~True.~~ D′	DEDUCED DISTANCE. ~~from B~~ E′	NORTHING. F′	SOUTHING. G′	EASTING. H′	WESTING. I′	ANEROID NO.	REMARKS.
8		C′	Gimmell	349°36′45″	50°35′0″	30°56′45	143°6′5″	297°9′50″	100°19′35″	2°33′25		
			A	37°57′15	99°21′05″	79°12′25	not seen	343°54′25″	148°5′45″	48°50′15″		
			good road line	86°25′25″	151°38′40″	134°32′55″	249°7′25″	43°25′45″	212°47′55″	not seen		
			bad road line	98°51′35″	163°23′25″	145°20′00″	259°41′35″	53°27′45″	221°18′45″	" "		
			Placer	149°21′35″	212°11′10″	192°38′55″	306°7′35″	99°0′15″	254°32′15″	167°15′5		
			Yalia	328°40′25″	28°34′45″	30°3′28″50″	12m Mag 100°36′45″	248°28′55″	42°24′00″	290°18′05		
			B					163°54′25″		228°50′55		

These Sta are the Instrument Sta. occupied by the — de — when laying out the line.

The line being laid out by pegs at 200′ apart, this distance measured with the steel tape, (see page 9) these pegs are to be used when required as level pegs, and the chain is to be lined by the eye between these in the final measurements.

DATE.	NO. OF— Camps.	NO. OF— Station.	Intermediate ~~DISTANCE BY ODOMETER.~~ Distances	BEARING. Magnetic. Level Peg	BEARING. True. Inst. Peg	DEDUCED DISTANCE.	Total ~~NORTHING.~~ Distance	~~SOUTHING.~~	Inter-~~EASTING.~~ mediate Distances	Level ~~WESTING.~~ Peg. No	Inst ~~ANEROID NO.~~ Pegs	REMARKS.
Oct 8			200	73					200	47		
			200	74					200	48		
			200	75					200	49		
			200	76					200	50		
			200	77					200	51		
			200	78			10,400	Mag variation	200	52	= F	12:00 M. (40 min.) = 1200'
			200	79					200	53		
			200	80					200	54		
			200	81					200	55		
			200	82					200	56		
			200	83			11400		200	57	= G.	12:40 P.M. (40 min = 1000')
			200	84					200	58		
			200	85					200	59		
		17200'	200	86	= I	3:45 P.M. (45 min. = 3400')			200	60		
			200	87					200	61		
			200	88					200	62		
			200	89					200	63		
			200	90					200	64		
			200	91					200	65		
			200	92					200	66		
			200	93					200	67		
			200	94					200	68		
			200	95			13800		200	69	= H	1:35 P.M. (55 min = 2400')
			200	96					200	70		2:05 P.M. Stopped for lunch
		19307.4	107.4	(center of pole A)	A.	4:40 P.M. (55 min = 2107.4')			200	71		3:00 P.M. Recommenced.
									200	72		

continued on preceding page

Camp 46 Measurement of Base , Computer. 6

1874 DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct 9												

(a) ~~[illegible]~~

1st Meas. 1 — Measured by G. Thompson, J. Capuner, W. W. Hamer.

(b) After Peg 5 + including no 5 corrected the Pegs were, ~~and~~ with 1st Measurement of Oct 9

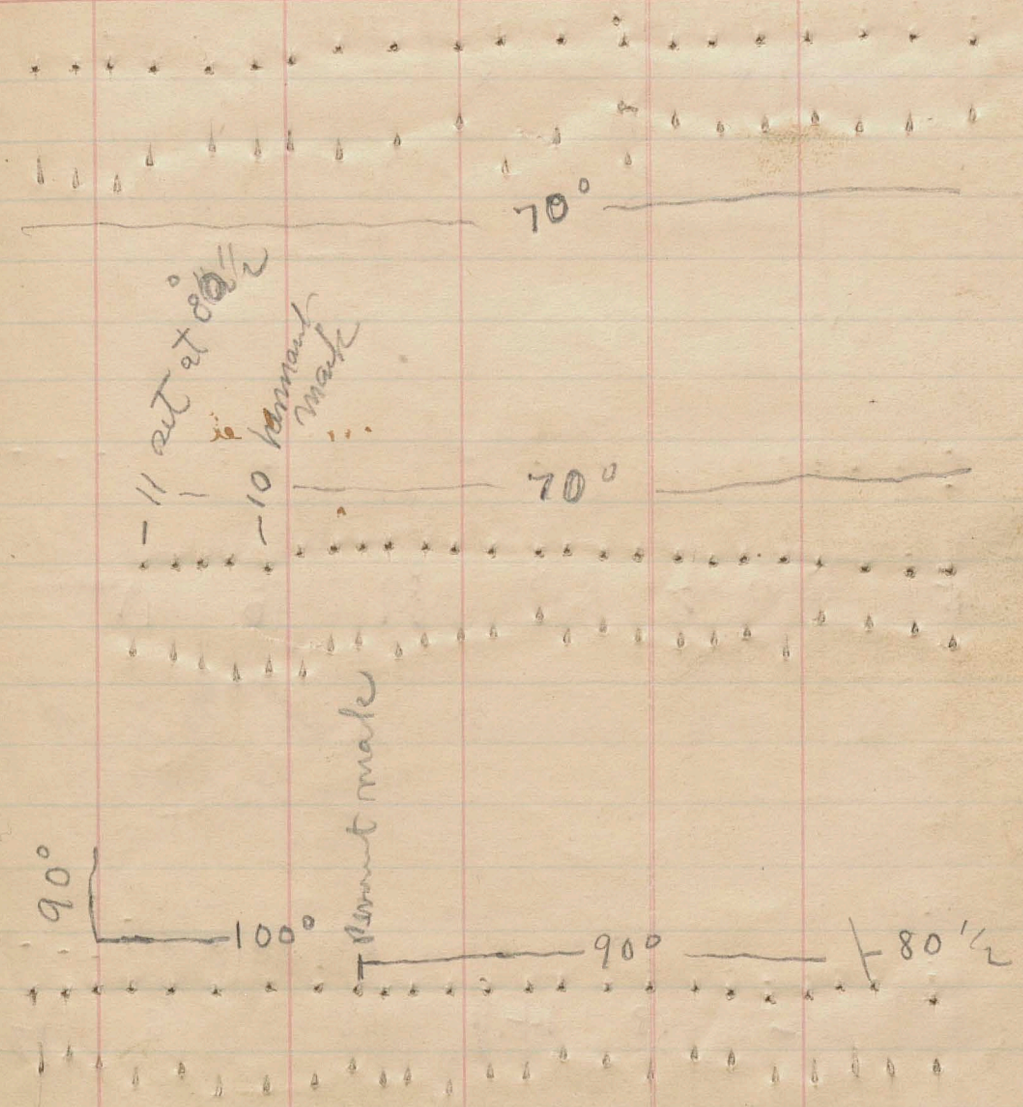
(c) Measurement. at no. 4 Peg + 22" Error + 1" should be + 21" (minus)

(d) Peg A = 9 + 32' 11 5/8" as corrected

Peg = 15 + (Peg 15 as corrected) 4 49" 1/16" 1"/16

(e) After 15 + including a mile is left in each peg.

C put back to 5280' for Ad. test



Camp Chain No VI Stackpole, Computer.

1874 DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct 9												

V X XV XX

Peg 1 + 2" Peg 2 + 6" Peg 3 + 8" Peg 4 + 11" Peg 5 + 13"

Peg 5 Peg 6 XXI 7 XXX 8 XXX 9 XL 10 11 XXV

XXI 12 13 14 15 16 17

90°

(+190 25' 3") Peg B + 19 Peg as corrected 25' 3"

90°

C + 26 Peg as corrected (87' 3" 3/4) 87' 3" 3/4
(sup. 6')

90°

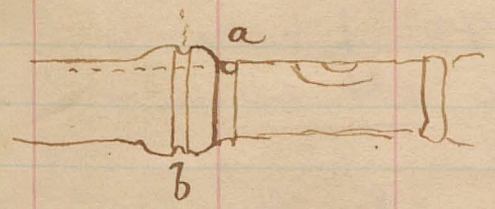
90

D + 38 (as corrected) 9 ft 8 in.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct 9												80° 90
17		18	19	20	21	22						
22		23	24	25	26	27+50						
	28		29	30	31	32						
	33	34	35	36	37	38 D						

Measurement made with Chain No. VI, Stackpole

Chain is corrected at the time according to the Temp. of the enclosed Thermometer of the Chain. The Chain is pulled taut to the point a and a dress pin stuck at b mark



Boards are fastened firm by 2 long spikes, and the pin stuck in them, the chain being stretched tho to three times always, and more if not satisfactory.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.

39. 40 close of Oct 9th meas.

Total measurement 8000'

The record is made by sticking the pins in this book, and the number of each level peg (as fixed last) is written above, and the length of the Chain used, bec. & Olevins put stations —

D & E

Odometer Readings

Miles				Hours
	46	8465	7h 50' a.m.	
7.208	D	1708	10 00	
5.849	E	4254	1 p.m.	
7.922	46	7710	4 25 p.m.	
20.972			8h 240'	

Mem. In laying out the Base a different point on the Chain was used than noted p. 8, and the pegs are corrected as the 1st measurement progresses. The first measurement is short as the pegs say but the Chain was 3/4 of an inch long, making the length of first measurement + 24'

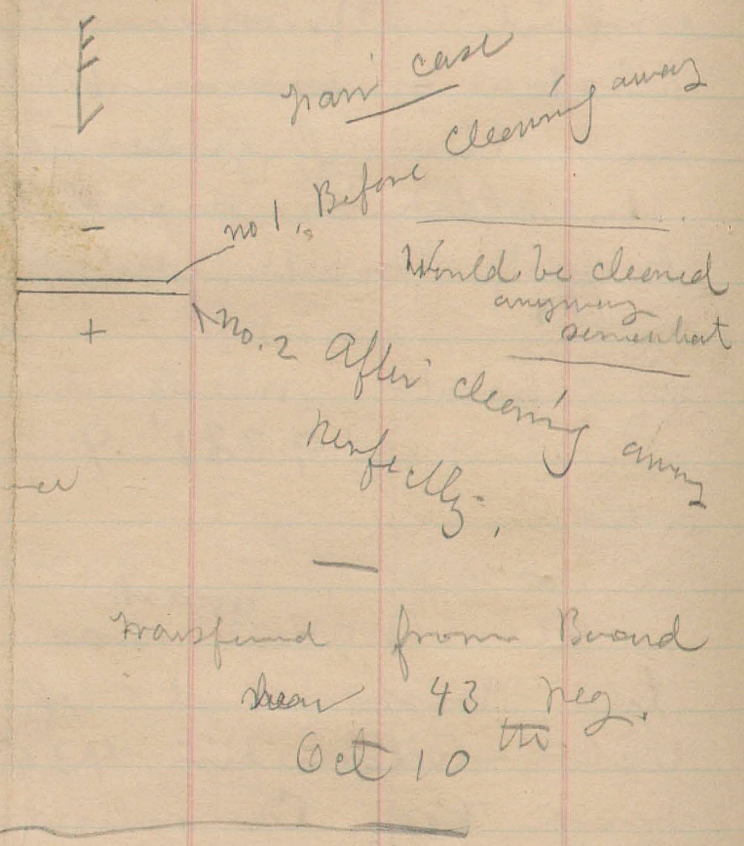
19331.4

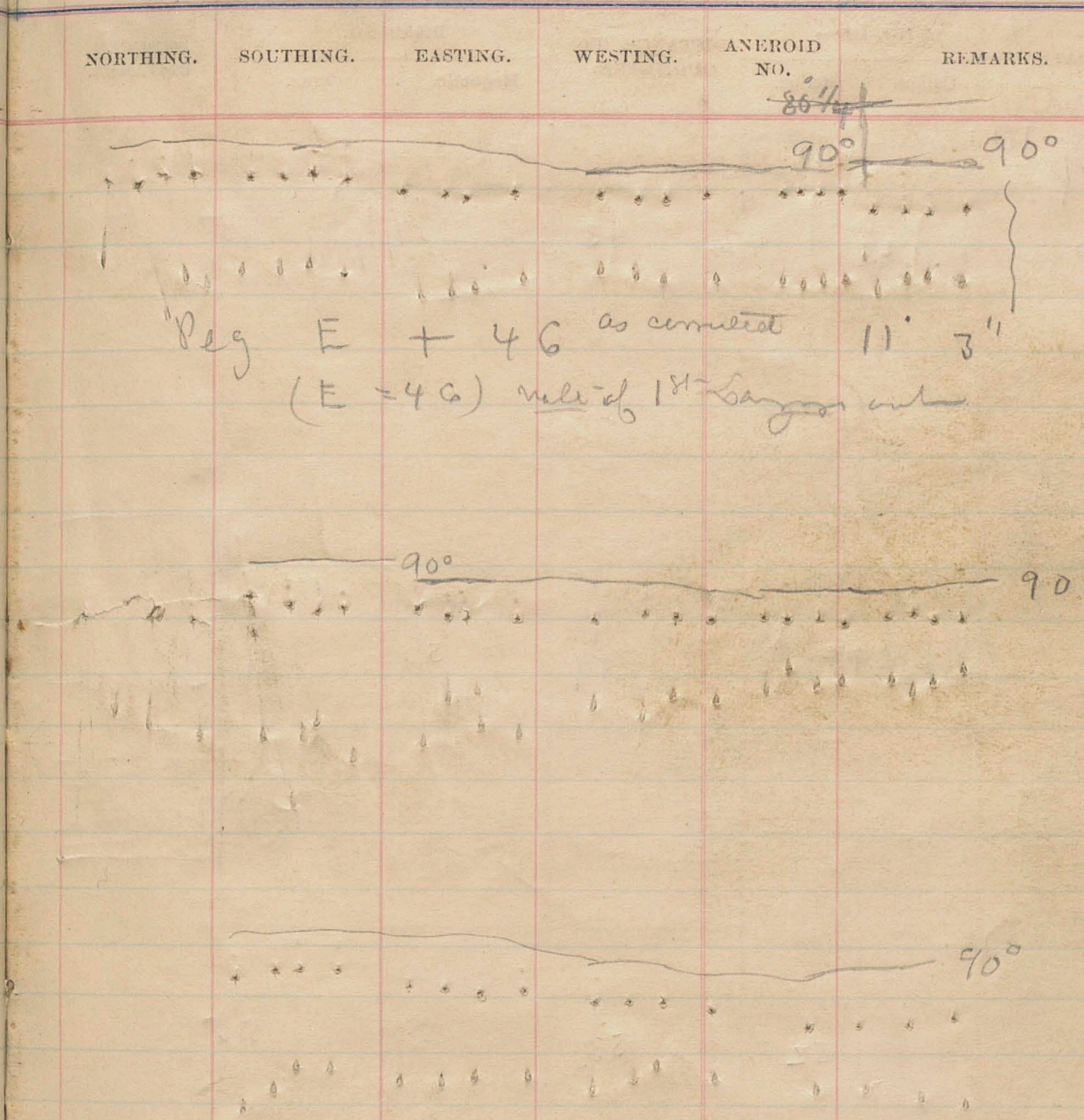
19307.4
24
19331.4

A mile mark was left at the west end of Base. 10 left Odometer 436 or (no 2.) very Peg. C. which is a different position than when an instrument stood. (see p. 67)

Camp Measurment of Base, Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
1874 Oct 10		Begun at Peg 40 (as corrected,)										





Oct 11 — Mem.

1st Measurment of Base = 19400
= 388 Lengths of Chain.

If 1/16 was added to each length of Chain it equals 24". 2 during length of Base but the 2" Measurment will be under the same circumstances, and might not to differ more than 2"

Camp Begin at Peg 40 (as corrected) , Computer.

1874 DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct 10										80°		90°
40		41	42	43	44	45	46					
									(G. at 57° as corrected + 136 m")			
46		47 ~~49~~	48	49	50	51						
		52	53	54	55							

Bern
Holes
not to be counted

Camp , Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct 10												
55	56	57	58	59	60	close Oct 9						

The Boards were left in place with ~~one~~ mile mark, one before & one after Peg 60.

Total Measurement Oct 10
4000 feet

~~Peg I + 86 as corrected 20 feet 5 ft inches~~

~~"A" of Base = 96 as corrected + 130 ft 1 inch.~~

See p. 13
Oct 11

Peg H + Peg 69 as corrected + 16' 4"

I

Camp , *Computer.*

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
1874 Oct 11	60	61	62	63	64	65	66	(24 pins)				
	67	68	69	70	71	72		(48 pins)				
	73	74	75	76	77	78		(72 pins)				
	79	80	81	82	83	84	85	(100 pins)				
	86	87	88	89	90	91	92	(128 pins)				

80 90 90°

Peg I + 86 as corrected 20' 5 1/4"

A of Base = 96 + 130' 1" as corrected

as at first

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
1874 Oct 11	93	94	95	96	97 End	(Oct 11th 148 fms)						

7400 feet measured

Least time in measuring 1000' was 35 minutes

Average = 1h 5', 1h, 55', 47', 45' 40'

which included clearing away, correction of pegs, etc

The flag was moved in line to 19,400 feet and a difference board was fastened firmly 50' exactly from it on which the different measurements can be marked.

Mem. Base as without corrections approx. length 19,400'

3.6742 miles.

The corrections to be applied are —

a. Temperature +

b. From the difference of level between pegs, as the measurement was made upon the ground.

Corrections will be —.

A profile should be carefully made to assist in scaning this computation.

Camp Data of Second Measurement of Base Line at Santa Fe, Computer.

From B to A. Oct. 12 and 13th Measured by J. Carpenter W. Hance.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Pro. of Peg	Temperature		Comparison of first and second measurements.									
0 to 10	70°		On account of insufficient compensation of tape for temperature the first two thousand feet of 1st measure is not considered trustworthy and will be re-measured.									
10-11	70°											
11-20	80°											
20-21	70°		At Peg 10 - 2000 ft. 2nd meas. was 2 3/8" inches short.									0'.20
21-23	80°		For convenience Peg 10 of 1st meas. was taken as new initial point.									
23-26	90°		with comparison of measurements at every fifth peg - 1000 feet.									
26-30	90°	Oct. 12										
30-31	80°						At	(The second measurement was				
31-35	90°		3° at 10th peg				Peg No.			Long	Short	
35-40	90°		0'.024 shorter				20			1/32 inch		
40-45	90°		200 / 199.976				26			1/8 "		No check pin at 15
45-49	90°						30	2" = .166 .031 .207 .197 3/8			3/16 inch	or 25
49-50	80°						35			25/32 "		
50-55	80°						40			7/16 "		
55-60	80°						45				23/32 "	
60-65	80°						50				1 3/16 "	
65-67	90°						55				1 5/16 "	
67-70	80°						60				31/32 "	
70-75	80°						65				15/32 "	
75-80	80°	Oct. 13					70				3/16 "	70 not reliable
80-85	80°						75				5/16 "	
85-86	90°						80				3/16 "	
86-90	80°						85			7/32 "		
90-97	80°						90				15/16 "	
							96+150 ft	Check Board 50 ft from A.			27/32 "	From 96+150 to A. or 97 measurements agree

Camp Third Measurement of Portion of Santa Fé Base Line, Computer.
From B to Peg 10

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
1874												
Oct. 15												
Temperature.												
From B to Peg 2, 90°												
" 2 to 10, 80°												
at Peg 10.												
Third Measurement was												
2 3/32 inches short of 1st												
9/32 inch longer than 2nd												

Camp Level Data of Base Line at Santa Fe, Oct. 14th, , Computer.
From B to A.

DATE. 1874	NO. OF— Camps.	Station. (Peg)	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct. 14.	Intermediate	Turning Point.	B. S.	F. S.	Height of Instrument	Height of Peg.	Aneroid Pike 4 22.62 8580	Time A. M. 10:30				The levelling instrument used in this work is from the Engineer of this District, Lieutenant Morrison, Santa Fe.
0.00		A B				100.00						Made by Gurley, Troy N.Y. No. 50.
			6.31		106.31							The rod was from the same source. Material, pine.
+ 1.77	1			4.54		101.77						Graduated to tenths of a foot and estimated to hundredths. Very imperfect, graduation marks being worn away in some places.
+ 1.40		2		3.14		103.17						
			5.46		108.63							
+ 0.82	3			4.65		103.98						
+ 0.28		4		4.37		104.26						
			5.61		109.87							
+ 0.78	5			4.83		105.04	22.61 8590	10:50 A.M.				
+ 2.94		6		1.89		107.98						
			7.28		115.26							
+ 2.55	7			4.73		110.53						
+ 1.69		8		3.04		112.22						
			5.47		117.69							
+ 0.89	9			4.58		113.11						
+ 1.54	A'			3.04		114.65						
− 0.15		10		3.19		114.50	22.61 8590	11:10 A.M.				
			5.79		120.29							
+ 1.08	11			4.71		115.58						
+ 1.05		12		3.66		116.63						
			6.28		122.91							
+1.79	13			4.79		118.12						
+2.16		14		2.73		120.18						
			6.14		126.32							
+1.45	15			4.69		121.63	22.60 8600	11:30 A.M.				

Frank Carpenter, Rodman.
W. W. Hand
— Stephens

DATE. 1874	NO. OF— Peg Camps.	Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct. 14	Intermediate	Turn Point.	B. S.	F. S.	H. I	H. P.	Aneroid Pike 4	Time.				
+1.81		16		2.88	126.32	123.44						
			6.74		130.18							
+2.06	17			4.68		125.50						
+3.01		18		1.67		128.51						
			7.26		135.77							
+2.39	19			4.87		130.90						
+0.72	B'			4.15		131.62						
+1.72		20		2.43		133.34	22.59 / 8610	11:50 A.M.				
			4.92		138.26							
+0.13	21			4.79		133.47						
+0.89		22		3.90		134.36						
			6.01		140.37							
+1.29	23			4.72		135.65						
+0.13		24		4.59		135.78						
			6.11		141.89							
+1.19	25			4.92		136.97	22.52 / 8690	12:10 P.M.				
+2.24		26		2.68		139.21						
			6.51		145.72							
+0.69	C'			5.82		139.90						
-0.31	26+100			6.13		139.59						
+2.26	27+50			3.87		141.85						
+1.51		28		2.36		143.36						
			7.14		150.50							
+2.40	29			4.74		145.76						

over

DATE. 1874	NO. OF— Peg ~~Camps.~~	~~Station.~~	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct. 14.	Inter-mediate	Turn Point	B. S.	F. S.	H. I	H. P.	Aneroid Pike 4.	Time.				
+3.01		30		1.73	150.50	148.77	22.51 8710	1:30 P.M.				
			7.24		156.01							
+2.58	31			4.66		151.35						
+1.93		32		2.73		153.28						
			6.33		159.61							
+1.46	33			4.87		154.74						
+1.06		34		3.81		155.80						
			6.65		162.45							
+1.93	35			4.72		157.73	22.52 8700	1:50 P.M.				
+2.70		36		2.02		160.43						
			6.84		167.27							
+2.41	37			4.43		162.84						
+1.44		38		2.99		164.28						
			4.48		168.76							
-0.13	39			4.61		164.15						
+0.88		40		3.73		165.03	22.51 8710	2:10 P.M.				
			7.44		172.47							
+2.59	41			4.85		167.62						
+4.19		42		0.66		171.81						
			8.46		180.27							
+1.72	42+100			6.74		173.53						
+1.73	43			5.01		175.26						
+2.32		44		2.69		177.58						
			5.91		183.49							

DATE. 1874	NO. OF— Peg: Camps.	Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct. 14.	Intermediate	Turn Point	B. S.	F. S.	H. I.	H. P.	Aneroid Pike 4	Time				
+1.87	45			4.54	183.49	178.95	22.49 8730	2:30 P.M.				
+0.27		46		4.27		179.22						
			6.64		185.86							
+2.03	47			4.61		181.25						
+1.62		48		2.99		182.87						
			6.09		188.96							
+1.46	49			4.63		184.33						
+1.69		50		2.94		186.02	22.49 8730	2:50 P.M.				
			6.45		192.47							
+0.68	50+50			5.77		186.70						
+0.99	51			4.78		187.69						
+0.90		52		3.88		188.59						
			1.87		190.46							
-0.85	52+100			2.72		187.74						
-1.97	53			4.69		185.77						
-0.20	53+100			4.89		185.57						
+3.15		53+150		1.74		188.72						
			9.59		198.31							
+2.93	54			6.66		191.65						
+5.19		55		1.47		196.84	22.47 8760	3:10 P.M.				
			9.47		206.31							
+5.09	56			4.38		201.93						
+1.04		57		3.34		202.97						
			6.24		209.21							

DATE. 1874	NO. OF— Peg Camps.	Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct. 14	Inter-mediate	Turn Point	B. S.	F. S.	H. I	H. P.	Aneroid Pike H.	Times				
+1.58	58			4.66	209.21	204.55						
-0.33		59		4.99		204.22						
-2.38			2.25		206.47							
-1.74	60			4.55		201.92	22.42 8820	3:30 P.M				
		61		6.29		200.18						
			5.77		205.95							
+1.28	62			4.49		201.46						
+0.72		63		3.77		202.18						
			3.89		206.07							
-0.45	63 +100			4.34		201.73						
-0.38	64			4.72		201.35						
-1.17	64 +150			5.89		200.18						
-1.39		65		7.28		198.79	22.42 8820	3:50 P.M.				
			2.95		201.74							
-2.73	65 +150			5.68		196.06						
+0.99	66			4.69		197.05						
+3.42		66 +100		1.27		200.47						
		67	9.29		209.76							
+2.16	67			7.13		202.63						
+2.55	68			4.58		205.18						
+2.97		69		1.61		208.15						
			7.59		215.74							
+2.85	70			4.74		211.00	22.43 8800	4:10 P.M				
+0.41		71		4.33		211.41						

Drey,

Oct 15th 1874

DATE. 1874	NO. OF— Peg Camps.	Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.
Oct 15	Intermediate	Turn Point,	B.S.	F.S.	H.I	H.P.
			1.91		213.32	
−2.32	72			4.23		209.09
−2.26	72 +150			6.49		206.83
+2.60		73		3.89		209.43
			8.55		217.98	
+2.38	73 +150			6.17		211.81
+3.42	74			2.75		215.23
+1.67		75		1.08		216.90
			5.13		222.03	
+0.51	75 +50			4.62		217.41
−0.05	76			4.67		217.36
+1.54		77		3.13		218.90
			5.85		224.75	
+1.22	78			4.63		220.12
−0.13		79		4.76		219.99
			5.99		225.98	
+1.28	80			4.71		221.27
+2.48		81		2.23		223.75
			9.01		232.76	
+3.23	82			5.78		226.98
+5.36		82 +150		0.42		232.34
			9.42		241.76	
+2.08	83			7.34		234.42
+4.73		83 +150		2.61		239.15
			7.54		246.69	

NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
No. of Peg.					
Intermediate	Turn Point	B.S.	F.S.	H.I	H.P.
	84		1.28	246.69	245.41 +6.26
		9.14		254.55	
	84 +100		2.61		251.94 +6.53
		7.78		259.72	
	85		2.23		257.49 +5.55
		9.42		266.91	
85 +50			6.77		260.14 +2.65
86			4.39		262.52 +2.38
	87		2.99		263.92 +1.40
		5.10		269.02	
88			4.51		264.51 +0.59
	89		3.73		265.29 +0.78
		5.69		270.98	
90			4.73		266.25 +0.96
	91		3.38		267.60 +1.35
		6.11		273.71	
92			4.78		268.93 +1.33
	93		3.76		270.65 +1.72
		6.67		277.32	
94			4.58		272.74 +2.09
	95		2.07		275.25 +2.51
		8.70		283.95	
96			4.81		279.14 +3.89
	96 +150		0.10		283.85 +4.71
A, end of base.		4.95	4.27	288.80	284.53 +0.68

Camp To find difference of level of A of base line and camp, Computer.

DATE. 1874	NO. OF— Peg Camps.	Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.
Oct. 15.	Turning Points		B. S	F. S.	H. I.	H. P
		A.	5.19		289.72	284.53
		a		5.82		283.90
			5.64		289.54	
		b		4.15		285.39
			4.10		289.49	
		c		9.76		279.73
			1.55		281.28	
		d		9.13		272.15
			0.71		272.86	
		e		9.58		263.28
			1.18		264.46	
		f		9.08		255.38
			0.51		255.89	
		g.		9.26		246.63
			0.08		246.71	
		h		9.73		236.98
Oct. 16			1.33		238.31	
		i		9.46		228.85
			1.87		230.72	
Level of mesa above camp		j		9.42		221.30
			1.65		222.95	
		k		9.71		213.24
			1.22		214.46	
		l		9.31		205.15
			1.15		206.20	

NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Turning Points	B. S.	F. S	H. I	H. P	Oct. 16th
m		9.71		196.49	
	1.54		198.03		
n		9.63		188.40	
	0.89		189.29		
o		9.58		179.71	
	0.04		179.75		
p		9.69		170.06	
	1.16		171.22		
q		9.52		161.70	
	0.64		162.34		
r.		9.32		153.02	
	0.07		153.09		
s		9.32		143.77	
	1.07		144.84		
t		9.31		135.53	
	0.95		136.48		
u		9.34		127.14	
	0.46		127.60		
v		9.78		117.82	
	1.47		119.29		
w		9.23		110.06	
	0.01		110.07		
x		9.28		100.79	
	0.38		101.17		

Level Notes

Camp Base Line to Camp, Computer.

DATE. 1874	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Oct. 16	Turning Points.		B. S.	F. S.	H. I.	H. P.						
				9.81	101.17	91.36						
	y		0.03		91.39							
	z			8.91		82.48						
			0.26		82.74							
	α			7.24		75.50						
			3.99		79.49							
	β			5.44		74.05						
			5.94		79.99							
Camp	γ			1.13		78.86						
	δ											
	ε											

Time, Oct 16th.
Three Hours

Traverse from Real to ~~Camp~~ Station, Santa Fé, N.M.

Transferred Astronomical location of deflection pegs, Computer.

Instrument Wm. Würdeman. Washington, D.C. N.58. 12" Transit, from N.M. Engineer Department

DATE.	NO. OF— Camps.	NO. OF— Station.	~~DISTANCE BY ODOMETER.~~	BEARING. Magnetic.	BEARING. ~~True.~~	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
1874 Nov. 2nd ~~1st~~.			Vernier angle	Azimuth on Flag Sta.		Angle of Deflection Merid. line = 0°						
Ast. Station;		O	84°27'12"	72°21'12"	359°26'24"	Right 84°27'12" N. 84°27'12" E						The results of these angular measurements are considered valueless. The instrument was out of adjustment - 18 inches of deflection to 100 yards of transit. The thread of ~~the~~ one adjusting screw was completely gone, and it was found impossible to correct the error. It is recommended that it be re-measured with a reliable instrument
		A	336°4'12"	324°6'48"	348°10'12"	Left 108°28'00" N. 23°55'48" W						
				On slate steeple.								
		B	14°22'12"	226°40'24"	353°17'12"	Right 38°18'00" N. 14°22'12" E						
		C.	341°46'24"	220°59'48"	339°12'24"	Left 32°35'48" N. 18°13'36" W.						
North Merid. Stone.		D	196°14'24"	208°40'48"	196°14'24"	Left 145°32'00"		S. 18°14'24" W.				

See over.

Variation of Needle 12° 10' 25"

Camp Traverse Angles - Real to transferred Astronomical Stations Computer.
Instrument - Stackpole 10" Transit Thompson - Tofog

DATE. 1874	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Nov 3rd				See topographical field book No. 24, page, 13.								

at astronom. Stone.

Meridian	0° 00' 00"
A.	84° 28' 35"
Meridian	100° 00' 00"
A	184° 28' 30"
Meridian	200° 00' 00"
	284° 28' 35"
Meridian to A	84° 28' 35"

at Station A.	Vernier A	Vernier B.
Stone =	360° 00' 00"	
Δ astronom. Station	88° 49' 25"	268° 49' 25"
Meridian Stone.	84° 44' 15"	264° 44' 15"
Mag. Az.	108° 30' 30"	288° 30' 30"
B	71° 44' 25"	251° 44' 05"

at Station B.

A	360° 00' 00"	180° 00' 00"
Δ astronom. Sta.	197° 14' 05"	17° 14' 05"
Meridian Mark	198° 17' 15"	18° 17' 20"
C.	218° 18' 30"	38° 18' 35"
Magnet. Azi.	217° 16' 45"	37° 17' 45"

at Station C.	Vernier A.	Vernier B
B.	360° 00' 00"	180° 00' 00"
Δ Ast. Sta	144° 51' 05"	324° 51' 10"
Meridian Mark	147° 25' 05"	327° 25' 05"
Mag. Az.	178° 21' 05"	358° 21' 05"

at Mer. Mark.

C.	360° 00' 00"	180° 00' 00"
Ast. Stone.	18° 03' 25"	198° 03' 25"
Δ. Ast. Sta.	34° 35' 25"	234° 05' 20"
Mag. Az.	211° 11' 35"	31° 11' 35"

Ast. Sta Δ.	360° 00' 00"
Meridian	34 05

Camp Measurements of Traverse, Real to transferred Astronimical Station, Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE ~~BY ODOMETER~~.	BEARING. Magnetic.	BEARING. ~~True.~~	DEDUCED DISTANCE.
1874 Nov ~~Oct.~~, 2nd	Peg			Total Distance	Temperature	
	0	0	50'		60°	
		1	50'			
	to	2	50'			
		3	50'			
		4	50'			
		5	50'			
		6	50'			
		7	20'			
		8	3.38'			
	A			373.38	60°	
		0	50 +			
		1	50 +			
		2	50 +			
		3	50 +			
		4	50 +			
	to	5	50 +			
		6	50 +			
		7	50 +			
		8	50 +			
		9	50 +			
		10	25 +			
	B	11	50 +			
		12	7.17 +			
	B			582.17		

NORTHING. Peg	SOUTHING. Station	EASTING. Total Distance	WESTING. Total Distance	ANEROID NO.	REMARKS. Temperature
B	0	20 +			60°
	1	50 +			
	2	50 +			
	3	20 +			
	4	50 +			
	5	50 +			
	6	50 +			
to	7	50 +			
	8	50 +			
	9	50 +			
	10	50 +			
	11	50 +			
	12	30 +			
	13	5.78			
C			575.78		
Nov. 3rd	0	50 +			60°
	1	20 +			
	2	50 +			
	3	50 +			
	4	50 +			
to	5	50 +			
	6	50 +			
	7	50 +			
	8	30 +			
D	9	50 +			
	10	50 +			

Camp Traverse Measurement — Continued — , Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ~~ODOMETER~~.	BEARING. ~~Magnetic.~~ Total Dist	BEARING. True.	~~DEDUCED DISTANCE.~~ Temperature	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
1874 Nov, 3rd	Peg											
	C	11	'50 +									
		12	'50 +									
		13	'30 +									
		14	'50 +									
	to	15	'50 +									
		16	'50 +									
		17	'50 +									
		18	'50									
		19	33.11 +									
	D			913.11		70°						
		0	50 +									
	to	1	17.06 +									
	Flag Station			67.06								

Level Data of Traverse — Real to Transferred Camp Astronomical Stations. Instrument — see page 17 , Computer.

DATE. 1874	NO. OF — Peg Camps.	Station.	DISTANCE ~~BY ODOMETER.~~ between pegs	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Nov 3rd	Intermediate	Turn point.		B.S	F.S	Height of Inst	Height of Peg.	Remarks.				
		0	50				100.00	Top of Stone - Astronomical Station				
				2.27		102.27						
-2.58	1		50		4.85		97.42					
+0.13	2		50		4.82		97.45					
+0.30	3		50		4.52		97.75					
+0.29	4		50		4.23		98.04					
+0.47	5		50		3.76		98.51					
+0.45	6		50		3.31		98.96					
+0.11	7		20		3.20		99.07					
+0.56	8		3.38		2.64		99.63					
+0.07		A	50.		2.57		99.70	End of first run on traverse -				
				8.80		108.50						
+0.37	1		50		8.46		100.04					
+1.18	2		50		7.28		101.22					
+1.21	3		50		6.07		102.43					
+0.72	4		50		5.35		103.15					
+0.37	5		50		4.98		103.52					
+0.14	6		50		4.84		103.66					
+0.27	7		50		4.57		103.93					
+0.39	8		50		4.18		104.32					
-0.09	9		50		4.27		104.23					
+0.26	10		25		4.01		104.49					
+0.67	11		50		3.34		105.16					
-0.12	12		7.17		3.46		105.04					
+0.08		B.			3.38		105.12	End of second run of Traverse				

Camp Level of Traverse - Continued - , Computer.

DATE. 1874	NO. OF— Camps.	Station. (Peg)	DISTANCE ~~BY ODOMETER~~.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Nov 3rd	Intermediate	Turn point.		B.S.	F.S.	H.I	H.P.		Remarks			
		B	20				105.12					
				4.93		110.05						
+1.08	1		50		3.85		106.20					
-0.11	2		50		3.96		106.09					
-0.98	3		20		4.94		105.11					
+2.20	4		50		2.74		107.31					
+0.03	5		50		2.71		107.34					
-0.77	6		50		3.48		106.57					
-1.03	7		50		4.51		105.54					
+1.57	8		50		3.94		106.11					
+1.46	9		50		3.48		106.57					
+1.55	10		50		1.93		108.12					
-1.63	11		50		3.56		106.49					
+0.74	12		30		2.82		107.23					
+0.53	13		5.78		2.29		107.76					
-0.09		C	50,		2.38		107.67	End of third run of traverse.				
				9.08		116.75						
5.96	1		20		3.12		113.63					
+0.64		2	50		2.48		114.27					
				9.14		123.41						
+3.63	3		50		5.51		117.90					
+3.70		4	50		1.81		121.60					
				8.72		130.32						
+3.54	5		50		5.18		125.14					
+5.02		6	50		0.16		130.16					

Camp Level of Traverse - Continued - , Computer.

DATE. 1874	NO. OF— Camps.	Station.	DISTANCE BY ~~ODOMETER.~~	BEARING. ~~Magnetic.~~	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Nov. 3	Intermediate	Turn Point		B. S.	F. S.	H. I	H. P.		Remarks -			
		6	50				130.16					
				9.84		140.00						9.84
	7		50		4.11		135.89					5.73
		a			0.65		139.35					3.46
				8.76		148.11						
	8		30		6.46		141.65					2.30
		9	50		3.49		144.62					2.97
				7.77		152.39						
	10		30		3.48		148.91					4.29
		b			0.50		151.89					2.98
				9.97		161.86						
	11		50		7.39		154.47					2.58
		c			0.47		161.39					6.92
				9.33		170.72						
	12		50		6.55		164.17					2.78
	13		30		7.87		162.85					-1.32
	14		50		7.01		163.71					+0.86
		15	50		2.70		167.96					+4.25
				9.22		177.18						
		16	50		2.83		174.35					+6.39
				8.37		182.72						
		17	50		1.27		181.45					+7.10
				7.93		189.38						
		d			0.54		188.84					+7.39
				8.28		197.12						

Camp Level of Traverse — Continued, Computer.

DATE. 1874	NO. OF— Camps.	Station.	DISTANCE ~~BY ODOMETER~~.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Nov 3rd				B. S.	F. S.	H. I.	H. P.	Remarks.				
+3.62	18.	50	50		4.66	197.12	192.46					
-0.33		e			0.33		192.13					
				8.53		200.66						
+5.23	19		33.11		3.30		197.36					
+0.73		f			2.57		198.09					
				4.88		202.97						
+3.05	D.		50		1.83		201.14	Northern Meridian Stone				
-2.91	1		17.06		4.74		198.23					
-0.08	E				4.82		198.15	Flag Station.				

Camp , Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.

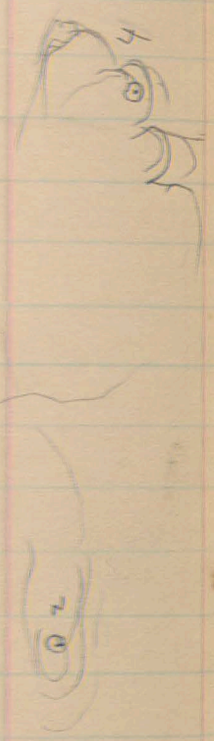
Las Vegas Base =
Ft
8570.0768
(Mean of the Bases.)

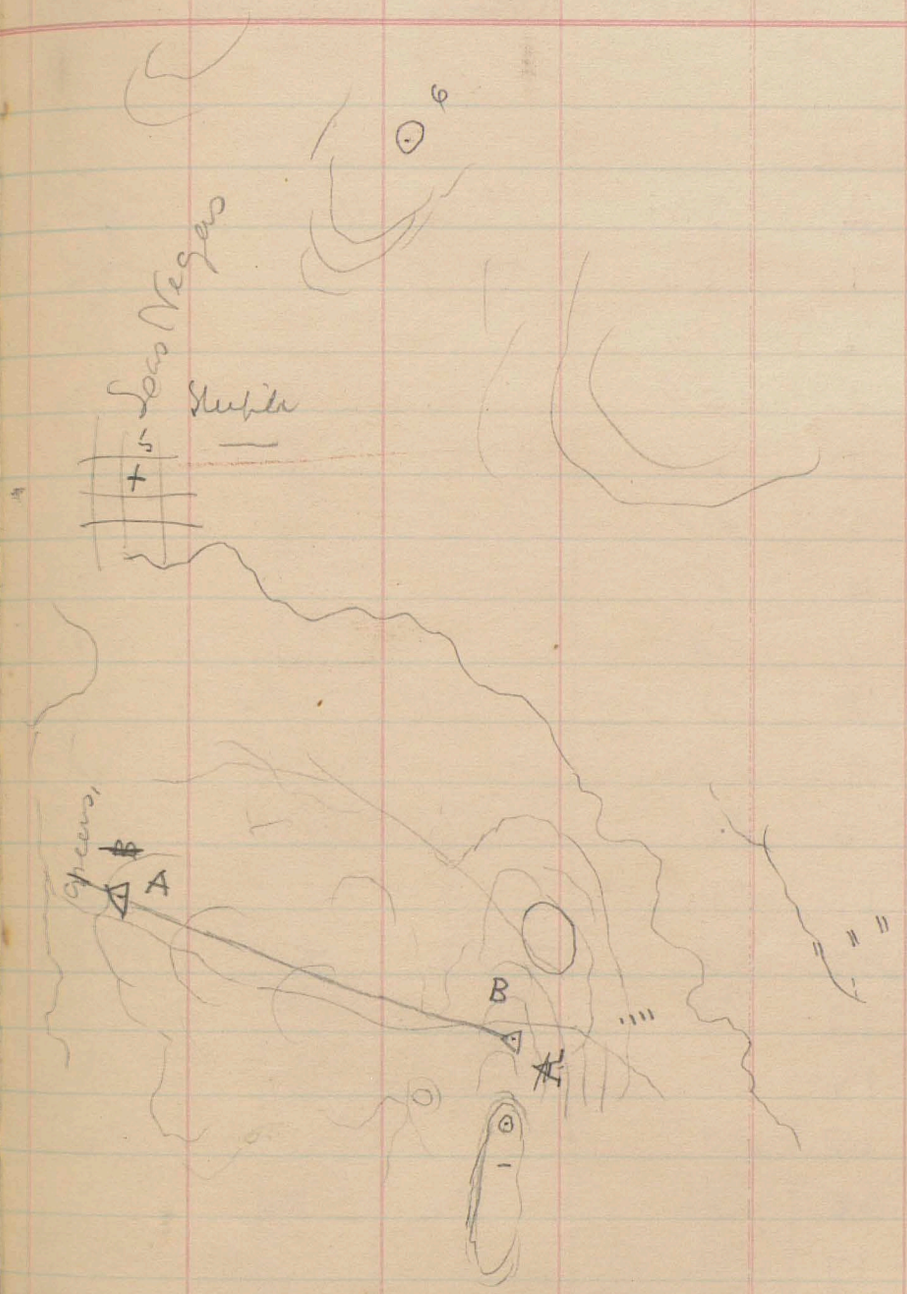
List of Gentlemen on the Base Line
At
Las Vegas
— Base —
New Mexico,
Nov 10th to 14th,
1874

Jas Thompson } Sub agents
N. Carpenter

Lieut. P. M. Price.
W. W. Hance Meteorologist
A. J. Trued Odometer
Wm Stephens Mark Leader
Geo Alberti Ditch digger
A. Rodericus Grain digger
Tom Harris Dog Hunter
O Hell. Bug Grater

DATE. 1874	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Nov. 10		Reconnoitre Los Vegas Base										
	B's	from	~~A~~ B	(altazimuth)								
	2	90°										
	A	105	bis (approx.)									
	3	127										
	4	132										
	5	153										
	6	190										





Camp 3rd Meas , Computer.

DATE. 1874	NO. OF— Camps.	NO. OF— Station.	DISTANCE ~~BY ODOMETER.~~ bet. pegs	BEARING. Magnetic. Temp.	BEARING. True. adjust.	DEDUCED DISTANCE.	Nov. 11 ~~NORTHING.~~ I Ther.	~~SOUTHING.~~ Chain set at	Nov 12 ~~EASTING.~~ II Ther.	(Left at) ~~WESTING.~~ Chain	ANEROID NO.	REMARKS.
		Stone						70°				
		A	50	74	80		63°		61	60	~~77~~	West leg. ~~80~~
		1	50				67°		~~59~~			
		2	50				70°					
		3	50				69					
		4	50	74	80		67		57		~~77~~	~~80~~
		5	50				68					
		6	50				66					
		7	50				67					
		8	50	74	70		68		55		~~74~~	~~70~~
		9	50				68					
		10	50				68					
		11	50				68					
		12	50	72	70		69		55		~~74~~	~~70~~
		13	50				69					
		14	50				70					
		15	50				70					
		16	50	72	70		71		54	50	~~74~~	~~70~~
		17	50				72					
		18	25				71					
		19	50				72					
		20	50	72	70		73		55	50	~~74~~	~~70~~
			1025									

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE ~~BY ODOMETER~~.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
			time 9.56	Temp	adjust		Thur.	Chain	7107 15 The	Chain	~~Ap 12~~ The	Chain
		21	10 50				75	70				
10 09 / 9.56 / 13'		22	50				75	70				
		23	50				76	80				
		24	50	71	70		78		55	50	~~71~~	~~72~~
13' = 250'		25	50 time 10.09				77					
		26	50				77					
		27	50				78					
		28	50	70	70		77		54	50	~~70~~	~~70~~
		29	50				77					
		30	50				77					
		31	50				75					
10 34 / 10 09 / 25'		32	50	70	70		76		56	60	~~70~~ 5/8 in a land	~~70~~
		33	50				77					
		34	50				77					
		35	50				77					1/32 3rd of 1st
25' = 750'		36	50	70	70		78		56	60	~~70~~	~~70~~
		37	50				78					
		38	50				77					
		39	50				77					
		40	50	70	70		78		57	60	~~70~~	~~70~~
~~bit fwd~~ brought forward			time 10.34 / 1025 / 2025									

Camp 3rd Ulcer , Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic. Temp.	BEARING. True. adjust.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING. Mor 12 The	WESTING. Chain	ANEROID NO. ~~[illegible]~~ ~~The~~	REMARKS. ~~Chain~~
brought forward			2025									
		41	50				79	80				
		42	50				80					
		43	50				80					
		44	50	70	70		81		58	60	~~70~~	~~70~~
		45	50				81					
10 51 / 10 34 / 17		46	50				80					
		47	50				80					
17' = 500'		48	50	70	70		80		57	60	~~70~~	28/32 in 2 of 1 in ~~70~~
		49	50				80					
		50	50				80					
			time = 10.51									
		51	50				81					
		52	50	70	70		81		61	60	~~70~~	~~70~~
		53	50				82					
		54	50				83					
		55	50				83					
		56	50	70	70		83		59	60	~~70~~	~~70~~
		57	50				82					
		58	50				82					
		59	50				82		~~60~~	~~60~~		
		60	50	69	70		81		60	60	~~69~~ 17/8 in 3rd of 1 in	~~70~~
			3025									

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID No.	REMARKS.
				40 12					40 12	Clair	8.7 Nov 12	
				322 Time								
				3h					3h		3h	Claire
brought forward			3025									
12:01		61	50				81	80				
10 51		62	50				80					
1 10			time = 12.01									
		63	50				82					
		64	50	70	70		81		61	60		
~~600'~~		65	50				78					
		66	50				78					
10' = 400'		67	50				77					
		68	50	70	70		77		62	60		
		69	50				77					
		70	50				77					
			time = 12.11									
		71	50				77					
		72	50	70	70		76		62	60		
12' = 500'		73	50				76					
		74	50				77					
		75	50				77					
		76	50	70	70		77		63	60		
		77	50				77					
		78	50				76					
		79	50				76					
		80	50	71	70 72/83rd of 1st		76		63	60		7/8th 2nd of 1st
			time = 1223									
			4025									

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
			4025	3rd line Mar 12 2hr	Chain				Mar 14 Thr	Chain		
		81	50				76	80	78	80		
12 40 / 12 22 / 1		82	50				77		77	80		
		83	50				78					
		84	50	70	70		78		76	80		
		85	50				77					
17' = 500'		86	50				77		74	70		
		87	50				77					
		88	50	71	70		77		73	70		
		89	50				77					
		90	50				77		74	70		
		line =	12 40									
		91	50	—		27/32 3 21 K1	77					
		92	50	72	70		77		71	70		
		93	50				77					
		94	50				77					
		95	50				77					
		96	50	71	70		77		70	70		
		97	50				77					
		98	50				77		70	70		
		99	50				77					
		100	50	72	70		77		70	70		
			5025									

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
			5025									
		101	50				78	80				
		102	50				77					
		103	50				77					
		104	50	72	70		83		70	70		
		105	50				82					
		106	50				81					
		107	50				81					
		108	50	72	70		80		71	70		
		109	50				80					
		110	50				79					
			Anne = 1.33									
		111	50	69	70		79					
		112	50	69	70 23/4 3rd 1st		78		70	70		
		113	50				78					
20' = 500'		114	50				78					
		115	50				78					
		116	50	69	70		79		70	70		
		117	50				79					
		118	50				78					
		119	50				78					1 1/8 2d 1st
		120	50	69	70		79		68	70		
			Anne 1.53½									
			6025									

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic. (Nov 12 Ohe)	BEARING. True. (Chain)	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING. (Nov 12 Ohe)	WESTING. (Chain)	ANEROID NO.	REMARKS.
			6025									
2 10 / 1 53 / 1 7		121	50				78	80				
		122	50				77					
		123	50				76					
		124	50	69	70		77		71	70		
		125	50				77					
17' = 500'		126	50				77					
		127	50				77					
		128	50	69	70		77		70	70		
		129	50				78					
		130	50				78					
		Time = 2.10										
		131	50				77					
		132	50	69	70		79		69	70		
		133	50				77					1 1/4 2nd of 121
17' = 500'		134	50				77					
		135	50				77					
		136	50	69	70		77		70	70		
		137	50				76					
		138	50				76					
		139	50				76					
		140	50	68	70		76		70	70		
			Time 227 1/2									
			7025									

Camp , Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Brut ford		141	7025				~~76~~	~~80~~				
		142	50				76	80				
		143	50				75	80				
245 / 227 / 18		144	50				74	80				
		145	50	68	70		73	70	70	70		117/32 2nd of 1st
		146	50				72		75	70		
18' = 500'		147	50				72		77	80		
		148	50	68	70		72		77	80		
		149	50				72		77	80		
		150	50				72		77	80		
317 / 245 / 32			2.45				72					
		151	50				73		76	80		
		152	50	68	70		72		75	80		
~~32' = 500~~		153	50				72		75	80		
		154	50				70		75	80		
		155	50				71		75	80		
		156	50	67	70		70		75	80		
		157	50				70		75	80		
		158	50				70					
		159	50				70					
Time 3.17¼		160	50	66	70		70		75	80		
		times	317¼									
			8025									

575

Camp , Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
			8025									
		161	50				70	70				
		162	50				68					
		163	50				68					
		164	50	66	70		68		73	80		
		165	50				68		73	70		
		166	50				68		73	70		11/32 2nd of 1st
		167	50				68		73	70		
		168	50	66	70		67		72	70		
		169	50				67		72	70		
		170	50				67		72	70		
		B	50	66	70 29/16 3rd of 1st		67		72	70		19/32 2nd of 1st
Total.			8575									

17
5
85' = 2500'

170
50
8500
500
8600
25
8575 - Huck.

mins. 500 but was measured, a peg driven at each length of chain (no. VI 50 ft) and ground cleared as was necessary, a pin left in each peg, in five trials in 17 minutes, in the first measurement.

Camp Las Vegas Base , Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Memoranda- Second and third measurements made Nov. 12th using same pegs as in first, and making occasional comparisons with the first. In ~~third~~ first measurement the temperature was usually 75°-80°, and graduation adjusted at 80°. Hence first measurement is considered too short. Third meas, the temperature varied but slightly from 70°, and adjusted at 70°. This measurement is considered most nearly correct, However the first is adopted, because it gives allowance for the irregularities of the ground which shortened the chain in some runs.												

Results 2nd ahead of 1st 1 9/32 inch
3rd " " " 2 9/16 "

Greatest variation, at peg 112 3rd ahead of 1st, 2 3/4 inches

F. C.

Camp Level Data — Las Vegas Base Line. Carpenter, ~~Computer~~ Topo.

DATE. 1874	NO. OF— Camps.	Peg Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
Nov. 13	Intermediate	Turn Point	B. S.	F. S.	H. I.	H. P.						
		0	0.73		200.73	200.00	End of Base. — Top of Monument.					
-2.26	A			2.99		197.74						
-2.57	1			5.56		195.17	Instrument used, No. 50 Gurley level, from Lieut. Morrison, Santa Fe. Rod made for this occasion, graduated to tenths of a foot, hundredths estimated.					
-1.75	2			7.31		193.42						
-2.36	R	3		9.67		191.06						
			2.29		193.35							
-2.45	4			4.74		188.61						
-1.94	5			6.68		186.67						
-1.75	6			8.43		184.92						
-1.92		7		10.35		183.00	all distances on this line, between pegs, are fifty feet, except between pegs 17 and 18, which is twenty-five feet.					
			0.54		183.54							
-2.08	8			2.62		180.92						
-2.28	9			4.90		178.64						
-1.29	10			6.19		177.35						
-0.85	11			7.04		176.50						
-1.78		12		8.82		174.72						
			1.38		176.10							
-2.28	13			3.66		172.44						
-1.83	14			5.49		170.61						
-2.31	15			7.80		168.30						
-1.33	16			9.13		166.97						
-1.57		17		10.70		165.40						
			1.13		166.53							
-0.58	18			1.71		164.82						
-1.13	19			2.84		163.69						

Camp Nov. 13th Continued — Nov. 13th Continued, Computer.

DATE. 1874	NO. OF— Camps.	NO. OF— Station. (Peg)	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING. (No. of Peg)	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.	
Nov. 13	Intermediate	Turn Point	B. S.	F. S.	H. I	H. P	Intermediate	Turn Point	B. S.	F. S.	H. I	H. P.	
-1.46	20			4.30	166.53	162.23	42			1.72	141.22	139.50	0.00
-0.99	21			5.29		161.24	43			4.28		136.94	-2.56
-0.98	22			6.27		160.26	44			5.24		135.98	-0.96
-1.10	23			7.37		159.16	45			6.22		135.00	-0.98
-0.69	24			8.06		158.47	46			6.87		134.35	-0.65
-0.82	25			8.88		157.65	47			7.74		133.48	-0.87
-0.73		26		9.61		156.92	48			8.79		132.43	-1.05
			1.51		158.43			49		10.11		131.11	-1.32
-0.63	27			2.14		156.29			1.69		132.80		
-1.32	28			2.46		155.97	50			3.06		129.74	-1.37
-1.00	29			3.46		154.97	51			4.07		128.73	-1.01
-1.62	30			5.08		153.35	52			4.63		128.17	-0.56
-2.13	31			7.21		151.22	53			5.22		127.58	-0.59
-1.67	32			8.88		149.55	54			5.58		127.22	-0.36
-1.99		33		10.87		147.56	55			5.83		126.97	-0.25
			0.86		148.42		56			5.41		127.39	+0.42
-1.57	34			2.43		145.99	57			4.89		127.91	+0.52
-1.28	35			3.71		144.71	58			3.92		128.88	+0.97
-1.52	36			5.23		143.19		59		2.91		129.89	+1.01
-1.00	37			6.23		142.19			5.09		134.98		
-0.73	38			6.96		141.46	60			4.19		130.79	+0.90
-0.73	39			7.69		140.73	61			4.05		130.93	+0.14
-0.77	40			8.46		139.96	62			4.16		130.82	-0.11
-0.46		41		8.92		139.50	63			4.87		130.11	-0.71
			1.72		141.22		64			6.06		128.92	-1.19

Camp Nov. 13th Continued _____ , Computer.

DATE.	NO. OF— Peg Camps.	Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.	
	Inter.	Turn Point	B. S.	F. S.	H. I.	H. P.	Intermediate	Turn Point	B. S.	F. S.	H. I.	H. P.	
-1.21	65			7.27	134.98	127.71	87			2.53	108.63	106.10	-0.81
-1.14	66			8.41		126.57	88			3.42		105.21	-0.89
-1.01	67			9.42		125.56	89			3.98		104.65	-0.56
-0.81		68		10.23		124.75	90			4.26		104.37	-0.28
			2.26		127.01		91			4.75		103.88	-0.49
-0.61	69			2.87		124.14	92			5.01		103.62	-0.26
-0.62	70			3.49		123.52	93			5.32		103.31	-0.31
-0.56	71			4.05		122.96	94			5.56		103.07	-0.24
-0.70	72			4.75		122.26	95			5.64		102.95	-0.12
-0.74	73			5.49		121.52	96			5.52		103.11	+0.16
-0.98	74			6.47		120.54	97			5.62		103.01	-0.10
-1.25	75			7.72		119.29		98		5.76		102.87	-0.14
-1.14	76			8.86		118.15			3.51		106.38		
-0.90	77			9.76		117.25	99			3.43		102.95	+0.08
-0.86	~~78~~	78		10.62		116.39	100			3.52		102.86	-0.09
			1.13		117.52		101			3.61		102.77	-0.09
-1.14	79			2.27		115.25	102			3.98		102.40	-0.37
-1.07	80			3.34		114.18	103			4.57		101.81	-0.59
-1.31	81			4.65		112.87	104			5.39		100.99	-0.82
-1.37	82			6.02		111.50	105			6.18		100.20	-1.79
-1.39	83			7.41		110.11	106			7.14		99.24	-0.96
-1.13	84			8.54		108.98	107			8.06		98.32	-0.92
-1.01	85			9.55		107.97	108			9.11		97.27	-1.05
-1.06		86		10.61		106.91	~~110~~	109		10.04		96.34	-0.93
			1.72		108.63				2.64		98.98		

Camp Nov'r 13th Continued

, Computer.

DATE.	NO. OF— Peg ~~Camps.~~	~~Station.~~	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.	
	Intermediate	Turn Point	B.S.	F.S.	H.I	H.P	Intermediate	Turn Point	B.S.	F.S.	H.I.	H.P.	
+0.12	110			2.52	98.98	96.46	133			6.34	80.19	73.85	-0.94
-0.90	111			3.42		95.56	134			7.26		72.93	-0.92
-0.98	112			4.40		94.58	135			8.28		71.91	-1.02
-1.14	113			5.54		93.44	136			9.23		70.96	-0.95
-1.07	114			6.63		92.35		137		10.21		69.98	-0.98
-1.03	115			7.66		91.32			0.68		70.66		
-1.07	116			8.73		90.25	138			1.53		69.13	-0.85
-1.26	117			9.99		88.99	139			2.48		68.18	-0.95
-0.87	~~H~~	118		10.86		88.12	140			3.41		67.25	-0.93
			1.03		89.15		141			4.32		66.34	-0.91
-1.13	119			2.16		86.99	142			5.29		65.37	-0.97
-1.00	120			3.16		85.99	143			6.12		64.54	-0.83
-0.99	121			4.15		85.00	144			6.85		63.81	-0.73
-1.14	122			5.29		~~83.86~~ 83.86	145			7.89		62.77	-1.04
-0.94	123			6.28		82.92	146			8.62		62.04	-0.73
-1.11	124			7.34		81.81	147			9.53		61.13	-0.91
-0.97	125			8.31		80.84		148		10.43		60.23	-0.90
-1.01	126			9.32		79.83			1.91		62.14		
-0.82		127		10.14		79.01	149			2.51		59.63	-0.60
			2.18		80.19		150			3.24		58.90	-0.73
-0.85	128			2.03		78.16	151			3.84		58.30	-0.60
-0.89	129			2.92		77.27	152			4.56		57.58	-0.72
-0.70	130			3.62		76.57	153			5.38		56.76	-0.82
-0.91	131			4.53		75.66	154			6.27		55.87	-0.89
-0.87	132			5.40		74.79	155			7.07		55.07	-0.80

Base Line.

Camp Nov 13th Continued — Level Data From B. end of Base, to Camp 59, Computer.

DATE.	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.
	Intermediate	Turn Point	B.S.	F.S.	H.I.	H.P.
-0.84	156			7.91	62.14	54.23
-0.89	157			8.79		53.35
-0.72	158			9.51		52.63
-0.95		159		10.46		51.68
			1.22		52.90	
-0.76	160			1.98		50.92
-0.98	161			2.96		49.94
-0.85	162			3.81		49.09
-0.92	163			4.79		48.17
-0.59	164			5.32		47.58
-0.30	165			5.62		47.28
-0.13	166			5.75		47.15
-0.21	167			5.96		46.94
-0.78	168			6.74		46.16
-0.58		169		7.32		45.58
			2.22		47.80	
-0.81	170			3.03		44.77
B End of Base -0.43	171			3.46		44.34

Height of initial end of Base 200 feet

" " final end of Base 44.34 feet

Difference of level. 155.66 "

~~NORTHING.~~	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
~~Intermediate~~	No. of Peg	B.S.	F.S.	H.I	H.P
End of Base	B.			47.80	44.34
	a		10.77		37.03
		0.51		37.54	
	b		10.76		26.78
		2.92		29.70	
	c		9.59		20.11
		2.01		22.12	
	d		10.81		11.31
		0.89		12.20	
	e		2.46		9.74
	E				

E is the step-door-sill of the main entrance to Green's Ranch Camp 59.

Camp Transfer of Astronomical Coordinates from Astronomical Station in the Plaza to flag station E. Las Vegas N.M., Computer.
Measure of Distance.

DATE. 1874	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic. (First Measurement) Temperature	BEARING. True. (Second Measurement) Adjustment	DEDUCED DISTANCE. Measure. Temp.	DEDUCED DISTANCE. Adjust	NORTHING. (First Measurement)	SOUTHING. Temper.	EASTING. adjust.	WESTING. (Second Measurement) Temp.	ANEROID NO. Adjust	REMARKS.
Nov. 14	astro. station	0		68	70	63	60						
		1	50 x	66	"	"	"	26	50 x	70	70	70	
		2	50 x	~~70~~	"	"	"	27	50 x	69	70	"	
		3	50 x	66	70	"	"	28	50 x	68	"	"	
		4	50 x	"	"	64	60	29	50 x	"	"	70	"
		5	50 x	"	"	"	"	30	50 x	"	"	69	"
		6	50 x	62	60	63	60	31	50 x	70	"	"	
		7	50 x	"	"	"	"	32	50 x	69	"	70	"
		8	50 x	60	60	"	"	33	50 x	68	"	70	"
		9	50 x	"	"	67	70	34	50 x	"	"	71	"
		10	50 x	59	60	67	"	35	50 x	69	"	"	"
		11	50 x	"	"	"	"	36	50 x	68	"	72	"
		12	50 x	58	60	66	"	37	50 x	69	"	71	"
		13	50 x	60	60	63	60	38	50 x	"	"	71	70
		14	~~30~~ 50 x	"	"	"	"	39	50 x	74	"	71	70
		15	~~50~~ 30 x	~~60~~	~~60~~	63	60	40	50 x	73	"	"	"
		16	~~50~~ 50 x	60	60	"	"	41	50 x	71	"	71	70
		17	~~50~~ 50 x	~~60~~	~~60~~	65	60	42	50 x	71	"	"	"
		18	~~20~~ 50 x	62	60	"	"	43	50 x	70	"	71	70
At Pg 19		19	20 x	68	70	"	"	44	50 x	69	"	"	"
second meas.		20	50 x	"	"	71	70	45	50 x	70	"	70	70
7/32 inch ahead		21	50 x	65	70	70	"	46	50 x	"	"	70	70
of first.		22	50 x	66	70	70	"	47	50 x	"	"	70	70
		23	50 x	68	70	72	"	48	50 x	"	1	71	70
		24	50 x	69	70	71	70	49	50 x	"	"	71	71
		25	50 x	"	"	70	70	50	50 x	"	"	71	70
								51 E	50 x 9.7	71 "	70 "	71 "	70 "

Distance from Astronomical station to E. 2509.7 feet.
Difference between measurements is 3/16 inch.
At E. first 9/16 inch ahead of second.

Level Data

Camp From the Astronomical Station in the Plaza, Las Vegas to , Computer.
flag station E. For distances between pegs see preceding page.

DATE. 1874	NO. OF— Camps.	NO. OF— Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	BEARING. True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.	
Nov. 14	Inter.	Turn	B. S.	F. S.	H. I	H. P	Intermediate	Turn Points	B. S.	F. S.	H. I	H. P	
Top of astronomical stone		0	6.63		106.63	100.00				6.99	137.60	130.61	+0.79
-0.60	1			7.23		99.40	21			5.82		131.78	+1.17
+1.45	2			5.78		100.85	22			3.16		134.54	+2.76
+1.03	3			4.75		101.88		23					
+4.42		4		0.33		106.30			8.74		143.28		
			8.75		115.05		24			6.58		136.70	+2.16
+2.84	5			5.91		109.14	25			3.90		139.38	+2.68
+1.22	6			4.69		110.36		26		0.83		142.46	+3.07
+1.73	7			2.96		112.09			10.91		153.36		
+1.94		8		1.82		114.03	27			8.56		144.80	+2.35
			9.73		123.76		28			6.59		146.77	+1.97
+2.41	9			7.32		116.44	29			4.51		148.85	+2.08
+2.04	10			5.28		118.48	30			4.16		149.20	+0.35
+2.30	11			2.98		120.78	31			2.08		151.28	+2.08
+1.16	~~12~~	12		1.82		121.94		32		2.28		151.08	-0.20
		~~13~~	8.35		130.29				10.31		161.39		
+2.30	13			6.05		124.24	33			7.99		153.40	+2.32
+2.43	14			3.62		126.67	34			5.98		155.41	+2.01
-0.30	15			3.92		126.37	35			4.19		157.20	1.79
-0.11	16			4.03 ~~6.42~~		126.26 ~~129.87~~	36			2.26		159.13	1.93
-0.97	17			4.97		125.32		37		0.00		161.39	2.26
+0.34 ~~0.66~~	18			4.63		125.66			10.68		172.07		
+0.64	19			3.99		126.30	38			8.78		163.29	+1.90
+3.52		20		0.47		129.82	39			5.99		166.08	+2.79
			7.78		137.60			40		2.50		169.57	+3.49
									9.97		179.54		

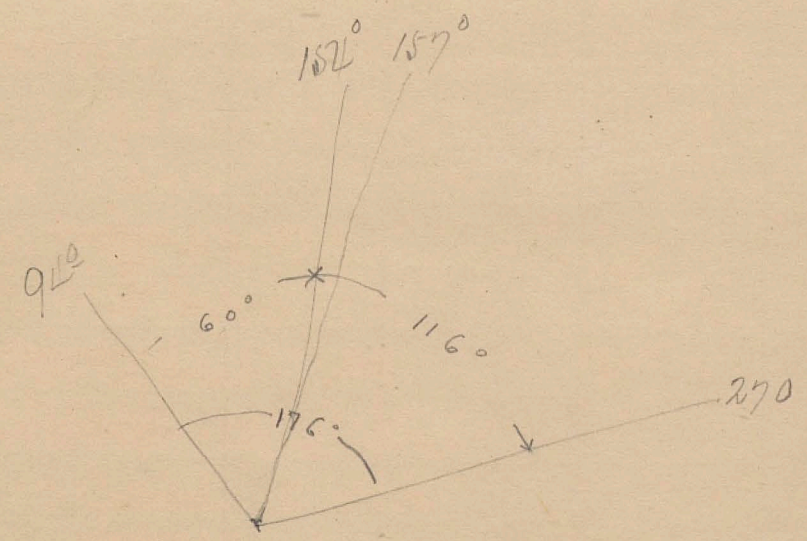
Level Data

Camp November 14th, Continued.

, Computer.

DATE.	NO. OF— Peg Camps.	Station.	DISTANCE BY ODOMETER.	BEARING. Magnetic.	True.	DEDUCED DISTANCE.	NORTHING.	SOUTHING.	EASTING.	WESTING.	ANEROID NO.	REMARKS.
	Inter.	Turn Point	B. S.	F. S.	H. I.	H. P.						
7.56		41		2.41	179.54	177.13						
6.68			10.11		187.24							
		42		3.43		183.81						
			10.85		194.66							
7.66		43		3.19		191.47						
			9.78		201.20							
8.85		44		0.88		200.32						
			10.19		210.51							
8.48	45			1.71		208.80						
-0.23		46		1.94		208.57						
			9.68		214.25							
5.21		47		4.47		213.78						
			8.35		222.13							
6.02		48		2.33		219.80						
			9.03		228.83							
6.31		49		2.72		226.11						
			8.66		234.77							
4.04	50			4.62		230.15						
1.38	51			3.24		231.53						
0.28	E			3.52		231.25						

Difference of level, 131.25 feet.



$$\begin{array}{r} 270 \\ 94 \\ \hline 176 \end{array} \qquad \begin{array}{r} 270 \\ 154 \\ \hline 116 \end{array}$$

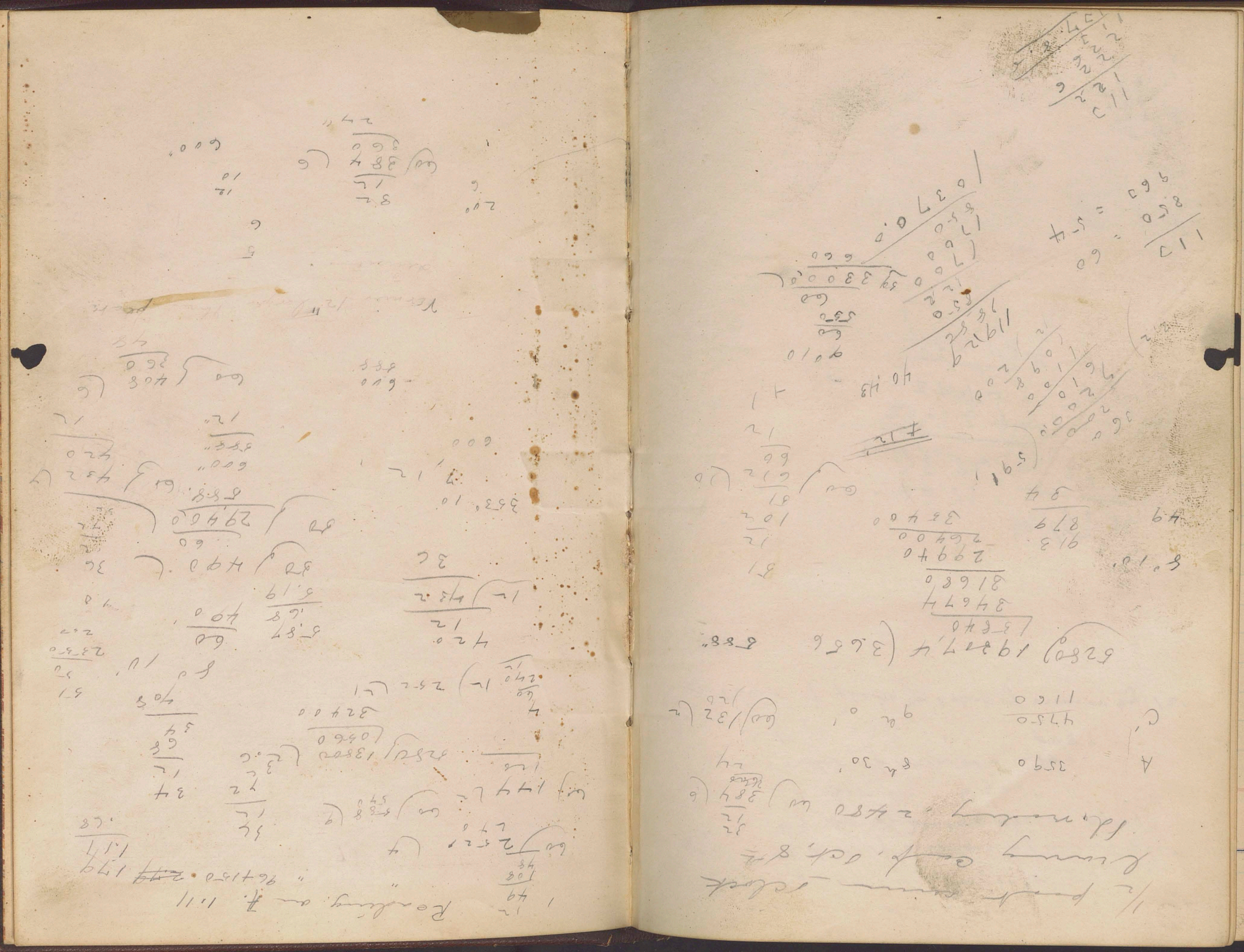
$$2 \overline{)\,176} \\ 88 \\ 94 \\ \hline 182$$

8°10′ = 50 div. of vernier.
8°10′ = 49 " V " plate

50 div. of vernier = 49 div. of plate.
49 div. of plate = 490′ = 29400″
1 div " " = 600″
50 div. of vernier = 29400″
1 " " " 588″

1 div of plate > 1 div of vernier by 12″

$$\begin{array}{r} 284.53 \\ 78.86 \\ \hline 205.67 \\ 21.14 \\ \hline 184.53 \end{array} \qquad \begin{array}{r} 150 \\ 78.86 \\ \hline 21.14 \end{array}$$



20.
44.
68
88
109
128
152

97
200
19400

5280) 18800 (2.61
10560
8240
7168
1120

7400
5280
2160
2640
7920

153) 1880.4 (12.29
9900
9662
238

153
350
306
444
306
138
77

12
12
24
24
60) 264 (4
240

7840
238
1378

159
12
318
159
1908

3820
1880.4
1939.6

84° 27' 12"

153
159

124) ~~1460.3~~ (11.78
124
220
124
1660
1488
9620

6 59
10

159) 1939.6 (12.20
159
349
318
316
318
20

28
3
84
4) 21

24
12
48
24
60) 288 (4
240
48
2

12,29
12.20
11.78

5280) 120000 (22.7
105600
14400
10560
38400

53
50
2650

75
3700

10 feet
20 000

36°
12'

+30

16) 400 (25"
32
80
80

2'

+30
2
2
2
2
2
2
2

196.49
78.86
117.6320
28
164"

140
50
7000

Camp

17895
454
18349

18453
1176.3
66.90

120.
3 11
16
1165
16

36
12
72
36
60) 432 (7
420

1165
16
696
1165
1861
16 × 1/12

2 acres

7020
60.
70

192) 1861 (9.7
1728
1330
1344

Thompson & Carpenter

No. 151

No. ~~10~~

No. 19.

U. S. ENGINEER OFFICE,

Explorations AND Surveys

West of the 100th Meridian.

TOPOGRAPHICAL DEPARTMENT.

Oct. 7 to Nov. 23. Santa Fe Case
Las Vegas "

1874