(69) - Arizona - (1) 133-138

1939

1939

Received with letter of Chud N. Darling
dated November 6th 1869.

1939

BOOK 1939

Navajo Indian Reservation
in
New Mexico and Arizona

Field Notes and Computation of
Observations for Time and Latitude,
at Old Fort Defiance, South
West corner and North West
Corner of Navajo Indian
Reservation. by E. N. Darling,
U. S. Surveyor and Astronomer,
under his Contract with
Hon. Jos. S. Wilson,
Commissioner of the General Land
Office.
Dated Washington D.C.
April 29th 1869.

1939

In T. 1 N., R. 6 W. and T. 1 N., R. 11 W.

1939

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1939

BOOK 1939

The following observations were made with a Sextant of Gambrey's make, Paris.

Observations made and Computed, by C. N. Darling, U.S. Surveyor and Astronomer.

Time observed by John C. McManus.

Observations made at the site of Old Fort Defiance A.T.

Equal Altitude (Suns Lower) for time July 23d & 24th 1869

July 23d P.M. h m s	July 24th A.M. h m s	Altitudes
4 23 37	6 51 59	67° 10'
4 24 28	6 52 45	66 50
4 25 12	6 53 32	66 30
4 26 2	6 54 17	66 10
4 27 56	6 55 02	65 50
4 28 47.5	6 55 48	65 30
4 29 34	6 56 37	65 10
1/7 .... 4 26 28	1/7 .... 6 54 17	

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Log A. 14h 27m 49s = 9.7060
Log. 31".7 = 1.5010
Tangt. φ 35° 46' 20" = 10.0268
17°.13 1.2338
1.82
15.31

Log B. 14h 27m 49sec = 9.2071
Log. 31".7 = 1.5010
Tangt. δ 19° 36' 21" = 9.5515
1.82 = 0.2596

11h 40m 27s.5
15.31

12.00.00. 11 40 12.19 M.S.
11 46 23.79 6 11.6
13 36 21 11 46 23.79

Chronometer slow on Mean Solar Time. 13m 36sec.21

Equal Altitude (Suns Lower) for time July 24th and 25th 1869.

July 24th P.M. h m sec	July 25th A.M. h m sec	Altitudes
3. 35 11	7 45 28	77° 40'
3. 36 55	7 44 40	77 20
3. 37 47	7 43 51	77 00
3. 38 28	7 43 02	76 40
3. 39 27	7 42 02	76 20
3. 40 02	7 41 12	76.00
1/6 — 3 37.58	1/6 ..... 7 43 22	

Log. A.	h 16	m 5	sec 24	=	9.79	50	
Log. 32".5				=	1.	51	19
Tangt. ϕ. 35°	46'	20"		=	10.	02	68
	2m	56		=	1.	33	37
	2.	46					
	19.	10					

Log. B.	h 16	m 5	sec 24	=	9.	33	35
Log. 32".5				=	1.	51	19
Tangt. δ 19°	23'	30"		=	9.	54	63
	2m	46		=	0.	39	17

	h	m s
	12.	0 0
	11.	46. 33.40
	13.	26. 60

h	m	sec	
11	40	40	
	19	10	
11.	40.	20.90	M. T.
	6	12.5	
11	46	33.40	

Chronometer slow on Mean Solar Time 13m. 26sec. 60

Circummeridian Altitudes (α Aquilæ)
July 23d 1869.

h.	m.	Sec.		°	'	"	m	sec		'	"
11.	17	20		125	35	20	5.	15.		1	3.3
11	19	10		125	36	55	3.	25			38
11	20	50		125	37	55	1	45			10
11	22	40		125	38	15	—	05.			00
11	23	35		125	38	10	1	00			05
11	24	50		125	37	45	2.	15.			16
11	26	10		125	36	55	3	35			41
			1/7	125	37.	19.3			1/7		29

Index Error — — — — — 6 40
Refraction — — — — — 5 4

1/2	125°	29'	45.3
	62°	44'	52".6
		0	29
	62°	45'	21".6
	8	31	40.6
	54°	13'	41.0
	90°	0"	0"
	54	13	41
	35°	46'	19" = Latitude.

Circummeridian Altitudes (δ Draconis) July 23d 1869.

h.	m.	sec.	°	′	″	m	sec	″
10	46	00	116	47	15	4	49	27.5
10.	47	31	116	47	55	3	18	13.
10	49	05	116	48	15	1	44	04
10	50	46	116	48	20		03	00
10	51	58	116	48	20	1	09	02
10	53	21	116	48	05	2	32	08
10	54	44	116	47	55	3	55	18.
		½	116	48	00.7		½	10.3

Index Error - - - 6. 40

Refraction — 58

½	116	40′	22″.7	
	58	20	11.3	
			10.35	
	58	20	22.55	
N.P.	22.	33	56	
	35°	46′	26″ 55	= Latitude.

Circummeridian Altitudes (α Cephei) July 23d 1869.

h.	m.	sec.	°	′	″	m	sec	″
0	48	11	127	34	55	4	56	43.
0	49	30	127	35	30	3	35	22
0	51	55	127	36	10	1	10	02
0	53	35	127	36	20		25	00
0	55	02	127	36	20	1	57	6.5
0	56	30	127	36	05	3	25	20.
0	57	49	127	35	20	4	44	39.
		½	127	35	49.2			

Index Error - - - 6 40

Refraction - - - 48 =

	127°	28′	21.″2
	63°	44′	10.″6
			18.9
	63	44	29.5
N.P. distance	27	58	04
	35°	46′	15.″5 Latitude

Circummeridian Attitudes (B. Acquarii) July 23d 1869.

h.	m.	sec.	°	′	″	m.	sec.	″
0	59	50	96	18	12	2	25	13
1	1	10	96	18	33	1	5	03
1	2	50	96	18	50	—	35	00
1	4	01	96	18	40	1	46	07
1	5	42	96	18	25	3	27	26
		1/5	96	18	32.		1/5	9.8

Index Error — 6. 40

Refraction — 1. 30

1/2 .... 96° 10′ 22″

48 5 11

6 8 30

54 13 41

9.8

54 13 50.8

90° 0′ 0″

54. 13. 50.8

35° 46′ 9.″2 = Latitude.

Altitudes (Polaris) July 23d. 1869

h.	m.	sec.	°	′	″
10	58	01	71	46	25
10	59	42	71	49	10
11	1	04	71	50	40
11	2	50	71	51	20
11	4	22	71	52	55
11	6	01	71	53	30
11	7	50			
1/7 11	2	58.5	1/7	71	50	30.7

Index Error. — — 6. 40

Refraction — 2 10

1/2 — — 71° 41′ 40.″7

35° 58′ 50.″35

Lay. 50 16 = 3.70036

cos. P. 86° 42′.4 8.76965

29.″5.2 2.47001

4′. 55.″2

Sin 35° 50′ 50″ = 9.76760

cos P.m. 4′. 55″ = 10.

cosec. 88° 36′ 24″ = 10.00013

35° 51′ 29″ 9.76773

4. 55

35° 46′. 24″ = Latitude

Altitudes (Polaris) July 24th 1869.

h.	m	sec	°	′	″
10	55	35	71	47	45
10	57	02	71	48	55
10	58	51	71	50	30
11	00	40	71	52	10
11	2	22	71	53	35
11	4	01	71	53	00
11	6	04	71	56	40
h.	m.	sec.			
÷7	11	0 32.4	÷7	71	52 5″

Index Error — 6. 40
Refraction — 2 10
÷2 71 43′ 15″
35° 51′ 37.5″

Log. 4985 = 3.69767
Cos. P. 86° 17½ = 8.81173
323.2 2.50940
5′ 23″

Sin. N. 35° 51′ 37″ = 9.76773
Cos. P.M. 5′ 23″ = 10.
Cosec. of 80° 36′ 24.6″ = 10.00012
35° 52′ 10″ = 9.76785
5′ 23″
35° 46′ 47″ = Latitude

Circummeridian Altitudes (δ Draconis) July 24th 1869.

h.	m	sec.	°	′	″	m.	sec	″
10	41	20	116	47	20	5	36	38
10	42	55	116	48	00	4	02	20
10	44	31	116	48	10	2	26	7
10	45	55	116	48	20	1	02	1
10	47	32	116	48	15	—	34	0
10	49	04	116	47	55	2	07	6
10	50	50	116	47	15	3	53	18
			÷7	116	47 53.5		÷7	12.8

Index Error — 6.40
Refraction. — 58
½ 116° 40′ 15.5″
58 20′ 07.7
12.8
58 20 20.5
22 33 56
35 46′ 24″.5 Latitude

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Circummeridian Altitudes (A. Aquilae) July 24th 1869.

h.	m.	sec.	°	′	″	m.	sec.	′	″
11	13	10	125	35	10	5	34	1	40
11	15	2	125	36	40	3	42		44
11	16	41	125	37	45	2	33		13
11	18	35	125	38	10		9		0
11	20	21	125	37	55	— 1	37		8
11	22	12	125	37	25	3	28		19
11	23	34	125	37	05	4	50		84
		1/7	125°	37′	10″			1/7	38.2

Index Error — — 6.40
Refraction — — 54
1/2 125° 30′ 36″

62 45 18
8 31 40
54 13 38

90° 0′ 0″
54 13 38
35° 46′ 22″ Latitude.

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*Circummeridian Altitudes (B. Aquarii) July 24th 1869.

h.	m.	sec.	°	′	″	m.	sec.	″
0	57	40	96	18	30	1	44	6
0	59	04	96	18	40		20	0
1	00	22	96	18	30	—	58	21
1	1	55	96	18	15	2	31	14
1	3	14	96	17	40	3	50	33
		1/5	96°	18′	19″			1/5 — 11

Index Error — — — — 6.40
Refraction — — — — 1.30
1/2 — 96° 10′ 09″

48 5 4.5
11
48 5 15.5
6 8 30
54 13 45.5
90° 0′ 0″
54 13 45.5
35° 46′ 14.5″ Latitude.

* Circummeridian Attitudes (A. Cephei) July 24th 1869.

h.	m.	s.	°	′	″	m.	sec.	″
0	44	20	127	34	00	5	13	47
0	45	32	127	34	25	4	02	28
0	47	59	127	35	15	1	35	4
0	49	31	127	35	20		3	0
0	51	05	127	35	15	1	29	3
0	52	35	127	35	00	3	01	16
0	53	53	127	34	15	4	19	32
			1/7 127	35	46.4			1/7 18.5

Index Error — — — 6.40

Refraction — — 48

1/2 127° 28′ 18.″4

63° 44′ 09.″2

18.5

63° 44′ 27.″7

N.P. distance .. 27 58 04.

35° 46′ 23.″7 Latitude.

Date	Name of Star		No.	Latitude
July 23d	α	Aquilae.	7	35° 46′ 19″
" 23d	δ	Draconis.	7	35 46 26.5
" 23d	α	Cephei.	7	35 46 15.
" 23d	β	Aquarii	5	35 46 09.
" 23d		Polaris.	7	35 46 24.
" 24th		Polaris	7	35 46 47.
" 24th	δ	Draconis	7	35 46 24.
" 24th	α	Aquilae	7	35 46 22.
" 24th	α	Cephei.	7	35 46 23.7
" 24th	β	Aquarii	5	35 46 15.5
			56	35° 46′ 22.″3 = Mean Latitude

I therefore set Astronomical Monument on site of old Fort Defiance in Latitude 35° 46′ 22.″3. Said point is just South of the Issue Building and Store Rooms.

Set a granite stone. 44×12×12. 2½ feet in earth. marked on the north "S. B. N. I. R." on the East "1869"

Observations made at South West corner of Navajo Indian Reservation.
Equal Altitudes (Suns Lower) for Time. August 8th and 9th. 1869.

Aug. 8th P.M. h. m. sec.	Aug. 9th A.M. h. m. sec.	Altitudes ° ′
2. 49. 44	8 37 20.5	88 30
2. 50. 12.	8 36 56	88 20
2. 50. 38.5	8 36 31	88 10
2. 51. 5	8 36 5.5	88 00
2. 51. 31.5	8 35 40.5	87 50
2. 51. 59.	8 35 14.5	87 40
2. 52. 22.	8 34 48.	87. 30
2. 51. 4.5	8 36 5	
1/7	1/7	

Log. A. 17h 45m = 9.9088
Log. 4" 3.4 = 1.6375
Tangt. ϕ 35° 46′ 20" = 9.8576
25" 64 = 1.4039
6.82
18.82

Log B 17h. 45m = 9.7436
Log. 4" 3.4 = 1.6375
Tangt 15° 34′ 57" = 9.4529
6"82 = 0.8340

h. m. sec.	h m sec
	11 43 9.5
	18.82
12. 0. 0.	11 42 40.68 M.S.
11 48 3.83	5 13.15
11. 56.17	11 48 3.83

Chronometer slow on Mean Solar Time 11m. 56.17 sec.

Equal Altitudes (Suns Lower), for Time. August 9th and 10th 1869.

August 9th P.M. h. m. sec.	August 10th A.M. h. m. sec.	Altitudes ° ′
2 48 42	8 35 19.5	88 33
2 49 06	8 35 44	88 20
2 49 31	8 36 09.5	88 10
2 49 58.5	8 36 36.	88 00
2 50 18.5	8 37 02	87 50
2 51 8.5	8 37 50	87 40
2 50 44.5	8 37 30	87. 30
1/7 2. 49 54.7	1/7 8. 36. 38.	

Log. A. 17h 46m 43s = 9.9111 Log B 17h 46m 43s. = 9.7494
Log. 43.3 = 1.6365 Log. 43.3 = 1.6365
Tangt. ℓ 35° 46' 20" = 9.8576 Tangt. 6° 15' 17.26" = 9.4368
25.40 = 1.4052 6.65 = 0.8227
6.65
18.75

h. m. s.	h. m. s.
11. 43 16.2	12. 0. 0.
18.75	11. 48 04.15
11. 42 57.45	11 55.85
5 6.7	
11. 48 04.15	

Chronometer slow on mean Solar Time m. 11. Sec. 55.85

Circummeridian Altitudes (δ Draconis) Aug. 8th, 1869.

h. m. s.	° ′ ″	m. s.	″
9. 44. 34.	116. 47. 20.	5. 5	31
9. 47. 05.	116. 47. 50.	2. 31	8
9 48 38	116. 48 00	41	0
9. 50 05	116 48. 10	26	0
9 51 23	116 48. 05	1.46	4
9 53 04	116. 47 45	3.25	14
9 55. 06	116 47. 10	5.27	35
÷7	116. 47. 45.7	÷7	13

Index Error. — 6. 40
Refraction — 58
½ 116. 40. 7. 7
58. 20 3.8
13
58. 20. 16,8
22. 33. 51.
35° 46' 25.8 = Latitude.

Circummeridian Altitudes (A Aquilae). August 8th 1869.

h.	m.	sec.	°	′	″	m.	s.	′	″
10	15	43	125	35	00	5	43	1	45
10	17	21	125	36	25	4	05		53
10	19	24	125	37	40	2	02		13
10	21	31	125	38	00	—	5		0
10	23	12	125	37	20	1	46		25
10	25	1	125	36	40	3	35		41
10	26	24	125	35	20	4	58	1	19
			½	125	36	35.5		½	45

Index Error. — 6.40
Refraction 34

½ ..... 125° 29′ 01.5″
62. 44. 30.7
45.
62. 45. 15.7
8 31 44.7
54 13 31

90° 0′ 0″
54 13 31
35° 46′ 29″ = Latitude.

Circummeridian Altitudes (A Cephei). August 8th 1869.

h.	m.	sec.	°	′	″	m.	s.	″
11	47	21	127	34	40	4	55	42
11	48	59	127	35	25	2	17	9
11	50	54	127	36	05	1	22	3
11	52	40	127	36	15	—	24	0
11	54	31	127	36	05	2	15	9
11	56	04	127	35	35	3	48	24
11	57	42	127	34	45	5	26	51
			½	127	35	32.8		½ 19.7

Index Error. — 6. 40
Refraction — — 48

½ 127. 28. 04. 8
63. 44. 02. 4
19. 7
63. 44 22. 1
27. 57. 55.
35° 46' 27".1 = Latitude.

Circummeridian Altitudes (B. Aquarii) August 8th 1869.

h.	m.	s.	°	'	"	m.	s.	"
11	59	57	96	18	40	1.	29	5
12	1	58	96	18	50	—	32	0
12	3	29	96	18	35	2	3	9
12	5	01	96	18	10	3	35	29
12	6	50	96	17	00	4	24	44

⅕ ..... 96 18 15 ⅕ 17.5

Index Error. — 6.40
Refraction — 1.30

½ 96 10 05
48 5 2.5
17.5

48 5 20
6 8 30

54 13 50

90° 0' 0"
54 13 50
35. 46 10 = Latitude.

Altitudes (Polaris) August 8th 1869.

h.	m.	s.	°	′	″
10	29	31	72	07	10
10	31	00	72	08	10
10	32	35	72	09	15
10	34	15	72	10	20
10	35	51	72	11	25
10	37	40	72	12	40
1/6	10	33	58.6	t	72	9	50

Index Error. — 6.40
Refraction — 2.00

½ 72 1 10

36° 0′ 35″

Log. 5 0 13 = 3.71012 Sin A. 36° 0′ 35″ = 9.76932
Cos P 79° 46′ 51″ = 9.25309 Cos P.M. 15. 11.8 = 10.00000
Cosec. δ 88° 36′ 27″ = 10.00013

911.8 = 2.96321
15.11.8

36. 1′ 21.″ = 9.76945
15. 11. 8

Latitude = 35° 46′ 09.″2

Altitudes (Polaris) August 9th 1869.

h.	m.	s.	°	′	″
9	46	10	71	47	31
9	48	24	71	49	06
9	50	03	71	50	36
9	52	00	71	52	07
9	53	51	72	53	26
9	55	40	72	55	06
9	57	45	72	56	41
1/7	9	51	59	1/7	71	52	03.9

Index Error = — 6 40
Refraction — — 1 00

½ 71 43 23.9
35 51 41.95

Log. 4982.5 = 3.69740
Cos P. 85° 45' 14" = 8.86947

367.8 = 2.56687
6.7.8

Sin N. 35° 51' 41.9 = 9.76777
Cos. P.M. 6. 7.8 = 10.000000
cosec. 88° 36' 27.5 = 10.000013

35° 52' 28" = 9.76790
6 7.8
35° 46' 20".2 Latitude.

Circummeridian Altitudes (δ Draconis) August 9th 1869.

h.	m.	sec.	°	'	"		m.	sec.	"
9	40	30	116	47	15		4	57	29
9	42	51	116	47	45		2	28	7
9	45	01	116	48	05			22	0
9	46	30	116	48	10	—	1	07	2
9	47	42	116	48	05		2	19	6
9	48	59	116	47	50		3	36	16
9	50	50	116	47	15		5	27	35

1/7 ..... 116 47 46.4 — 1/7 ..... 13.5

Index Error. — 6.40
Refraction — 58

1/2 ..... 116 40 8.4
58 20 4.2
13.5

58 20 17.7
N.P. distance. 22 33 51

35° 46' 26".7 = Latitude.

Circummeridian Attitudes (A. Aquilae) Aug. 9th 1869.

h. m. s.	° ′ ″	m. s.	″
10 11 50	125° 35′ 05″	5. 19	1. 31
10. 13. 40	125° 36 23″	3. 29	40
10 15° 23	125° 37 40	1. 46	10
10 17 29	125° 37 55°	— 18	0
10 19 14	125° 36 35°	2. 05°	13
10 21 23	125° 35′ 25°	4 14	58
1/6	125° 36′ 30″.8	1/7	35. 3

Index Error. — 6. 40
Refraction. — 5′4

1/2	125° 28′ 56.″8	
	62 44 28.4	
		35. 3
	62° 45′ 3.″7	
	8 31 43. 5°	
	54 13 20. 2	
	90° 0′ 0″	
	54° 13′ 20″, 2	
	35° 46′ 39″. 8 = Latitude.	

Circummeridian Attitudes (A. Lephei) August 9th 1869.

h	m.	s.	° ′ ″	m.	sec.	″
11	43	31	127 34 45°	3.	29	20
11	45.	02	127 35° 30	1	58	6
11	46	51	127 36 10	—	9	0
11	48	44	127 36 10	1	44	5°
11	50	34	127 35° 55°	3	34	20
11	52	20	127 35 30	5°	20	49
		1/6	127° 35′ 40″		1/6	16.6

	127°	35′	40″
Index Error	−		6.40
Refraction			48
½	127	28′	12″
	63	44.	6
			16.6
	63	44	22.6
	27	57	58
	35°	46	24.6 = Latitude

Circummeridian Altitudes (β Aquarii) Aug. 9th 1869.

h	m	s	°	′	″	m.	sec.	′	″
11	56	01	96	18	45	0	37		1
11	57	52	96	17	00	− 1	14		4
11	59	30	96	16	55	2	52		18
12	01	23	96	16	45	4.	45		52.
12	3	57	96	16	10	6	29		2.36
⅕			96	16	43			⅕	46.2.
Index Error. −					6.40				
Refraction					− 1.30				
½			96°	18′	33″				
			48.	4	16.5				
					46.2				
			48	5	2.7				
			6	8	30.6				
			54	13	33.3				
			90°	0′	0″				
			54	13	33.3				
			35	46′	26.″7 Latitude.				

Date.	Name of Star.	No.	Latitude	
Aug. 8th	δ. Draconis	7	35° 46' 25"	
" 8th	a. Aquilae	7	35° 46 29	
" 8th	a. Cephei	7	35 46 27	
" 8th	b. Aquarii	5	35 46 10	
" 8th	Polaris	7	35 46 09	
" 9th	δ. Draconis	7	35 46 26.7	
" 9th	a. Aquilae	7	35 46 39.8	
" 9th	Polaris	7	35 46 20.2	
" 9th	a. Cephei	7	35 46 24.6	
" 9th	b. Aquarii	5	35 46 26.7	
		66	35° 46' 23".8	Mean Latitude

The point where the observations were made is 1.51 chains North of the line at the South West corner of the Reservation, which would make the Latitude of the line 35° 46' 22".81. which makes a difference in Latitude of the South West corner and the Monument at Old Fort Defiance only 24".

Therefore set Astronomical Monument in Latitude 35° 46' 22".81 and marked as the South West corner of the Reservation.

Deposited a sand stone, 4 feet in earth, Set a cedar post 10 feet long, charred at the bottom and marked, four feet in earth. Built Mound of earth, 8 feet at base and 4½ feet in height. Dug pits on the North, South, East and West, 10 links from base of mound, 2½ feet square and 2 feet deep.—

Observations made at the North West Corner of the Reservation

Equal Altitudes (Sun's Lower) for Time, August 16th 1869.

August 16th P.M.	Aug 17th A.M.	Altitudes
h. m. s.	h. m. s.	° ′
2 36 46	8 46 44.5	89 00
2 37 12.5	8 46 14.5	88 50
2 38 40	8 45 50	88 40
2 38 6.5	8 45 22	88 30
2 38 33.5	8 44 56	88 20
2 39 03.5	8 44 27	88 10
2 39 30.5	8 44 02	88 00
½ 2 38 16	½ 8 45 22	

Log. A. 18h 9m = 9.9383
Log. 47″.57 = 1.6773
Tangt φ 37° = 9.8771

Log. B 18h 9m = 9.7944
Log. 47″.57 = 1.6773
Tangt δ. 13° 8′ 07″ = 9.3680

6.″91 = 0.8397

31″.10 = 1.4927
6.91

24.19

h. m. s.	h. m. s.
12 0 0	11 41 49
11 45 11.21	24.19
14. 48. 79	11 41 24.81
	3 46.4
	11 45 11.21

Chronometer slow on Mean Solar Time 14m 48.s79

Equal Altitudes (Sun's Lower) for Time, Aug. 17th and 18th 1869.

Aug. 17th P.M.	Aug. 18th A.m.	Altitudes
h. m. s.	h. m. s.	° ′
4 18 35	7 2 57	48 50
4 19 2	7 3 21	48 40
4 19 26.5	7 3 46	48 30
4 19 49.5	7 4 10.5	48 20
4 20 13	7 4 34	48 10
4 20.40	7 4 09	48 00
4. 21. 6	7 5 44	47 50
½ 4 19 50.2	½ 7 4 5.9	

Log. A. 14h 44m 15s = 9.7198 Log. B. 14h 44m 15s = 9.2643
Log. 47 = 1.6721 Log. 47' = 1.6721
Saugt. ϕ 37° = 9.8771 Saugt. δ 13° 08' 31" = 9.3682
18".58 = 1.2690 2.02 = 0.3046
2.02
16.56

h.	m.	sec.
12	0.	0
11	45	32.84
14	27.	16

h.	m.	s.
11	41	58
	16.	56
11	41	44.44
	3.	57. 4
h. 11.	m. 45	sec. 32.84

Chronometer slow on Mean Solar Time 14m 27s.16.

Circummeridian Attitudes (δ Draconis) Aug. 16th 1869

h.	m.	s.	°	′	″	m.	s.	″
9	9	57	119	12	00	5	28	35
9	11	24	119	12	30	3	55	18
9	13	03	119	12	30	2	16	6
9	14	57	119	13	00		28	0
9	16	20	119	12	55	1	01	1
9	17	58	119	12	40	2	39	8
9	19	33	119	11	55	4	34	25
			1/7 119	12	38.3			1/7 ..... 13.2

Index Error — 6.40
Refraction — 58

1/2	119	5	00.3
	59	32	30.15
			13.2
	59	32	43.35
	22	33	48.4
	36	58	54.95 = Latitude.

Circummeridian Attitudes (α Aquilae) August 16th 1869

h.	m.	s.	°	′	″	m.	s.	″
9	41	18	123	10	20	5	58	1 55
9	43	01	123	12	05	4	05	51
9	44	20	123	12	45	2	46	22
9	45	59	123	13	15	1	7	3
9	47	22	123	13	15		16	0
9	49	1	123	12	40	1	55	12
9	50	54	123	12	10	3	48	46
		1/7	123	12	21.4			1/7 ..... 35.2

Index Error	—	6.	40
Refraction	—		54
½	123	4	47.4
	61	32	23.7
			35.2
	61	32	58.9
	8	31	44.5
	53	1	14.4
	90°	0′	0″
	53	1	14.4
	36°	58′	45.6″ = Latitude.

Circummeridian Altitudes (A. Lephei) August 16th 1869.

h.	m.	s.	°	′	″	m.	s.	″
11	12	42.	129	59	15	5	14	48.
11	42	02.	129	59	45	3	54	42.
11	51	31.	130	00	10	2	25	20.
11	17	20.	130	00	25		36	0.
11	18	59.	130	00	15	1	03.	2.
11	20	52.	129	59	40	2	56	15
11	22	49.	129	59	20	4	43	38
¼			129	59	50			23.5

Index Error	—	6.	40
Refraction	—		48
½	129	52	22
	64	56	11
			23.5
	64	56	34.5
	27	57	56
	36°	58′	38.5″ = Latitude

Circummeridian Altitudes (B. Aquarii). August 16th 1869.

h.	m.	s.	°	′	″	m.	s.	″
11	25	1	93	53	20	2	5	9
11	26	22	93	53	30		44	1
11	28	01	93	53	25	−	55	2
11	29	49	93	52	40	2	43	16
11	31	45	93	52	10	3	39	29
			93	53	05			11.4

Index Error − 6.40
Refraction − 1.30
½ 93 44 55
46 52 27.5
11.4
46 52 38.9
6 8 30
52 1 08.9

90° 0′ 0″
52 1 08.9
36° 58′ 51.1″ = Latitude.

Altitudes (Polaris) August 16th 1869.

h.	m.	s.	°	′	″
8	50	11	73	48	11
8	52	17	73	49	30
8	54	4	73	50	45
8	55	50	73	51	45
8	57	42	73	52	55
8	59	37	73	53	50
9	01	22	73	55	00
¼	8.	55 52	¼	73	51 42.2

Index Error — − 6.40
Refraction − 2.00
½ ... 73 43 2.2
36 57 31.1

Log. 5011 = 3. 69992
cos. P. 85° 18′ 4″.5 = 8. 91233
40″.9 = 2. 61225
6′ 49″.5

Sin N. 36° 51′ 31″ = 9.77803
cos. P.m. 6′ 49″.5 = 10.00000
cosec. d. 88° 36′ 29″ = 10.00013
36° 52′ 03″ = 9.77816
6′ 49″.5
36° 58′ 52″.5 = Latitude

Altitudes (Polaris) August 17th 1869

h.	m.	s.	°	′	″
8	59	20	73	57	30
9	1	33	73	58	55
9	3	22	73	59	40
9	5	41	74	0	55
9	4	50	74	2	30
1/5	9	2	57.2	1/5	73	59	52

Index Error — 6.40
Refraction — 2.00
1/2 ..... 73 51 12
36 55 36

Log. 5010.6 = 3.700029
Cos. P 88° 14′ 15″ = 8.487994
15.42 = 2.188023
2′ 34″.2

Sin. N. 36° 55′ 36″ = 9.777872
Cos. P.M., 2′ 34″.2 = 10.-
Cosec of 88° 36′ 29″ = 10.000013
36° 56′ 20″ = 9.777885
2.34
36° 58′ 54″ = Latitude

Circummeridian Altitudes (δ Draconis), August 17th 1869.

h.	m.	s.	°	′	″	m.	s.	″
9	6	42	119	12	20	4	52	28
9	8	26	119	12	50	3	09	12
9	10	11	119	13	00	1	24	2
9	11	54	119	12	55	0	19	0
9	13	41	119	12	40	2	06	5
9	15	19	119	12	25	3	44	17
1/6			119	12	41.6			10.6

Index Error — 6 40
Refraction — 58
1/2 ..... 119 5 03.6
59 32 31.8
10.6
59 32 42.4
22 34 7.5
36 58 35 = Latitude.

Circummeridian Altitudes (A. Aquilae) August 17th 1869.

h.	m.	s.	°	′	″	m.	s.	′	″
9	37	26	123	10	10	6	15	2	07
9	39	11	123	12	25	4	30	1	06
9	40	52	123	12	45	2	49		26
9	42	47	123	13	20	0	54		02
9	44	27	123	13	05	0	46		02
9	46	09	123	12	40	2	28		20
9	47	53	123	12	20	4	12		56
			⅐ 123	12	23.6			⅐	42.7

Index Error — 6.40
Refraction — 54

½ 123 4 49.6
61 32 24.8
42.7

61 33 07.5
8 31 44.5

53 1 23

90° 0′ 0″
53 1 23

36° 58′ 37″ Latitude.

Circummeridian Altitudes (A. Cephei August 17th 1869.

h.	m.	s.	°	′	″	m.	s.	′	″
11	7	52	129	59	00	6	38	1	16
11	9	47	129	59	35	4	43		39
11	11	25	130	00	05	3	05		17
11	13	21	130	00	30	1	09		2
11	14	58	130	00	35		18		0
11	16	29	129	59	55	1	59		6
11	18	07	129	59	35	3	37		23
			⅐ 129	59	53.6			⅐	23

Index Error — 6 40
Refraction — 48

½ 129 52 05.6
64 56 02.6
23

64, 56, 25.6
37. 57. 55.4

36°. 58′. 30″ = Latitude.

Circummeridian Altitudes (B. Aquarii) August 17th 1869.

h.	m.	s.	°	′	″	m.	s.	″
11	20	01.	93	53	00	2	39	16.
11	22	34.	93	53	25		06	0.
11	26	11.	93	53	20	—	29	1.
11	25	52.	93	52	50	2	12	11.
11	27	49.	93	52	25	4	09	38
			1/5 ----- 93	53	01			1/3 ------ 13

Index Error — 6 40
Refraction. — 1 30

1/2 ----- 93 44 51
46 52 25.5
13

46 52 38.5
6 8 36.8

53 01 15.3

90° 0′ 0″
53 01 15.3

36° 58′ 44.7″ = Latitude.

Date.	Name of Star.	No.	Latitude	
Aug. 16th.	δ Draconis.	7	36° 58' 54.9	
" 16th.	α Aquilae.	7	36 58 45.6	
" 16th.	α Cephei.	7	36 58 38.5	
" 16th.	β Aquarii.	5	36 58 51.1	
" 16th.	Polaris.	7	36 58 52.5	
" 17th.	Polaris.	7	36 58 54.	
" 17th.	δ Draconis.	7	36 58 35	
" 17th.	α Aquilae.	7	36 58 37	
" 17th.	α Cephei.	7	36 58 30	
" 17th.	β Aquarii.	5	36 58 44.7	
		66	36° 58' 44"33	= Mean Latitude

I therefore Set North West corner of Reservation 116.32 chs. North of Astronomical Station, in Latitude 37° 00' 00"99 North,

Set sand stone 40 x 24 x 6. marked on the South. "N. W. corner. N. R." on the West "1869" and on the East. "37° N. L." Deposited a sand stone "N. W. 6". 2 feet in earth. Built Mound of earth, 2 feet high and 6 feet at base. Dug pits on the North, South, East and West sides, ten links from base of Mound,

I hereby certify that I observed the Chronometer for time, in making observations for time and Latitude; and that the time was, to the best of my knowledge and belief, correctly recorded,

John C. McManus.

Signed and Sworn to, before me E. H. Darling U.S. Surveyor, this 1st day of November. 1869. at Navajo Indian Agency. N.T.

E. H. Darling

U. S. Surveyor

I hereby certify that the foregoing observations and Computations were made by me, E. H. Darling U. S. Surveyor and Astronomer; and that the foregoing are the Correct results of Same.

Ehud N. Darling
U. S. Surveyor and Astronomer.

Signed and sworn to before me a Notary Public in the County of Bernalillo, Territory of New Mexico, this 6th day of November 1869.

Thomas V. Keams
Notary Public

Department of the Interior
General Land Office.
December 10th 1869.

The foregoing observations and Computations for true and latitude at old Fort Defiance New Mexico, S.W. Corner and N.W. Corner of Navajo Indian Reservation, by Ehud N Darling U. S. Astronomer and Surveyor, under his contract dated 29th April 1869. for the survey of the Boundaries of the Navajo Indian Reservation in New Mexico and Arizona, are hereby approved

Jos. S. Wilson
Commissioner.

Department of the Interior
General Land office
1869

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BOOK 1939

Department of the Interior
General Land office
February 26th 1891

I hereby certify the foregoing to be a true copy.

J. A. Williamson
Commissioner