

KG
11366
v.298

Survey No.

1-
15
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Index.

- 1- Index
- 15 Atmospheric undulations and haze. Aug 24/78
- 16-17 Sketches - Northern points seen at Arlington Heights.
- 18-20 Atmospheric undulations + haze. Jan 18, 19 + 23/78
- 21- Scale of Visibility + Definition.

Mo. Lafayette	Lat. = $44^{\circ} 09' 37''.83$	Long. = $71^{\circ} 38' 41''.03$	From Official G.S. Preliminary From Data. Prof. Q's figures 1876
Mo. Moosilauk	" = $44^{\circ} 01' 23''.08$	" = $71^{\circ} 49' 54''.97$	
" Whiteface	" = $43^{\circ} 56' 00''.21$	" = $71^{\circ} 24' 21''.45$	
Sandwich Dome	" = $43^{\circ} 54' 00''.5$	" = $71^{\circ} 29' 54''.3$	

(Note. Sandwich Dome has been calculated without suitable allowance for refraction error. G.S.B.)
 See other lat. & long's on next page.

Lafayette to Moosilauke	21396 ^{m.7}	} Distances to use as checks. + J.R.E.'s from Prof. Q's figures 1877
" " Whiteface	31667 ^{m.3}	
Whiteface " Moosilauk	35597 ^{m.1*}	
* ~~from 35597 from official figure~~ official approx figure = 35598		

Occupied Station Lafayette.

Prof. Q's Pointings.

Calculated from Q's data.
 A. M. C. (1878) Distances
 from to of note.
 Local place unreliable

Distances similarly
 obtained from Whiteface

Moosilauk	$000^{\circ} 00' 00''$		
Kinman	$15^{\circ} 56' 00''$	8657.9	
Cannon	$39^{\circ} 39' 20''$	4379.1	
Agassiz, C.S.	$122^{\circ} 59' 20''$	11995.0	
Sugar Hill	$71^{\circ} 33' 46''$		
(on dome)	$123^{\circ} 01' 20''$	13550.	
Jefferson (46)	$162^{\circ} 26' 50''$		
Standing	$(164^{\circ} 22' 32'')$ ~~$166^{\circ} 56' 50''$~~		
Cherry	$166^{\circ} 56' 50''$	22161.8	
Bridgeport	$177^{\circ} 49' 40''$		
N. Twin	$191^{\circ} 19' 00''$		
Wash ^m (6 line)		29912.6	38541.4
S. Twin	$202^{\circ} 43' 00''$	6810.	
Wiley	$217^{\circ} 19' 30''$		
Piquemont			
N. Mount			
Carissin	$250^{\circ} 37' 20''$		
Shocoma		37548.8	10873.6?
Pangua			

Pointing

Dist. for Loof.

Thom Whitford

Pacocomary

Whitford

278° 12' 30"

Oscula

19715.8 ✓

12867.9 ✓

Aluma

(302° 41' 10")

Liberty

313° 32' 00"

Lincoln

(316° 28' 20")

Tennach

22694.0

12657.9

(~~Washington to Starr King only a check.~~ ~~Having located Washington, take~~
 Note. Change of plan and consequent extensive recalculation
 due to receipt of official figures after these pages were started.
 Just before this the check, Washington to Piquawhite =

Washington to Starr King =
 Note. Change of plan and consequent extensive recalculation
 due to receipt of official figures after these pages were started.
 Just before this the check, Washington to Piquawhite =

M⁵ Wash^{to} Old Signal. Lat = 44° 16' 12".99 Long. = 71° 18' 12".91

" Starr King. " = " =

" Piquawhite - Oscula. " = 44° 06' 19".93 " = 71° 05' 40".28

Boy M⁵ from Wash^{to} Old Signal

" " " Cherry

" " to Washington Chimney

For Twin " " to Old Signal

M⁵ Pleasant from Wash^{to} Chimney

" " " Boy M⁵

" Adams " "

" " Wash^{to} Chimney

Fa

Sittington Heights.

Fri. May 29/78

8 A.M.

Somewhat hazy - everything jumping - ^{just slight fleecy} sky clear. Try to measure jumping of a horizontal line on Barnard No. as seen from permanent pier, with Collimator telescope mounted in Y's of Micrometer D, by setting at each extreme of the vibration.

46.0 - 46.8 .3

First number remembered till second is taken,

5.1 5.8 .7

to reduce time between. Third = difference.

5.0 5.9 .9

Amplitude = $\frac{1}{2}$ of one division of screw of D

5.7 6.1 .4

very roughly. This is hardly a satisfactory

5.8 6.1 .3

means of measuring.

2.5

angular amplitude of

.5

jumping seems inversely as distance, but am not sure there is no deception about this.

3 1/2 P.M. Hazy - Unconformable barely visible - Massachusetts + Monks rock invisible. Lighter again at mark on Barnard No. - Amplitude of quick vibration apparently same as in forenoon, but on an average, but frequent jumps of much greater extent. East wind now. Did not notice this morning.

4 P.M. Fearing that proximity to ground might cause the unsteadiness, the instrument is taken to cupola of Barnard No. The same trembling observed. Any object near enough to be distinct is shown in vibration. Vibration of slightly hazy objects less marked. Vibration of objects ~~hardly~~ hardly discernible for objects so hazy as barely to be seen. The half hazy objects showed less of the regular vibration, but rather the irregular jumping. Near, distinct objects showed both. At least so it seems, but should need more observation to base a statement upon.

N.B. There seems to be a large fire north of Boston, the smoke of which is rapidly overspreading the city. But the limits of the cloud of smoke are well marked, and the haze cannot be due to that.

5 to 6 P.M. Very hazy - Overcast - Less jumping. Later more hazy if possible.

Wed. 29/78 7-45 to 8 A.M.

U. island.

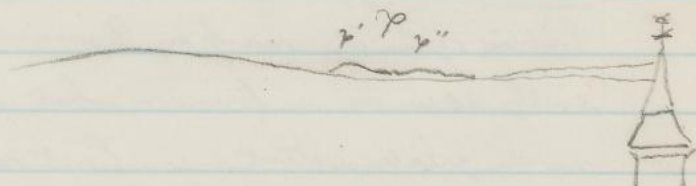
Kearney's barly
n. 1/2 1/2

Success sketch
 proceeding back and round the circle

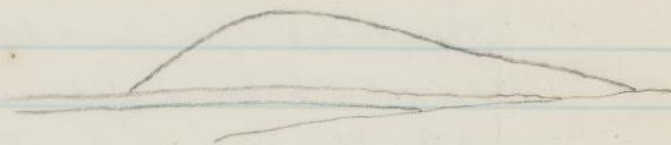
again
later

d. d.

d. d.



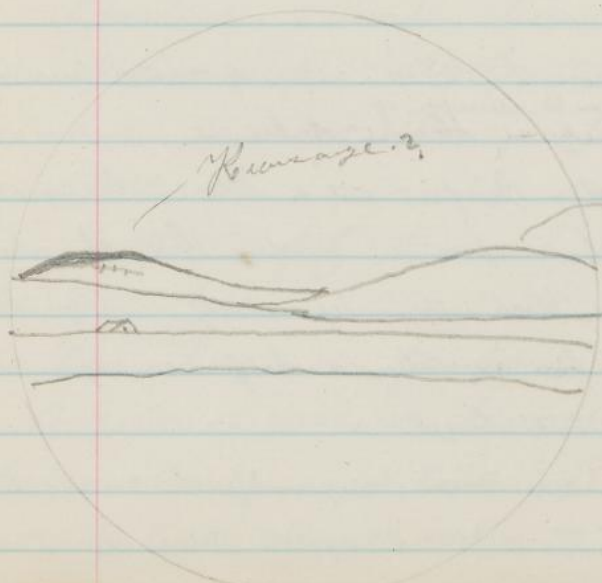
Joe English



Crotchet hidden by house

Wachwitz	{ buildix - - - -	96°50'
	{ other " - - - -	96°55'
Monadnock	122°00' but hazy	121 55 more satisfactory.
Joe English	145 00 " rounding	145 00
3'	147 05	147 05
3"	147 15	147 15
Uncannon W.	150 10 " "	150 10
" E.	150 45	150 45
Uncannon ?	151 10 " hazy	

Mon. June 6 1/4 A.M. Clear. Hazy north - Not yet looked else-
where. Sketch from window of room, ^{in Burnt House} without glass.



With glass - reversion as with mirror.
i. e. diagonal-symmetry.
Uncannon.

Yule. Jan 18th 7^{1/4} A.M. St. Pier. Diagonal cyphers

The γ , γ of page 16 shows essentially as sketched, but shows irregularities caused by trees, ^{to a greater extent than on Dec 8.} i.e. it is nearer than then supposed.

Not so clear as one hour ago. The mt called "Hemlock" on page 17 is still visible, and the impression is strong that the line under it is the sky-line of page 16. The "Hemlock barely visible" of page 16 is not made out. The clearness is rapidly diminishing. It is both smoky and misty toward Boston. No jumping.

Wed. 19th Uniform haze hiding distant objects. Undulations accompanying visible objects. But none of the large jumps noted on page 15.

Sun. 23rd Has been cloudy - summit enclosed in cloud late last evening. In clouds broke before breakfast - soon not noticed. Bufala At 9 A.M. blue sky overhead with occasional clouds. Hazy in east South moderately clear. West & N.W. mixed haze & cloud - Wachusett + Monadnock barely visible. N. & N.E. very hazy & cloudy - impossible to separate haze from cloud. Sultry atmosphere - no breeze - sun shine hot.

State H. invisible. Possibly something in the nature of a "sea turn", since the thick haze terminates suddenly ^{in the direction of} Mount Auburn.

Blue Hill moderately clear. Also Prospect and a hill to the right are twice as far off. In the half hour spent in writing this, the clouds have diminished in the west, so that Wachusett is less misty. But Monadnock as before. Note - May have been mistaken a half-hour ago about no wind. There is now a light S.E. breeze.

The dense haze, spoken of as "sea turn", originally obscured distant and half distant objects in N.E. It not affect near objects in

that direction. Fifteen minutes ago, Mt. Auburn was clear, while more distant objects were obscured a little to the left; but moderately clear a little to the right. Now Mt. Auburn is hazy and the limit for great distance is half way toward Blue Hill.

9³⁴ A. M. The N.E. is now black haze for everything over a mile or two.

But in W. & S. objects for five miles are quite clear, and colors brilliant.

9-50 Blue Hill almost as clear as before. Got at left of summit on border of haze. Left hand part of range quite invisible.

10 A. M. Blue Hill hazy. Limit of haze becoming less abrupt.

Wachusett clearer, but still quite hazy. Its indistinctness may now be referred to haze entirely, without interference of mist and cloud.

Clouds linger in N.W. Haze rapidly encroaching from N.E.

The 10-01 A. M. The "sea turn" or whatever it be is now rapidly enveloping the Heights themselves. Near objects in the west. Objects a few miles to westward are therefore losing their brilliancy of color.

Objects within a mile, south or north are perceptibly hazy.

10-10 A. M. Cambridge & Somerville have come out of the obscurity - State House

also barely discernible. Black haze to north & extending to N.W.

Monadnock invisible, but Wachusett clearer than before.

Distant view to S.W. growing clearer also.

10-25 South and N.W. more hazy. N.E. less so.

10-40 Cambridge & Boston clearer. South hazy. North hazy.

Monadnock just visible. Wachusett as before. Local haze more uniform

by distribution; i.e. no extreme (as there were at first) of invisibility and sharpness for objects within a few miles. Only an occasional cloud overhead.

Summits reflecting off the sun by sky-light in Roxbury. They all twinkle violently.

10-45 The ^{decidedly} haziness for points within a mile is gone, but the brilliancy of color of grass &c. has not returned. But excepting the wind, the haze is uniform, N. Cambridge being as distinct as Lexington.

S.W. not quite so clear as noted at 10-10. Occasional clouds overhead.

All this is but the circumstances under which observations on the modulation were taken. These from memory are; - (this nature does not admit of precise record.)

At first a marked boiling noted, especially for those near and half distant objects which appeared immensely sharp to the unaided eye. These collimator in $\frac{1}{2}$ of microns D.

Modulation less perceptible as distance increased.

While the limit of haze was so evident, noted objects within and without. Within obtained buildings at roughly equal distance for comparison. Those without the haze, sharp, with brilliant colors but with undulating outlines. Those within the haze, moderately sharp, colors dull and gray, less modulation.

The fact that the modulations are less apparent on distant hazy objects ~~must~~ (as noted today, and several times before) can be accounted for by a more homogeneous opacity (so to speak) of the air. But here, apparently, the objects were sharp enough to show vibrations, and these vibrations appeared ^{of} less ~~modulation~~ ^{amplitude} though more frequent rapid.

While the heights were enveloped in haze, it was noted that objects a few miles off were apparently in as great vibration as before. Unfortunately very near objects had not been noted before the haze came, so that its effect in that respect could not be noted. By

By noting buildings in Leamington and Lounville as these regions became visible, the impression was gained that there is no difference between the approach and receding of the haze so far as modulation is concerned, the modulation for buildings in L. & L. being quite ^{as} marked as for similar buildings which were noted while the haze was approaching. But the observer was taken unawares by the coming and going of the local haze, and so did not note everything that he could now wish.

11-15 A.M. Haze nearly uniform.

Winecooke still invisible. Joe English just visible.
Temple House & Moundwork just visible.

Wachusett & Watatick hazy, but perhaps clearer than before.
Blue Hill hazy for so near a point.

S.E., E., & N.E., horizon quite hazy.

No clouds east — few north & south — none west & S.W.

Scale of visibility evidently much needed.

Scale 0 = Invisible. ~~Applicable to any kind of object or distance~~
~~aid of glass admissible.~~

- Scale of Visibility of Object as a Whole.
1. = doubtfully discernible by one familiar with its appearance. ~~aid of glass admissible.~~
 2. = very faint but undoubted by one. ~~aid of glass admissible.~~
 3. = capable of being correctly sketched by one not familiar with it, ~~unless provided with a glass.~~
 4. = incapable of being overlooked by a careful observer, even if ignorant of its existence, ~~and of being provided with a glass.~~
 5. = prominent, ~~conspicuous.~~ ~~subtended a large visual angle.~~

Size of object immaterial. Aid of glass always admissible.

0 = Invisible.

- 1 = doubtfully discernible by one familiar with the outline.
- 2 = very indistinct but undoubted by one.
- 3 = indistinct, but capable of being correctly sketched, in general outline, by one not familiar with it.
- 4 = characteristic details discernible by one familiar with the outline.
- 5 = one unfamiliar with outline would sketch characteristic details in sketching.
- 6 = slightly hazy.
- 7 = ordinarily distinct.
- 8 = extraordinarily sharp.
- 9 = superlatively sharp.

Scale of Visibility of Outline of Object — Definition.

Experiment with reading scale.

2-05 P.M.

Recreation Is.	0.	
2-05 P.M. Hancock	1.1	
Turkey Hill	5.7	
Danvers Hospital	5.6	
Hill in N.E.	3.3	Minerage suspected.
Yaffle College	5.6½	
Egg Rock	3.3	
Somerville Power H ^o	4.6½	
Minerage	0.	
Bunker H. Mon.	4.6	
State H ^o	4.5	
Blue Hill	5.5½	
Prophet "	5.6	
Wachusett	4.4	
Monadnock }	4.3	
+ Belknap range }		
12-05 Ditto	2.1	
12-05 Fox English	3.4	
12-35 "	"	
12-35 Unknown	2.3	

The scale for ~~Definite~~ ^{Definite} was commenced with the idea of making it a pointer to the scale of Visibility.

Is this desirable?

Is not the liability of frequent occurrence of 1.1, 2.2, 3.3 a defect which might be remedied by altering the scale?

The wisdom of discarding mere size seems wise. There on a day when Minot's Leaky was received, & it would probably also receive 4., even it is supposed that he uses his eye, a small glass, or a powerful glass according to the nature of the object sought.

In describing 4, the words "at that further point" carry out

the latter idea. ^{the observer} i.e. he is supposed to be taking care that objects of a certain size do not elude him, but he does not know where to look for them.

1 P.M.

Threatening thunder-storm in N.W. Distant point hazy, without undulation. Middle distance, slightly hazy & undulating. Near point lack the brilliant color.

Not having yet worked out the change of scale, the same will be used again.

Specific		In General.	
2-15 P. M.			
Hecarase	0.	Near points	.7
Hecarose	2.2	Middle Distance	.6 1/2
Turkey Hill	5.7	Distant	.0 to .4
Dana Hill	5.7 1/2	Widespread indications of approaching thunder storms.	
Doyle Hill.	5.7	Undulations slightly less for objects in middle distance, but very much less for near objects.	
Egg Rock & local sea fog.		2-45 Thunder common.	
Pond Hill	4.7	East wind.	
Miner's Lodge & fog bank.		3-30 South wind.	
Bunker Hill M.	4.7	Heavy rain.	
Glenn Hill	5.7		
Bell Hill	5.7		
Brook Hill	5.7		
Wachusett	4.4		
Mountains	2.1		
Temple Range	2.2		
Brook	1.1		
Joe English	2.2		

In the lower numbers in scale of visibility, ^{identification} ~~recognition~~ need not enter, since the number for definition will show it.

So "1." should be "doubtfully discernible," referring to noticing its mere presence independent of recognizing its identity.

"2." should be "very faint but undoubted." If there.

If there is any doubt as to identity it should be denoted by a query after the name. Thus in the last series Brocton proven here probably here put "Brocton? 2.1" instead of "Brocton 1.1"

"3." should be "less faint," but capable of being overlooked by one not

aware of its presence in that direction."

"4." + "5." as before. But it should be specified that adequate means must be used to see the object.

Thus we might have "B", "H", and "F" for the eye unaided save by a single lens to correct imperfection of vision, a small field glass held in the hand, and a telescope upon a firm mounting.

A larger field-glass upon a good extemporized support would be "F". The letter preceding the figure will make the matter

definite. Then for ^{color} of surface of object - we may have a small letter after the figure. "B" = brighter or brilliant,

refractive equally to a distant blue mountain, a white house or a green hill-top. "d" = dark, signifying a surface in shadow.

"m" = misty, signifying an apparent want of opacity of the medium through which the surface is seen. Thus ".7m" signifies a

clear outline of an object indistinctly seen on account of smoke, or haze in the intermediate air, while ".6" would indicate that

the haze blurred the outline. ".8" would denote a ^{very} sharp outline made out when it is almost too dark to see. "5b" would characterize a well lighted but decidedly hazy view.

4-15 I have ended.

S.P.H. Near and middle-distant objects probably as clear steady as ordinary.

5-30 Washmett e 1.1 m
 Monadnock }
 Joe English } 0. } Shomere.
 Ucarvome }
 Turkey Hills 5.7
 Lawrence Chapter 5.7
 Townville, Cambridge 18
 Beyond Boston, foggy
 To Elm, Brookline 8
 Blue Hills 5.7 1/2
 Prospect Hill 5.7

5-45 Washmett 4.5
 S. W. distance .8
 N. W. Shomere 0.
 N. E. fog at sea.
 Boston + Vicinity .8 } Steady.

7 P. M. Very Steady. East .8 South .7 West .6 North 0.
 for distant. Near .8 in all directions.

See below. Minute Ledge 4.7 d Washmett 4.6 m Monadnock = 0.

7-35 (Sweet gum) Minute Ledge 2.3 d In regard to the 7 noted above, it is to be remarked that .3 for that also would be more correct as regards ability to sketch details. Thus it would have been impossible to say whether the top is Π or Π . Perhaps "Ordinarily" is not a good word. ~~It~~ ^{It} ~~Shom~~ would it do to substitute, "outline sharply defined".

7-40 Minute Ledge 1.1 In the above remarks on Minute Ledge, perhaps it is too much to ask any ordinary glass to define the form of the top of the light-house.

7-48 Light of Minute Ledge seen in same field of view, but

not at point just called ~~Minot~~ Ledge. The telescope is clamped. Revolving light also noted.

8 P.M.

Clouds overhead & to N, E, & S. Clear in S.W.

No light - but appearance for the pt. called Minot.

Pt. is probably a chimney. About 5° between revolving light and Minot Ledge light.

Thurs. June 25/78 4-45 P.M. No undulation perceptible, and

in general, & save where specified below.

At
Pier.

Note Not Minot Ledge 3.8 (called Minot Ledge Sunday)

Minot Ledge? 3.7

S.W. very slight undulation for buildings several miles off

Dist. $6\frac{1}{2}$. Nearest .7

Bright - Luminous

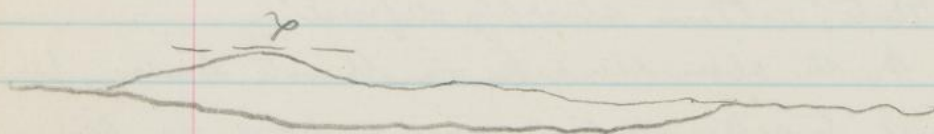
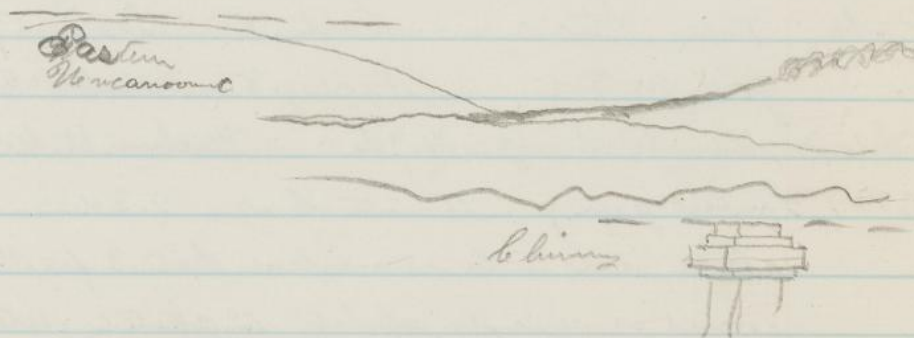
Wachusett $6\frac{1}{2}$ Mount Wach. $6\frac{1}{2}$

Strong West Wind.

Longpoint bk. No undulation 4.7

Joe English & W. Hancock $6\frac{1}{2}$.7

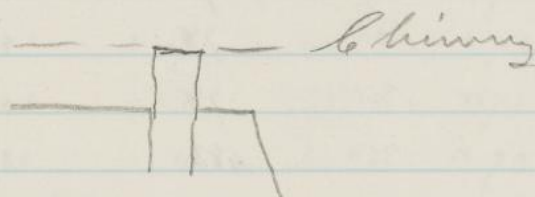
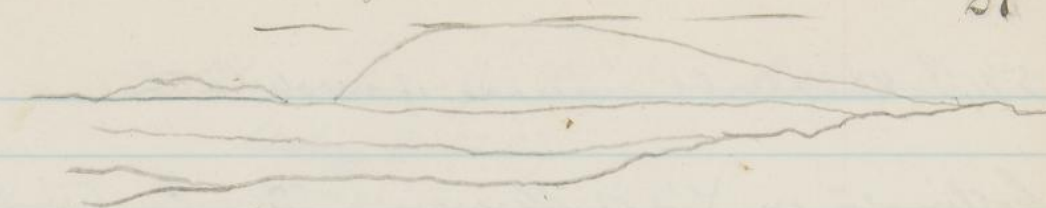
With Collimator Telescope.



Ventilator of gas yet unknown name.

Joe English

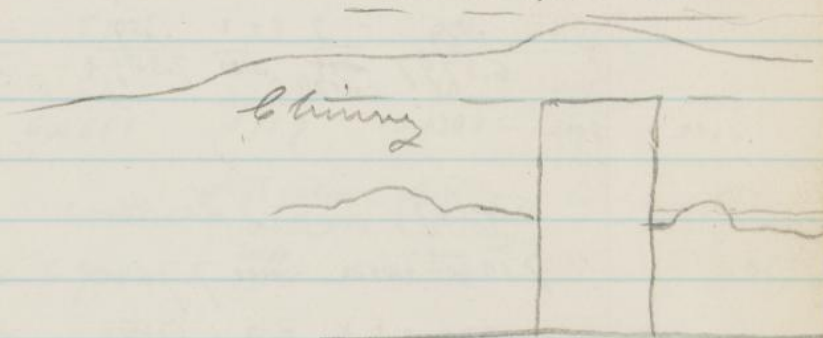
27



Chimney

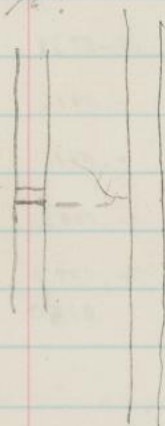
How Pack Monad read Temple

Pack Monadwork

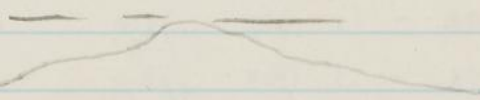


Chimney

Barnes No.

 Which
 Frame


Monadwork.



28

5 1/4 P.M. Slight increase of modulation.

Collimation on V's of Mercurius-D. Instrument-shaded.

S-20

Mercurius (.7) 66?

(With two lines in field)

				diff	sum	diff	sum
6.880	+ .0003	-.0012	7.356	.478	14.238	-.0015	-.0009
.879	- 7	- 22	.357	78	36	-.0015	-.0029
.882	+ 28	+ 8	.360	78	42	-.0015	+ .0031
.883	+ 33	+ 18	.361	78	44	-.0015	+ .0051
.877	- 27	+ 8	.360	.483	37	+ .0035	-.0019
.880	+ 3	+ 8	.360	80	20	+ .0005	+ .0010
.880	+ 3	+ 8	.360	80	40	+ .0005	+ .0010
.879	- 7	- 12	.358	.479	37	-.0005	-.0019
.878	- 17	- 2	.359	.481	37	+ .0005	-.0019
.879	- 7	- 2	.359	80	38	+ .0005	-.0009
6.8797	+.0130	.0100	7.3592	.4795	14.2389	.0130	.0208

7(.7)

Ventilation

(with same cross-line)

S-30

				diff	sum	diff	sum
7.104	+ .0032	-.0001	7.768	.664	14.872	-.0033	+ .0031
.100	- 8	+ 9	.769	69	69	+ .0017	+ .0001
.101	+ 2	+ 9	.769	68	70	+ .0007	+ .0011
.100	- 8	- 11	.767	67	67	-.0003	-.0019
.100	- 8	+ 14	.770	.670	70	+ .0027	+ .0011
.103	+ 22	- 11	.767	.664	70	-.0033	+ .0011
.100	- 8	- 11	.767	67	67	-.0003	-.0019
.100	- 8	+ 9	.769	69	69	+ .0017	+ .0001
.100	- 8	- 11	.767	67	67	-.0003	-.0019
.100	- 8	- 1	.768	68	68	+ .0007	-.0009
7.1008	.0112	.0084	7.7681	.6673	14.8689	.0150	.0132

S-36

This between Joe English & Crotchet (or how
looking Crotchet)

For Pack No. read Yemph

	Pack No. (.6 1/2)		6.6 1/2	(Two cross-line in field)			
				diff	sum	diff	sum
5-41	6.479	-.0002	-.0001	6.651	.172	13.130	+.0001
	.479	- 2	+ 9	.652	73	31	+ 11
	.480	+ 8	- 1	.651	71	31	- 9
	.480	+ 8	- 11	.650	70	30	- 19
	78	- 12	+ 9	52	74	30	+ 21
	79	- 2	- 1	51	72	30	+ 1
	80	+ 8	- 1	51	71	31	- 9
	80	+ 8	- 1	51	71	31	- 9
	78	- 12	- 1	51	73	29	+ 11
5-46 1/2	.79	- 2	- 1	51	72	30	+ 1
	6.4792	.0064	.0036	6.6511	.1719	13.1303	.0092

On reverse

(Distance between lines entire
with opposite sign.)

5-49	6.490	-.0027	-.0018	6.796	.306	13.286	
	92	- 7	+ 2	97	05	89	
	92	- 7	+ 2	97	05	89	
	94	+ 13	+ 2	97	03	91	
	96	+ 33	+ 12	98	02	94	
	94	+ 13	+ 2	97	03	91	
	92	- 7	+ 2	97	05	89	
	93	+ 3	+ 2	97	04	90	
	92	- 7	- 18	95	03	87	
5-55 1/2	92	- 7	+ 2	97	05	89	
	6.4927	.0124	.0052	6.7968	.3041	13.2895	

Note, The omission of the figure does not denote that they are unchanged,
but rather that it is evident what is intended. Thus the fifth
reading on Pack No. is 478, not 488.

	Monadnock (.6)	Yr. Ave.	(Sunrise)
5-59	+ .0002 6.312 + .001 - .0004 6.478		diff sum .166 12.790
+ 22	13 + 2	.472 ?	.159 ? 85 ?
+ 22	13 + 2 - 4	.478.	.165 91
+ 2	11 0 - 14	77	.66 88
- 8	10 - 1 + 6	79	.69 89
+ 2	11 0 - 4	78	.67 89
+ 2	11 0 + 6	79	.68 90
- 8	10 - 1 - 4	78	.68 88
- 15	09 - 2 + 6	79	.170 88
9 = $\frac{.0042}{.0002}$	10 - 1 + 16	80	70
$\frac{2.097}{.0.3108}$	6.3110 $\frac{.0100}{\text{true}}$	$\frac{91706}{6.4784}$	$\frac{91609}{.1677}$
			$\frac{91803}{12.7892}$

6 P.M. Wachusett 4.5 $\frac{1}{2}$ Monadnock 5.6 Hancock 5.7
 Minute Ledge .0 Revolution's for objects a few miles
 off have increased, especially toward Boston, which at 4 $\frac{3}{4}$ was
 remarkably steady although the sun was (and had been) shining
 bright. Boston ⁹⁰ smoke especially in direction of Minute Ledge.
 No clouds.

Hancock 3.6

Hancock 1.1

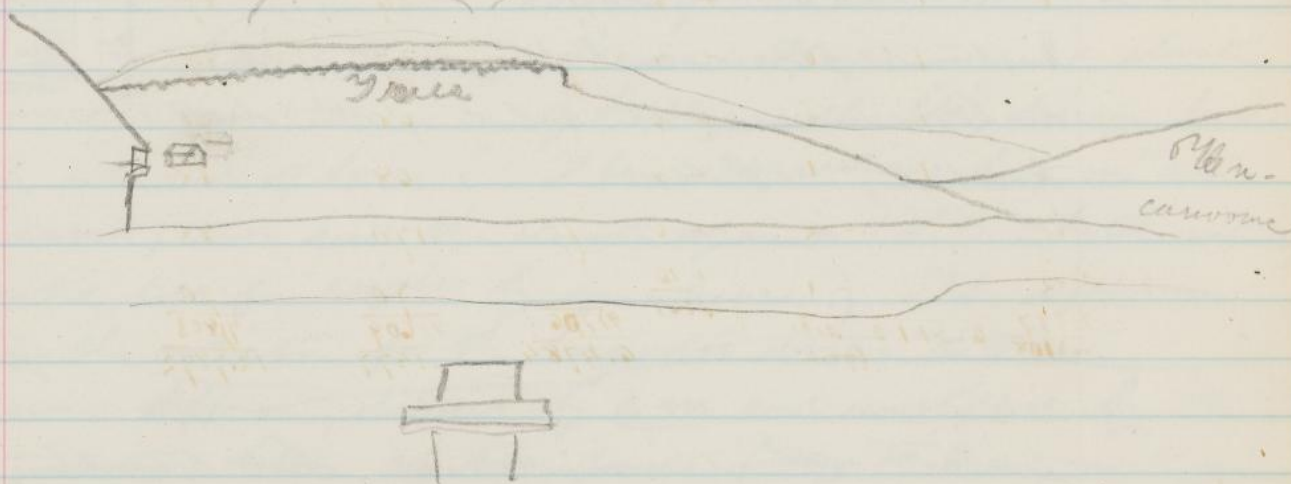
Wed 6 A.M.

(Alick Buzle) at Pier

Nov. 6/78 7 $\frac{3}{4}$ to 8 A.M.

With diagonal eyepiece

About same light
Perhaps a little the highest



Very clear.

Three distinct on Vancouver

Order of "lapping" of ridges clearly shows grades of distance.

Nothing 7 Definite

Vancouver 5.8

Distance over blurring (? Vancouver) 4.7

N.B.

N.B.

H. Mearns

At pier (Pier) Nov 14/78 Meridian-level-diagonal eyepiece.
Apparently no clouds. 4-15 P.M.

Instrument placed on ledge north of pier to get parallax
on house and see the whole of the distant mt.

Nov 15/78 6 A.M.

H. Mearns

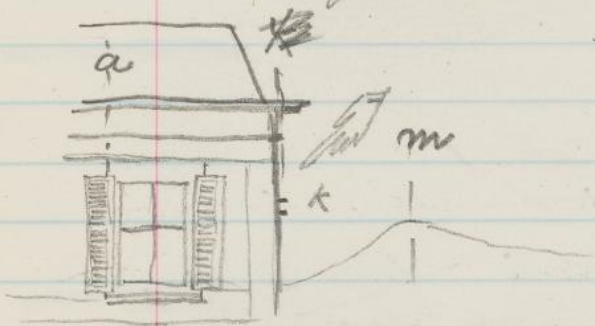
Distant outline unmistakable, but trembling so that
the most careful details cannot be had.
Meridian finger cold in drawing.

At pier 9 1/4 A.M.

(Nothing)

See English

Nov 15/78 P.M. Since vertical - measurement of horizontal angle
in the field. Scheme to get variation of line from
the horizontal.



Place the vertical line (center of field
on "a", the line of edge of window
brown finish around window on

Barnard House - read elevation
of knitting needles ("k") driven hori-

zontally into side of house. Then set vertical line on "m"
(Monadnock) and read the elevation again. (N.B. Sketch nature,
not inverted left for right by eye-piece.) The difference
will give the variation for the horizontal distance "a" to "m".
The observed difference, divided by $\frac{a}{m}$ and multiplied by the
horizontal distance between any two points (say "k" to "m") will give
the correction due to slope of line. $\therefore$ The horizontal distance between
each pair of points that it is desired to measure differentially
must be expressed in terms of $\frac{a}{m}$. It is too small to
measure ~~this today~~. These relative horizontal angular distances
today. It will be conveniently done by placing the parallel line
vertical and measuring with the micrometer. [Method not carried
out in just this way.]

Nov 23 4 P.M.

Joe English 11-30	Chimney 15-50	Diff 4-20	Mostly made.
Hidden Temple	"	"	
Window	Window	"	
Eastern Home th	Chimney	"	
Monadnock	Needles	"	

Dec. 1/78 Unassisted eye.

Uncanoonuc

Heavenly

Beth

With small sheet.

Dec 3/78

? Patuxent 66.8

on the Fort range
in E. from.

Uncanoonuc (east) 49.3

" west 48.7

J. English 43.6

Order of summits visible - from west around by north.

Wachusett - well known.

Wataatic - in Ashby Mass. - Sugar-loop-shaped.

Barrett? - low.

Monadnock - sharp peak, steep on left.

Hickok? may not be distinguished from north ridge of Monadnock

Temple - characteristic nub on top, steep to left with steep ^{to left} further ^{to left}

Pack Monadnock - characteristic steep place low on left.

Northern summit of same - separated by nearly level ridge.

Synodborough? & Piscataway?

Crater - very irregular ridge.

Joe English Hill - in New Boston N. H. Round top, steeper on left

Uncanoonuc - in Goffstown N. H. - Twin mounds.

Heavenly - in Warner N. H. - To right of gap on right of Katawme - Distant

Nov 24/78

Light
Minute Scale

6:50 A.M.

4-58.7

59.1

58.5

58.8

6:52

58.7

level 85.2-15.0

86.2

7:00

58.2

1-32.8

86.2-15.8

light out.

About

Wire on Barometer 28" above 4^m dia, 60^m long and 152^m apart.
 16 ft 6^m from ground.

Jan. 1879 System described on p. 64 adopted for denoting unit, and work subsequent thereto made to conform by revising the recorded unit, in blue ink. Change made by actually inspecting the combined eyepiece, plate & micrometer, so that the result may be considered as observed rather than calculated. & To do this it is necessary to remember that the  now about reads 10-36. on the  so that the projection between the 10 & 11 notches of the comb must be called 10 in making the conversion, this difference corresponding roughly to the readjustment of the head of the micrometer made on p. 64. (But for P. M. obs. of Dec. 6 the accidental displacement of either counterbalance or complement it (as the case may be) micrometer just saw to balance within a very few subdivisions, ^{either 10 or 11} notch ^{must} ^{according to circumstances} be used.) The effect of changing the micrometer reading 30 instead of 36 (the latter would be very undesirable) is to leave apparent "discontinuities" (of about 5^{or 6} divisions) in the collimation, the time of entrance & same duly appearing in the diary.

Nov. 29/78

Same as before for level of line - looking northward.
 L. chimney W. chimney

~~24.3~~	~~25.1~~
~~15.8~~	~~15.9~~
~~15.1~~	
⁴ 15.2	⁴ 15.8
⁴ 15.6	⁴ 15.3
⁴ 15.3	⁴ 16.8
⁴ 15.7	⁴ 15.7
⁴ 15.3	⁴ 16.3
45.42	45.98

4-22 P.M.

~~Monadnock~~

Wire 12

10-⁴17.9

moved

Monadnock 13

¹⁰12-¹16.1⁴15.9

Wire 12

-39.7

4-26 P.M.

10-⁴18.3

Monadnock 13

¹⁰12-¹15.2⁴15.1⁴15.7⁴16.3⁴14.7⁴15.40

29.08

16.32

10-⁴10.7⁴10.0⁴10.0⁴10.23

4-30

⁴18.1⁴17.93

For the wires the line (on other side of plate) between 12 & 13 is used.
 Leamer wire by estimate 12.3, on regular scale.
 Upper 12.8 " " "

Nov. 26/78
42 P.M.26.
 $\times 8.2$ $\times 7.9$

4-45

 $\times 7.7$
 $\times 7.93$

Monad. 13

10- $\times 8.2$ $\times 8.7$ $\times 8.0$ $\times 8.2$ $\times 8.3$ $\times 8.28$

29.02 19.26

Lo.

 $\times 0.3$ $\times 0.1$ $\times 9.9$ $\times 0.10$

4-52

 $\times 7.8$ $\times 8.1$ $\times 0.2$ $\times 8.3$ $\times 7.8$ $\times 8.4$ $\times 9.9$ $\times 8.1$

4-56

 $\times 7.6$
 $\times 7.73$ $\times 8.8$ $\times 0.6$ $\times 8.34$ $\times 0.23$

28.98 19.36

5-03

 $\times 0.4$ $\times 9.3$ $\times 0.8$ $\times 0.2$

5-06

Too dark to
see wires $\times 0.7$ $\times 0.28$

5-12

Too dark to read
micrometer well. $\times 0.8$ $\times 1.6$ $\times 0.4$ $\times 0.4$ $\times 1.0$ $\times 0.84$ No matches in pocket.
Readings unreliable.Brilliant sky behind
mountain.

Flight breeze.

Instrument unmoved through
this P.M.'s observation.

Nov 27/78 Level. Distant Pt.

Reference Pt.

		Monadnock	^{W B} ~~4~~ 8.8 78.8	^{Z B} ~~2~~ 8 81.1	27.7 24.0	23.3
8-20 A.M.		⁵ 80.7			⁰ 86.2	⁰ 86.3
		⁴ 89.2	⁴ 88.9		⁰ 87.0	⁰ 86.7
		⁴ 89.1		¹ 81.6	⁰ 84.7	⁰ 85.8
		⁵ 80.6		¹ 81.8	⁰ 86.8	⁰ 86.7
8-26	90.0-13.6	⁴ 88.2	⁴ 88.3	⁴ 81.5	⁰ 86.1	⁰ 86.7
		49.56	48.66		⁰ 86.8	6.44
					6.58	
					Chimney inside front minute of hospital. Is 14"	
8-29	90.2-13.8	Simple 13 12-03.1		86 10 -21.8		
		12-01.3		20.7		
8-32		² 83.2	⁹ 80.1		Series extended on account of noticing systematic variation.	
		³ 83.1	⁴ 89.8		13 line used for mountain,	
		³ 83.0	⁴ 89.8		line between 10+11 for chimney.	
		³ 82.2	⁴ 89.6		Chimney = 9.8 turns	
		³ 81.3	⁴ 89.8		Summit distinct	
		³ 80.7	⁴ 89.7			
		² 88.9	⁴ 89.9			
		² 89.1	⁴ 89.5			
		³ 80.1	⁴ 89.3			
8-39		² 89.3	⁴ 89.7			
			49.72			

		Monadnock	^{W B} ~~4~~ 89.2	^{Z B} ~~2~~ 8	Summit hazy.
8-16		⁴ 80.9		¹ 81.8	
		³ 89.3	⁴ 89.9		
		⁴ 80.4		¹ 81.9	
		⁴ 80.5	⁴ 89.9		
		⁴ 81.6	49.66	¹ 81.7	
		40.54		11.8	

Dec 1/78

	McCauley 8	McCauley 9	Chimney (8.3)
9-30 A.M.	~~8-45.7~~	~~9-23.7~~	~~47.2~~
	~~8-46.0~~	~~9-23.1~~	
	~~44.8~~		~~44.9~~
	43.9	19.0	

	10-6	10-5	
9-36	5-47.2	9-40.3	X
	44.1 65.65		9-46.1
	47.3	419.0	
	545.9 61.60		46.0
	41.9	418.4	
	543.4 62.65		46.2
	44.6	418.9	
	546.8 55.70		46.1
	544.7	419.6	
	546.1 55.40		45.7
	542.9	418.0	
	543.8 53.35		45.8
	542.7	412.7	
	418.7 50.70		45.9
	419.0	411.2	
	418.6 45.50		45.7
	416.4	39.9	
	415.3 45.85		45.6
	411.2	37.7	
	412.1 41.65		45.7
	38.1	36.9	
	38.3 35.20		45.5

26.	26.	6 hr.
³ 9.9	34.5	
⁴ 10.0 39.95		⁴ 5.9
38.2	35.1	
38.7 38.45		⁴ 5.8
38.0	33.7	
35.4 36.70		⁴ 5.9
35.2	33.9	
34.1 34.65		⁴ 5.8
33.7	31.6	
10-14 32.4 33.05		⁴ 5.9
Punish	² ~~(5)~~ 9.2	
	³ ~~(5)~~ 1.9	
	² ~~(5)~~ 9.7 30.26	⁴ 5.7
	29.0	
	28.1	
10-21	28.6 28.56	⁴ 5.9 15.84

There is no 5/6 line.
[Evidently 6/7 since the 4/5 could not
be moved up to this position - obstruction.]

To chimney next line between 5-6 (called 5/6)

" Bone. " 9 "

" Horn. " 8 "

No exact reading of barometer before 10.30 A.M. but
it was noticed to be higher than that at Breakfast.

Hospital. (taken after work on page 42 - here for convenience)

F.	V	Heavens very dim throughout.
³ 46.3	³ 46.2	Heavens very dim
³ 45.7	36.8	
35.9	36.3	
35.8	36.7	
36.0	36.8	
35.94	36.56	

Settings on chimney in Macanone field of view
with 5⁵ line ~~5⁶ line~~

~~4~~ 7.1	~~4~~ 5.1
~~4~~ 7.3	~~4~~ 5.9
~~4~~ 7.3	~~4~~ 4.3
~~4~~ 7.2	~~4~~ 5.1
~~4~~ 7.5	~~4~~ 5.2
~~4~~ 7.28	~~4~~ 5.92

$2 \times 46 = 27.54$

Settings made very slowly (and therefore not so hurried for finding comparative accuracy of setting) to find angles subtended as near as may be. There is parallax in either case. Hence the difficulty. Some trembling of object has by this time become evident. Everything steady for work on preceding page.

Alme. 9²

Chimney 5

10-56 ~~4~~^{10²-2}8.2

~~4~~^{10²-4}7.3

28.6

28.4

28.5

~~4~~7.0 47.15

- 59

28.3 28.4

Alme.

Still under Macanone 8²

Chimney

11-02

~~4~~²8.8

~~4~~^{10²-1}9.9

~~4~~6.4

28.5

~~4~~9.9

29.2

19.0

28.4

19.7

- 05 1/2

28.6 28.7

19.53

~~4~~6.6

46.5

11-16

~~4~~²8.3

~~4~~6.2

28.5

~~4~~9.7

29.1

~~4~~9.6

28.3

19.8

~~4~~6.4

- 19

28.3 28.5

19.7

46.3

The name of the station will be followed by the degree of visibility, ~~above~~

dt. = distinct, br. = bright, ft. = faint, are used by Coast Survey. br. will be held to mean, distinct and highly illuminated.

ft. " " " " feebly illuminated but not hazy.

hy " " " " ~~hazy~~ but well illuminated but hazy.

dm " " " " and feebly " and "

dt " " " " ordinarily well defined in general.

v. = very

Then may follow st = steady or tr = trembling, or mv = moving also used by C. S.

* will denote fear of something abnormal (like a hot current from a chimney or the sunny side of a building) affecting the results. tr. will not apply to trembling feared to be due to such cause, but nothing will prevent applying both opposite characters together to denote that the abnormal is not the only element of trembling.

Illustrations

8 + H. vft. st. = 8th line set on Hearsong which shows above it when plate is in zero position, and it is very faint (feebly lighted) but steady.

5/6 b hy tr. = line on near side of plate set on chimney which is trembling, both the line and the chimney showing between the 5th & 6th lines of the scale when the plate is in the zero position.

7-3 br. = 7th line set on Temple which shows below it in zero position of plate, and is bright.

Or Better. Put the visibility and steadiness against the reading, and let the number of line follow the name - Thus H 8+ with vft. st. against the first micrometer reading and "ditto" marks against the others.

46 Dec 9/78

Howe

M.

B

Levels + Remarks.

7-30A. M. Summit dm occupied (omit)

No. 2. Howe corner

12¹²Bly 10¹⁰7-39 10-⁰8.7 at st. 10-¹9.1 at.⁰8.8⁰8.7¹9.1

-41

⁰8.5.0⁰8.80?¹9.1

47.7

Vb 9⁹Vb 8⁸Bly 5⁵

7-47

10-³3.2 at st. 10-²5.9 (at) st.³3.2³3.4 (3.4)²5.910-⁵8.6⁵21.5³3.7

25.9

51.55

-50

33.42

M 13¹³LB 12¹²

8-52

10-¹7.2 br. st. 10-⁰8.8 ft st.¹6.7¹6.610-⁰9.2

9.0

-55

¹7.0

16.87

M

LB

-58

¹6.7

79.3 ft. st.

¹6.2¹6.7

19.5

-60

¹5.8

9.4

16.35

Inst. unmon.

Quot. undisturbed

	M	LB
8-14	$\sqrt[1]{5.0 \text{ hr. at}}$	$\sqrt[0]{9.7 \text{ at.}}$
	$\sqrt[1]{5.7}$	
	$\sqrt[1]{5.1}$	$\sqrt[0]{9.7}$
-16	$\sqrt[1]{5.4}$	9.7
	<u>15.3</u>	

	M	LB
8-18	~~36.4 hr. at.~~	
-19	$\sqrt[0]{4.8}$	$\sqrt[1]{9.1}$
	$\sqrt[0]{5.0}$	
	$\sqrt[0]{4.2}$	$\sqrt[1]{8.8}$
-21	$\sqrt[0]{4.7}$	
	<u>34.67</u>	<u>148.95</u>
	45.7	

	$\sqrt[8]{26.8}$	$\sqrt[9]{26.9}$	$\sqrt[8]{26.8}$	$\sqrt[5]{6.45}$	Levels
8-26	$\sqrt[3]{10-17.8 \text{ hr. at.}}$	$\sqrt[3]{10-22.1 \text{ hr. at.}}$	$\sqrt[2]{10-22.8 \text{ hr. at.}}$	$\sqrt[5]{11.3 \text{ at.}}$	85.2-06.8
-28	$\sqrt[3]{6.5 \text{ at.}}$		$\sqrt[2]{3.0}$	22.9	
	$\sqrt[3]{5.7}$	$\sqrt[3]{2.7}$	$\sqrt[2]{2.9}$		
-32	$\sqrt[3]{5.1}$			$\sqrt[5]{11.6}$	85.0-06.6
	$\sqrt[3]{5.6}$	$\sqrt[3]{1.0}$			
	$\sqrt[3]{5.2}$	$\sqrt[3]{1.3}$			
	$\sqrt[3]{5.1 \text{ hr. at.}}$	$\sqrt[3]{1.1}$			
-36	$\sqrt[3]{5.2 * 2}$	$\sqrt[3]{1.2}$		$\sqrt[5]{11.3}$	86.0-08.0
	<u>38.15</u>	<u>31.15</u>			

48

Therefore, so that distinctness or faintness shall precede steadiness or tremulousness always.

	$\%.$	$\%.$	$\%.$	$\%.$	First motion
-43	$3 \begin{array}{l} 47.8^{*2} \\ 26 \end{array}$	$3 \begin{array}{l} 11.7^{*2} \\ 26 \end{array}$	$2 \begin{array}{l} 52.1^{*2} \\ 26 \end{array}$	$5 \begin{array}{l} 1.9 \\ 26 \end{array}$	87.2-09.2
-44	8.1	1.2			
	7.6	1.4	$2 \begin{array}{l} 52.2 \\ 22.15 \end{array}$	$5 \begin{array}{l} 11.8 \\ 57.85 \end{array}$	86.3-08.0
-48	7.9	1.3			
	37.85	31.4			

 $\%.$

Moved tent
First, possibly
distinctness

Bearings above this morning like the sketch
of page 32. Snow covered.

9-40 Bearings dim and * Hill *

9-48 $10-12^{12}$ 6.10^{10}
10- 16.2 dim to 10- 50.3 st.

34.3

34.0

50.3

86.2-08.6

33.8

33.8

34.4

35.2

50.4

35.2

35.4

50.3

87.2-09.8

-54

34.9

34.72

50.32

44.4

 $\%.$ $\%.$

-58

33.2*dim

52.1*alt

Difference
reliable

32.8

33.5

52.3

 $\Sigma \% = 03.05$

10.85

-61

32.7

 $\Sigma \% = 52.20$

~~28~~	~~will~~
$\begin{array}{r} 4 \times 3.9 \text{ tn} \\ 4 \times 3.4 \\ 4 \times 3.8 \\ \hline 4 \times 3.70 \end{array}$	$\begin{array}{r} 4 \times 3.3 \text{ tn} \\ 4 \times 3.8 \\ 4 \times 3.9 \\ \hline 4 \times 3.67 \end{array}$

10-56

+0.03

	~~28.~~	~~28.~~
10-56	$\begin{array}{r} 3 \\ 80.1 \text{ ft. (tn)}^* \\ 2 \\ 80.5 \\ 2 \\ 79.7 \\ 3 \\ 80.0 \\ 2 \\ 79.6 \\ \hline 279.98 \end{array}$	$\begin{array}{r} 2 \\ 51.3 \text{ ft. (tn)}^* \\ 2 \\ 52.1 \\ 2 \\ 51.2 \\ 2 \\ 51.7 \\ 2 \\ 51.3 \\ \hline 251.52 \end{array}$

60

08.56

4 also tn
Each * but
Diff reliable

	~~312-¹²~~	~~312-¹⁰~~
11-04	$\begin{array}{r} 10-85.3 \text{ dmtm} \\ 84.4 \\ 84.7 \\ 84.3 \\ 84.67 \\ \hline 45.32 \end{array}$	$\begin{array}{r} 10-89.1 \text{ (at) tn} \\ 89.6 \\ \hline 89.35 \end{array}$

-06

86.8-12.6

	~~369-⁹~~	~~36.8-~~	~~36.5+~~
11-16	$\begin{array}{r} 10-83.7 \text{ tn} \\ 83.0 \\ 83.2 \\ 83.9 \\ \hline 83.45 \end{array}$	*	$\begin{array}{r} 10-81.7 \text{ tn} \\ 81.7 \\ 81.4 \\ \hline 81.45 \end{array}$

-20

32.00

84.5-08.9

84.0-07.8

Note at 11 $\frac{1}{2}$ while J.R.E. was in the house a guy of tent-roof broke. Tent may have flapped against instrument and altered the collimation.

Instrument re-set.

Y

Chy

Zero now when ten (10) line is opposite $\rightarrow$ and micrometer at -30 30

Y 11+

Chy $\frac{9+}{10-}$

2-45 P.M. 53.0

Y $\frac{12-}{11+}$

Chy 10-

2-46 P.M.

Y 12¹²

Chy 10¹⁰

2-46 P.M. 9-55.9 at at 9-12.8 st.

79.6-03.4

53.9

53.4

-48

55.7

12.8

79.6-03.2

55.72

12.80

42.92

M 13¹³

Chy 12¹²/13

2-51

10-04.9 at. st.

10-07.4 at. st.

86.0-09.2

04.2

07.2

3.8

-56

4.2

07.0

85.6-09.0

04.37

07.20

57.17

Y

Chy

56.3 at. st.

12.3

81.6-05.2

-57

57.56.0

55.8

12.2

81.0-04.5

56.3

56.10

12.25

Blue plan of ^{some} micrometers reading accidentally crossed out in blue ink and the line afterward scratched out as much as possible without disturbing original pencil lines. 51

0 ²⁶ / ₁₀₀	26.1 ²⁶ / ₁₀₀
26.1 ²⁶ / ₁₀₀	27.0 ²⁶ / ₁₀₀
26.2	26.2
25.8	25.9
<u>26.03</u>	<u>26.37</u>
- .34	

3-04	²⁶ / ₁₀₀	²⁶ / ₁₀₀	
	21.0 * ²⁶ / ₁₀₀	13.3 *	Difference
	21.1 "	13.7 "	reliable
	21.7 "	13.8 "	
-06	21.5 "	13.8 "	
	<u>21.32</u>	<u>13.65</u>	
	07.67		

3-08	26.9 ⁹	41.5 ⁵	
	10-21.6 ²⁶ / ₁₀₀	10-41.6 ²⁶ / ₁₀₀	82.4-06.4
	21.7		
	21.7	41.4	82.6-06.8
	21.8		
	<u>21.70</u>	<u>41.50</u>	
	40.20		

¹² / ₁₂	¹² / ₁₂
36.1	10-36.2
36.7	36.6
36.3	36.3
36.3	36.6
36.5	36.2
<u>36.38</u>	<u>36.38</u>

52 [See note, page 54]

-10

26

26

33.6

33.0

33.0

33.3

33.6

33.3

33.4

33.2

26.8⁸26.9⁹26.8⁸6 by 5⁵

4-14

10-33.4 alt. alt. 10-26.3 alt. alt. 10-20.7 alt. alt.

26.

26.

26.

6 by

4-16

10-35.0⁷

10-26.8 alt. alt.

10-21.7⁷

10-45.7

35.3^(all)

26.1

21.1

45.7

83.2-87.0

34.5

26.4

21.1

45.7

-21

34.6 alt.

26.5

21.1

45.7

82.6-87.4

34.85

26.45

21.3

45.7

312¹²6 by 10¹⁰

-24

9-02.1 alt. alt. 9-18.4^(all) alt.

86.6-10.0

2.3

2.3

16.8

-28

2.5

02.30

16.6

45.7

86.6-10.0

16.13¹³LB 12/13¹²

-30

10-10.2 alt. alt. 10-09.7 alt.

85.4-09.0

10.9

10.4

09.7

85.6-09.4

32

10.3

10.45

9.7

	$\frac{H}{D}$	$\frac{H}{D}$	$\frac{H}{D}$	$\frac{H}{D}$	
4-35	36.3 ft. ch. ~~dist.~~ ^{st.}	28.2 dist. ^{st.}	23.2 dist. ^{st.}	46.7 st.	88.4 * 2
	38.2	28.5	23.8	46.3	85.5 - 08.6
	37.8	28.8	23.3		
4-40	37.1	28.5	23.1	46.4	85.2 - 08.2
	37.35	28.5	23.35	46.47	
4-44	39.0	29.7	23.7		Abundant
-46	37.2 ft.	28.0 ft. st.	22.3 ft. st.	45.3 ft. st.	78.8 - 03.0
	37.6 "	28.8 "	22.0 "		
	37.8 "	28.3 "	22.2 "		
	37.1 "	27.8 "	22.3 "		
	37.0 "	28.3 "	22.6 "	45.7 (i) "	80.8 - 03.8
-56	37.6 ft. (dist.)	28.5 ft. st.	23.0 (i) ft. st.		
	37.38	28.35	22.38	45.5	
-57	02.8 dist.	16.2 ft.			79.4 - 03.0
	02.8 ft.				
	3.6 "	16.2 "			level neg.
-61	3.6				
	03.25 ?	16.2			
	47.0				

The asterisk denotes that trembling due to chimney currents independent of other cause. See page 44. *? Denotes possibility, but strong improbability that the chimney currents have any effect on position of mts.

	16.	73.2	08.0	ft.	level way
-03	08.4	08.0	ft.		
	11.1	08.9			
	9.7	8.6			
	10.0	8.1			
-08	10.2	8.4	ft.	0.8 ft.	
	9.88				

Strong wind all day - high near noon.

Noticed (A. M.) an appreciable parallax due to field being too far from objective. Especially troubled by it in P. M.

Made a few poor settings followed by good, and found it possible to estimate fairly well by the eye whether a setting already made were 0.0, 0.2 or $> .2$ away from the correct. Did not make a very rigid test however. The correct setting was got by applying the test that motions of the eye to the extreme that ~~practically~~ possible should produce equal displacements on each side. The estimate was made by similar motions of eye. As it was impossible to set rapidly with and accuracy ~~with~~ the existing parallax, and as giving the screw several successive motions for a single setting is undesirable and very slow, the expedient was adopted of setting at once and then estimating the correction - of course before reading the micrometer. If the estimation correction fell much over 0.2 the setting was discarded. If it fell below 0.3, the micrometer was read and the correction (never called greater than .2 in applying) was applied to obtain the figure recorded.

After the observations of page 51 & before those of page 52, the field was moved in, perhaps two (2) tenths of a millimeter.

Watch out of regulation - About 7 or 5 minutes fast.

Dec 13/78	e H.	w H.
942 A. H.	02.6	02.8
	2.8	2.5
	2.9	2.6

Noticed still some parallax. Pushed in field a trifle more.

8-54	02.2	02.2
	1.4	2.3
	2.1	2.2
	1.9	2.4
	2.0	2.2

9.12

Aug 10

Still on slight parallax. Moved field again.

Total time spent on securing perfect focusing with essential parallelism between lines and transverse bubble = about 1 hour today. There are no special conveniences on the joint for making this adjustment.

Observe that there is ~~no~~ essentially no parallax now between specter line and wires on B toward H. But for the chimney smoke Temple & Hecarange there is parallax which out of line he said, the plate being too thick for those distances.

Then spent another hour ^{in doing} fixing a diaphragm across the eye-hole

() This diaphragm has an aperture as long as the diameter of the circular eye-hole, but its width is only about 2 mm

The length is placed perpendicular to the apparent direction of the lines (apparent because a diagonal system is used) for focusing, but parallel for observing. This reduces the error, due to parallax in the ratio of ^{extreme possible} about 3 to 1, ^{and greater accuracy in cavity obtained} without having to resort to the slow focusing of page 54

Remember setting micrometer head to agree with the ^{exactly} but have no record when it was done. See foot of this page. 57

Dec 14 A. M.

e 24.6	m 24.1
² 24.4 tr	² 24.1 tr.
² 24.7	² 24.3
² 24.9	² 23.8
² 24.2	² 23.6
² 23.5	² 23.7
<u>²24.5</u>	<u>²23.9</u>

10.7820	24.8	24.9	24.8 ⁸	24.5 ⁵	
	10-27.7	10-27.7	10-27.7	10-27.7	84.2-06.4
	26.7	26.7	26.7	26.7	
	27.7	27.7	27.7	27.7	84.4-06.8
-24	26.6	26.6	26.6	26.6	
	27.17	27.17	27.17	27.17	

	1613 ¹³	1612 ¹²
-29	10-21.1	10-22.7
	to 21.	

	212 ¹²	212 ¹²	
-37	9-28.3	9-26.3	86.8-09.0
	27.6	26.2	
	27.9		
-40	28.2	26.3	
	28.00	26.3	
	11.73	27	

Inspection shows that adjustment of micrometer head, noted above, must have been made after all the observations of Dec. 6 and before those of Dec. 14

58

Non Note sharp to eye but hazy and
tremulous in glass: star object moving.
Lump of N to however shown haze to eye.

	N. 9 ⁹	N. 8 ⁸	Obj 5 ⁵	
12-47 P.M.	10- $\overline{51.7}$ by tr	10- $\overline{46.7}$ mg.	10- $\overline{46.2}$ mg	85.8-09.4
	$\overline{52.1}$	$\overline{47.3}$		
	$\overline{51.1}$	$\overline{45.9}$	$\overline{46.5}$	85.2-09.0
57	$\overline{52.6}$	$\overline{46.6}$		
	$\overline{51.87}$	$\overline{46.62}$	$\overline{46.35}$	

N. 13- lb
v by v mg;

	N. 12 ¹²	Obj 10/11 ¹⁰	
12-54	9- $\overline{49.4}$ mg	9- $\overline{46.1}$ mg	85.6-09.4
	$\overline{50.1}$		
	$\overline{48.9}$	$\overline{45.9}$	85.2-09.0
-57	$\overline{49.0}$		
	$\overline{49.35}$	$\overline{46.0}$	
	13.3		

"9-1-" of next page indicates that its position is below the 8 line, but that the 9 line
was used to avoid large motion of screw between setting on different points.
8-1+ = 8-1 recorded when 8- was meant, + added to correct. (Visitor recording)

The 40 on micrometer is made 40 and may easily be read 10 when poorly illuminated.
 The 10 " " " 10 " on p. 61 it appears to have been read 40 at the last minute one
 59
 Note also that the figures are written upside-down.

3-15 = M12¹² *Liby 10/11*

$$\begin{array}{r} 9-88.7 \text{ at } 21 \\ 88.3 \\ 87.6 \\ 88.7 \\ \hline 88.32 \end{array}$$

$$\begin{array}{r} 9-85.2 \text{ (at } 21) \\ 84.5 \\ 85.85 \\ 85.85 \end{array}$$

 13.5
 79.6-03.4
 79.2-03.0

3-20 = M13¹³ *LB 12/13*

$$\begin{array}{r} 10-88.5 \text{ at } 21 \\ 88.6 \\ 88.3 \\ 88.3 \end{array}$$

$$\begin{array}{r} 10-86.7 \text{ at } 21 \\ 86.4 \\ 86.55 \end{array}$$

$$\begin{array}{r} 88.45 \end{array}$$

 78.0-01.8
 77.0-00.4

3-31 = M. (8-) M. (9-) M. 8- *Liby 11/12*

$$\begin{array}{r} 9-81.9 \\ 80.1 \\ 79.1 \\ 79.4 \\ 80.12 \end{array}$$

$$\begin{array}{r} 9-85.3 \\ 85.9 \\ 85.1 \\ 85.2 \\ 85.37 \end{array}$$

$$\begin{array}{r} 9-88.6 \\ 88.9 \\ 88.7 \\ 88.7 \\ 88.72 \end{array}$$

$$\begin{array}{r} 9-86.0 \\ 86.1 \\ 86.05 \end{array}$$

 80.4-04.0
 79.6-03.4

3-49 = M. 8-⁸ M. 9-⁹ M. 8-⁸ *Liby 6/7*

$$\begin{array}{r} 10-82.7 \text{ at } 21 \\ 83.3 \\ 82.7 \\ 83.7 \\ 83.1 \end{array}$$

$$\begin{array}{r} 10-87.8 \text{ at } 21 \\ 87.4 \\ 87.3 \\ 87.7 \\ 87.55 \end{array}$$

$$\begin{array}{r} 10-80.3 \text{ at } 21 \\ 80.6 \\ 80.2 \\ 80.3 \\ 80.45 \end{array}$$

$$\begin{array}{r} 9-86.1 \\ 86.1 \\ 86.1 \end{array}$$

 82.0-6.0
 81.6-05.0

60

4.17

26 68

26

26

26

80.6 - 8.2

³48.7 ft. 10³41.2 ft. 10²55.4 ft. 10¹46.7⁴40.2³60.7²55.7*¹46.4⁴40.4³41.6

20*

³69.9*³41.1²55.7¹47.2

79.0 - 01.6

- 23

³69.8³41.15²55.6¹46.57~~79.0 - 01.6~~

4.30

¹²712-1 ¹⁰8 by 10 ft¹⁰9-⁰86.8 ft. 10 ⁴9-⁴47.4⁰37.0⁰86.0⁴47.4

81.0 - 03.4

4.32

⁰27.2

4.32

⁰86.75⁴47.4

80.2 - 2.6

19.3

4.34

¹³711.13-¹²12/13¹⁰9-¹47.1¹⁰9-⁰89.0¹46.2¹⁰9-⁰88.7¹46.7¹⁰9-⁰89.2¹45.5¹⁰9-⁰89.6

81.8 - 04.0

4.34

¹16.37

81.2 - 03.4

4-42

²⁶^(75.5)45.5 ft. 10²⁶^(65.3)45.3²⁶²59.9²⁶¹47.2

83.2 - 05.0

⁴45.4³45.2²59.6⁴45.9³45.7³40.0¹47.0⁴45.7 dm.³46.0³40.0

82.6 - 04.6

4-47

⁴45.62³45.55²59.87¹47.1

82.6 - 04.6

	Σ	Δ	Σ	Δ
4-49	$\begin{array}{l} 4 \\ 17.2 \text{ vft.} \\ 18.0 \text{ " } \\ 17.8 \text{ " } \end{array}$	$\begin{array}{l} 3 \\ 17.4 \text{ ft.} \\ 17.2 \text{ " } \\ 17.3 \text{ " } \end{array}$	$\begin{array}{l} 3 \\ 12.0 \text{ ft.} \\ 12.1 \text{ " } \\ 12.3 \text{ " } \end{array}$	$\begin{array}{l} 1 \\ 17.1 \text{ ft.} \\ 17.4 \text{ " } \\ 17.3 \text{ " } \end{array}$

-55

$\begin{array}{l} 4 \\ 19.0 \\ 19.6 \text{ dbt.} \\ 19.2 \text{ " } \end{array}$	$\begin{array}{l} 3 \\ 17.7 \\ 17.1 \text{ vft.} \end{array}$	$\begin{array}{l} 3 \\ 12.3 \\ 12.17 \\ 12.4 \end{array}$	$\begin{array}{l} 47.2 \text{ dbt.} \\ 17.2 \text{ dbt.} \end{array}$
$\begin{array}{l} 49.4 \\ \text{impossible} \end{array}$	$\begin{array}{l} 2 \\ 17.8 \text{ " } \\ 3 \\ 18.7 \text{ dbt.} \\ 17.8 \text{ dbt.} \end{array}$	$\begin{array}{l} 3 \\ 12.0 \text{ vft.} \\ 12.7 \text{ dbt.} \end{array}$	

82.4 - 04.2

5-03

4-45 to -49

$\begin{array}{l} 4 \\ 18.0 \end{array}$	$\begin{array}{l} 3 \\ 17.4 \end{array}$	$\begin{array}{l} 37.4 \\ 32.17 \\ 32.36 \end{array}$	$\begin{array}{l} 1 \\ 17.27 \end{array}$
--	--	---	---

 Σ ~~8-17~~ Σ Δ

-04

$\begin{array}{l} 4 \\ 14.2 \text{ vft.} \\ 14.4 \text{ " } \\ 13.6 \text{ " } \\ 12.1 \text{ dbt.} \\ 13.9 \text{ " } \\ 13.64 \end{array}$	$\begin{array}{l} 4 \\ 18.8 \text{ ft.} \\ 18.9 \text{ " } \\ 18.2 \text{ " } \\ 18.4 \text{ " } \\ 18.57 \end{array}$
--	--

Possibly 13.64 see p. 59

25.1

Watch 3 min fast.

Dec. 16/78	e H.	w H.	Difference	Diff { ^{2nd e, 1st w} H.	Mean
1-31.4.4.	³ 4.1	³ 3.2	0.9	1.0	³ 3.6
	³ 4.2	³ 3.7	0.5	-0.1	³ 3.0
	³ 3.6	³ 2.6	1.0	0.7	³ 3.1
	³ 3.3	³ 2.4	0.9	1.0	³ 2.8
	³ 3.4	³ 2.7	0.7		³ 3.0
	<u>33.72</u>	<u>32.92</u>	<u>0.8</u>		

Is the variation in mean of e & w due to heat from burner of observer?

Hereafter Hill will denote Hill under H. range, while H. will denote a house sketched page 31. Setting on ridge line. I will denote that hot current from chimney alternately disturbed and the object - and left it free according to temporary variation in the wind, and that a slight delay ensued in getting a still time to make the setting. N.B. The stillness of object not due to failure of currents to produce trembling, but to their making it occur at a different part of the field.

[28] or a figure number in brackets standing under in the column headed H. will denote the minor summit or knoll westward from the true summit of H. range and seen through the gap near the west end of Hill.

	¹⁰⁻¹⁻ 10-9-1	⁹⁻¹⁻ 10-7-1	^{6/7-} 6-7-1	
	¹⁰ 10-10-1	⁷ 10-7-1	⁹ 10-7-1	⁶ 6-7-1
10-2324	9- ² 3.8 dm. cc	9- ² 9.9 dt +	9- ¹ 7.3 *?	9- ¹ 7.7 st.
	² 54.5 "	² 59.4 "	¹ 56.7 "	¹ 57.4 "
	² 54.3 "	² 59.4 "	¹ 57.2 "	¹ 57.6 "
	² 54.7 "	² 59.9 "	¹ 57.3 "	¹ 57.7 "
-34	24.57	29.42	57.12	17.6

Delayed by cable
frizman and
slipping
footings.

	¹³ 10-13-1	¹² 10-12-1
10-42	10- ¹ 2.0 dm. cc	10- ⁰ 7.2
	¹ 1.3	
	¹ 2.1	⁰ 10-7.1
-46	^{11.8} 11.8 51.0 dt.	7.15
	11.6	

	¹³ 11-12-1	¹⁰ 11-10-1
11-26	10- ⁰ 1.4 dm	9- ⁴ 6.5
	st.	
	¹⁰ 10-10-1	⁷ 10-7-1
11-34	9- ² 3.8	9- ² 8.3
	⁹⁻¹ 5.9 *?	⁹⁻¹ 7.2

Gen. line reads more than 10 on comb when opposite
the ~~first~~ with micron at 60. Moving the micron to back
till the line reads 10 on comb, the head reads 35.036
The ~~sum~~ figure before dash is reading of ten-line
upon comb when the setting is made on obj. cap.
Settings of last line and ^{also of} first line on next page
hastily made. Only object to exhibit effect of re-adjusting
micron - head.

Micrometer set to agree with comb
 and otherwise undisturbed.

26.10	26.07	26.269	6 by 6/7
9-20.2	9-24.3	9-13.3	9-13.9

Figure after the letter at head of column denotes
 the line used to set with.

Reading consists of a figure denoting reading of ten-him on comb

" dash

" pair of figures denoting division of head of screw

" decimal point

and " figure denoting estimate tenths of a division.

Remember that divisions are 60th of a turn.

26.10	26.07	26.269	6 by 6/7
12-25 P.M. 9-17.9 by. at	9-24.3 tot. tr.	9-14.3 * by tr	9-13.0 dt tr
17.7			
18.1 "	24.0 "	12.4 "	
19.3 "		13.1 "	
-32 "	23.9	13.4 "	12.8
18.14	24.06	12.9	12.9

Re-levelled

3-40	e 26.	w 26	
3-40	32.5	31.7	0.8
	32.1	31.6	0.5
	32.2	31.4	0.8
	32.3	31.5	0.8
	32.27	31.55	0.72

	No. 9	No. 10	No. 7	No. 9	6/7
3-51	9-30.3 ^{*2} rft. at	9-23.2 ft. at	9-27.8 t dt. (at)	9-16.4 T dt. (at)	9-11.9 dt. at
	31.2 dt.	23.2 "	28.2 t dt. at	17.0 *3 t "	
	^{30.5} rft. vdt.	23.7 "	28.1 t dt. at	16.9 " " "	11.8
4-03	" "	23.4 "	27.6 " "	17.2 " "	
		23.37	27.92	16.87	

Delay

Delay = t

	No. 13	LB 12/13 ¹²
4-07	10-06.9 dt. at	10-01.4 dt. at
	07.4	
	07.7	01.9
-09	07.7	
	7.42	1.55

	No. 12	10/11 ¹⁰
11	9-58.3 dt. at	9-48.5 dt. at
	59.2	
	59.1	41.5
-14	58.7	41.3
	58.82	41.43

	No. 10	No. 7	No. 9	6/7
-18	9-25.2 ft. at	9-28.4 dt. at	9-18.1 t dt. at	9-11.4
	24.9 "	29.1 "	18.3 t (*?)	
	24.7 "	28.9 (t)	18.3 t	-11.1
	25.2 "	28.8	18.23	11.25

	No. 13	LB 12 ¹² /13	
- 26	10-08.4 at ₂₀	10-02.7 at ₂₀	5.7
	09.6	01.7	7.9
	10.3	02.3	8.0
	09.3	02.1	7.2
	09.5	02.9	6.6
	09.1	01.7	7.4
	09.0	02.3	6.7
	09.7	02.6	7.1
	08.8	02.2	6.6
- 35	<u>09.5</u>	<u>02.3</u>	7.2
	09.32	02.25	

Series extended
and B noted each
time on account
of discrepancy
appearing.

	No. 8	No. 8	No. 8	No. 6
	No. 10	No. 9	No. 9	No. 6/7
- 40	9-26.8 at ₂₀	9-30.8 at ₂₀	9-19.9 at ₂₀	9-10.2 at ₂₀
	26.4 "	30.4 "	20.1 "	09.4 at ₂₀
	26.8 "	30.1 "	20.3 "	10.4 "
- 46	<u>26.7</u>	<u>29.7</u>	<u>20.8</u>	<u>11.7</u>
	26.67	30.05	20.27	10.42

	No. 12	No. 10 ¹⁰ /11
- 48	10-01.7 at ₂₀	9-41.4 at ₂₀
	1.4	
	1.9	41.3
- 50	<u>1.3</u>	
	1.57	41.35

~~4-51~~ ~~Al 13~~ ~~CB12/13~~¹²
 4-52 10-12.0 *data* 10-01.9 *data*
 11.5 " 1.7 "
 11.3 " 1.5 "
 -54 11.6 " 1.7
 11.6

-56 -11.7 *dt* -02.0
 11.8 1.5
 10.8 1.9
 11.7 1.4
 11.9 11.58 1.3 1.62
 12.0 1.1
 11.6 1.7
 11.3 1.9 *ft.*
 11.2 1.2 "

5-04 11.3 1.7 "
 11.48 1.52

-05 11.2 *ft.* 00.9 *ft.*
 11.5 " 01.3 "
 11.7 " 1.0 *dt.*
 12.2 *ft.* 2.1 "
 12.0 " 0.3 "
 11.7 " 1.9 "
 11.8 " 1.8 "
 11.7 1.33

-11 *Yards* 11.5 " *invisible*
 dt
 read 11.3 "
 11.1 *dt.*

-13 12.3 " 11.58

Dec. 9/98

Scheme for Publication.

4 Description of Arlington Heights

Lat. & long. and distances from C.S. stations

1 Discussion of

1 General location. Buildings & pier on summit. Also (4) [see below.]

3 * Discussion of precise Location - lat., long., elevation, & distances ^{see therein.}
Also any determination of relative positions of objects on summit, and distance ^{4 points visible.}2 * ^{Visibility of points.} Points visible. Distances to them. Local obstructions.

[Part 4?] (4) Description of Pier, and Tripod for supporting shading Tent-roof.

* [Note made after finishing the next page] Theoretically ^{any} "discussion" of this kind belongs ^{after} the lodgers, but practically it is better here. i. Stand in the relation of lodger to Part IX.

Note. Since the instruments are not used here exclusively, the description of them will not refer to any one place. Similarly the method of carrying out any class of observation will have been so fully described, ^{elevation} that but ~~from~~ brief reference to method need be made in connection with figures.

Why not consider that three (3) journals were kept? -

a - A journal relating to methods of using the instruments, in which every progressive or experimental departure from what has already been done is chronologically noted.

b. A ~~of~~ journal relating to points visible, and containing all the sketches and remarks, as successive points are discovered or identified.

c - A journal of observations, in which the brief notes as to method will be intelligible in the light of "a."

But having developed the idea embraced in the above question, it now becomes evident that "a" is a diary

Monday, a sketch in the thought. Went to next page.

rather than a journal. The outcome is this —

Hereafter conform to the following system, and for publication make what has been already done conform as near as may be, with perhaps a distinction between past and present time to denote what is written after the lapse of time.

~~I~~ Provide the observer with two (2) separate books, — the home-book and the field-book. Each book is in ^{more than one} ~~two~~ parts, the connection under one pair of covers being only a convenience.

Home-book - Part III Diary. Embracing all extended notes more explicit than the hasty memoranda made while at work.

" - Part IV Meteorological Journal.

~~Part V Description of Apparatus - Instruments, Price &c.~~

Field-book - Part I Journal relating to points visible &c. Embracing all sketches, recording phenomena noted by inspection and not intimately connected with the observation measurements &c.

- Part II Journal of measurements. Embracing also such brief notes as directly affect the method of using the figures. Notes ^{to be} as ^{brief} ~~as possible~~ practicable i.e. everything requiring noting during observations and capable of being put into Part I ^{the Diary Part I is in the Meteorological Journal (Part IV)} should be so located; while everything requiring extended explanation should be noted as briefly as is consistent with a record of the facts; and on the next opportunity the full explanation should be written out in the diary or the meteorological journal, or the description of apparatus.

Preliminary explanation, historical previous ^{existing} In Publication

- | | | |
|------------------------------|--|--|
| A. Introduction. | Description of Stations and Instruments. | Historical synopsis of system of reading & publishing. |
| B. Parts I, II, III & IV. | Condensed copy of Observer's Books. | |
| C. Ledger of Observations. | Discussion of all observations. | |
| D. Final summary of Results. | Conclusions (State ~~whether~~ the matter is left.) | |

Station

Cambridge. E. C. P.

McWachusett. E. C. P.

McMonacknock. E. C. P., J. R. E.

McWashingon. E. C. P., J. R. E.

McKearney. J. B. H. Jr.

East Jefferson. J. R. E.

Jefferson Hill. J. B. H. Jr.

Arlington Heights. J. R. E.

McStarr King. J. R. E.

Instrument.

Micrometers - level A. ^{Belongs to Inst. Tech.} Small inst. of 1866. Mic. eye-piece.

" " B. ^{Belongs to inst. of Tech.} Small inst. of 1866. Micrometers under Y's.

" " C. Large inst. Mic. eye-piece. Also mic. under Y's.
1st stage, parallel lines on 1 side. 2nd stage, lines on 2 sides of plate.

" " D. 2nd small inst, without erecting lenses.

Collimator for D. tried in 1897. Telescope of A on fixed wooden Y's.

" " C. tried in 1898. ^{convex} collimator on fixed wooden Y's and without lines in field.

Auxiliary telescope, variously used. One of pair of H. L. C. small collimators.

Topographical camera.

Observations - Pickering, Hunk, Edmunds.

E. C. P.

Cambridge, Washburn, Monadnock & Washington

J. B. H. Jr.

Summer of 1877 at Jefferson Hall. (Mic. lens B)

July 1877 " Haverhill (I.) (" A)

J. R. E.

Summer of 1877 at Capt. Jefferson ^(Mic. lens D) ~~at Washington (profiler)~~

and at Mr. Washburn (Yop. Camera & Y. & S. Theodolite)

^{July 1877 & autumn}
Day in Nov. 1877 at Monadnock (Yop. Camera)

^{Autumn}
Autumn of 1878 at Starr Spring. (4 in 1876 & profiler.) (Mic. lens C)

and " 1876 & 1877 (Yop. Camera)

^{Autumn}
Spring of 1878, ~~autumn~~ & Winter of 1878-9 at Arlington Heights. ^(Mic. lens C)

Give each observer's work by itself, with no attempt at combination till the Ledger, which will open with a chronological list in detail of

To make up arrears of preparation of work for publication.

- [4th copying] / 1st in detail and in Chronological order
 Chronological Index, of each Observer's Work separately, with reference to
 state (better than date in diary or journal, and mention of book containing original record,
 to book and page) containing original observations of observation.
- 2nd Make Preliminary Draft of ^{classified} Skeleton of Ledger of Operations. Chronological combination of each Observer's
 (made with the help of the index) work, in the shape of brief reference to the above Index, ^{each item including as many}
^{or in preparing for publication} ^{as well as} ^{for} ^{publishing} ^{as well as} ^{for} ^{publishing}
 This puts the matter in the best shape for use in the discussion. ^{the two may be combined for publication}
 The two may be combined for publication. Make the Index, inclusive
 of anything everything which may bear on the subject. Irrelevant
 matter may be crossed out in preparing for publication.
 In publishing, reference to page, ^{date or entry} of published journal or diary would be added,
 or perhaps substitution for reference to originals.
- 3rd Examine material as to relevancy, and decide what to use.
- 3rd 4th For each observer separately, arrange Parts I, II, III & IV for
 publication. If the parts are mixed in the originals,
 start synopsis of each part, ^{with reference to book & page of original,} and with colored pencil
 mark each page or portion of page of original denoting in which
 part it belongs.
- 5th 7th Describe Stations.
- 6th 8th " Instruments. ^{Methods of using each instrument will be subjoined entered}
^{in the Ledger of Operations. Accuracy attained will}
^{be given in the Ledger of Measurements.}
- 4th 6th Work up the results of surveys for use in descriptions of stations.
 This done, the Ledger may be commenced.

To prevent accumulation of arrears.

Keep all future work carefully in accordance with the
 plan of page 101.

Promptly describe new station or instruments, or modification of old.

* The Ledger of Operations will become a detailed history of the
 procedure of the operations ^{all} ^{subjectively as seen} ^{as seen} The history in the introduction
 to the ^{small} ^{summary} ^{of what was done, written reference to its being}

Description of Star Hill

- 1 General location. C. I. Sta. on summit. Position of old ^{data} and vertical station relative to C. I. Sta. Marking of vertical sta. on rock.
- 3 Precise Location of C. I. Sta. Table of distances (from C. I. Sta. & A. H. C., with particular as to observation ^{thence}) to points which have been or which may well be used in refraction work.
- 2 ~~Distance~~ Points Visible. Distance Visibility of Points. Local obstructions.

Description of Mt. Washington

- 1 General location. Buildings on Summit. C. I. Station on summit, and also refraction stations and those used in local survey, described relative to buildings.
- 3 Precise location of one or both C. I. Stations. Distance to points visible. ^{Discussion and} results of local survey.
- 2 Visibility of Points. Local obstructions.

General Plan for Describing Station

- 1st General character, and Position relative to other points. Qualitative, i. e. involving ^{no} quantitative measures. The reader is (as it were) brought from surrounding localities to the vicinity of the station, and the character of this vicinity, and relative position of objects therein are described. The station (one of the foregoing objects) is then described in particular.

- 2nd Relative Position of surrounding objects.

Arrived at the station, the reader is supposed to look about him, ^{and note} distant points visible, and near obstacles to the view.

3rd Finally, Quantitative Results pertaining to the station in relation to distance or local objects are discussed and summarized. A separate Ledger for Surveys is believed to be unnecessary.

General Plan for Ledgers.

Material to be systematically set forth comes under two heads, Qualitative and Quantitative. The first is entered in the Ledger of Observations as already described. This ledger gives a chronicle of what has been done without combining the thoughts with numerical results. The second class of observation is of a numerical nature and is entered in the Journal of Measurements. Stripped of all long explanations as to method, this ledger gives the actual determinations in the most convenient ^{form} for discussion.

Jan 11/79

Lat Division into Home - Park & Field - Books
 commenced. The But doubt expressed whether
 Doubt - thrown at
 Modification will undoubtedly be made in the
 foregoing scheme.

Jan 28/80

H. L. O. J

Device for reading chronograph of transits of Polaris.

From
Sheet

Jan 3 (13) $\begin{array}{r} (8) 8.1 \\ 02.2 \\ 8.5 \\ \hline 1.3 \end{array}$ $\begin{array}{r} 54.0 \\ (24) 58.1 \\ 63.2 \\ \hline 58.4 \end{array}$ 11 45.1

Dec 24/79 11 $\begin{array}{r} 84.1 \\ 06.6 \\ \hline 87.5 \\ 37.1 \\ \hline 32.1 \end{array}$

Dec 9/79 11 $\begin{array}{r} 46.9 \\ 50.4 \\ 56.2 \\ \hline 51.9 \end{array}$ 23 $\begin{array}{r} 40.6 \\ 47.0 \\ 54.2 \\ \hline 49.9 \end{array}$ 11 58.0

From	Polaris.	Mean time of transit over 1 st & last wire. From chronograph.	Interval between wires of chain.
Recorded	July 10/79	10 ^m 42.5	11.8
Reckoned		22 29.8	10.4
	2	minutes not 35.0	07.9
		noted 49.2	44.2
			10.4
	1	turn. 28.9	10.3
		errata! 15.1	46.2
			14.6
	June 30	31.9	11.7
		19.2	47.3
			09.5
	26	23.1	11.4
		40.2	47.1
			13.3
	May 6	10.4	10.1
		59.0	48.6
			11.6
	Apr. 23	58.6	12.1
		45.7	47.1
			11.2
	22	58.3	10.2
		43.2	44.9
			13.0

Apr. 20	50.5	10.8
	<u>41.7</u>	51.2
		07.8
19	47.1	09.3
	<u>37.4</u>	50.3
		10.9
15	49.2	09.7
	<u>41.5</u>	52.3
		10.3
6	45.3	09.3
	<u>39.1</u>	53.8
		10.2
Mean 25	55.7	12.6
	<u>45.6</u>	49.9
		11.9
24	~~58.8~~	~~7~~
20	54.5	07.3
	<u>46.1</u>	51.6
		12.1
18	01.2	13.2
	<u>47.9</u>	46.7
		10.3
12	00.3	10.7
	<u>49.6</u>	49.3
		09.4
10	53.2	11.1
	<u>43.3</u>	50.1
		13.2
5	30.3	10.7
	<u>20.6</u>	50.3
		12.8
5		
May 27	01.1	11.8
	<u>50.5</u>	49.4
		14.1
24	31.5	15.2
	<u>20.2</u>	48.7
		13.4
24	56.6	16.4
	<u>46.5</u>	49.9
		10.9

Feb. 23 48.3 6.6
 13.3 45.0 8.7

Jan 3
Dec 9/79

(See page)
109

11 45.1
58.0

Given Obs. without Pole & Tan.

$$-\Delta T = m = (T' - a) + n \tan \delta$$

$$m = b \sec \varphi - n \tan \varphi$$

$$-\Delta T' = (T' - a) + b \sec \varphi - n (\tan \varphi - \tan \delta)$$

When $\delta = \varphi$, n eliminates.

$$\frac{\Delta(\Delta T)}{\Delta n} = H_0 (\tan \varphi - \tan \delta)$$

$$\tan \delta = \tan \varphi - \frac{\Delta(\Delta T)}{\Delta n}$$

Suppose that the use of a value of n found on a previous occasion is equivalent to an uncertainty of $\frac{5}{100}$ seconds in its value.

Let it be required that the resulting uncertainty in ΔT shall not exceed $\pm \frac{5}{100}$.

$$\text{When } \tan \delta = \tan \varphi \pm \frac{5}{100}$$

$$\text{For } H_0 \text{ G. } \varphi. \tan \varphi = 0.913$$

When

$$t = 1 \text{ } \text{When}$$

$$t = 2$$

	$\tan \delta$	δ
δ	$\tan \delta$	δ
	1.213	50.6
$3\frac{1}{3} = \frac{10}{3}$	0.613	31.5
	1.113	48.0
5	0.713	35.5
	1.063	46.7
$6\frac{2}{3} = \frac{20}{3}$	.763	37.3
	1.013	45.4
10	.813	39.1

	$\tan \delta$	δ
δ	$\tan \delta$	δ
	1.513	56.5
$3\frac{1}{3}$	0.313	17.4
	1.313	52.7
5	0.513	27.2
	1.213	50.6
$6\frac{2}{3}$	0.613	31.5
	1.113	48.0
10	0.713	35.5

Comparison of Lick and Solar Block.

Ann. Eph. gives Wash. Lick Time for (Wash) Mean Noon,
call this W . Then

Then ~~W~~ $W - 3.89 = \text{Lamb.}$ " " " (Lamb) " "

But Boston time is 15.50 mean time

seconds ahead of Lamb. = 15.54 sid. sec.

$\therefore W - 3.89 - 15.54 = W - 19.43 = \text{Lamb. Sid. Time for Boston Mean Noon.}$

Thus for Jan 30, 1880 we have

~~22~~ 39 30.49	~~20~~ 37 17.30
~~19.35~~	~~19.43~~
~~22 39 11.14~~	~~20 36 57.87~~

For Jan 29/80

~~22~~ 35 33.95	~~20~~ 36 57.87
~~19.35~~	~~19.43~~
~~22 35 14.60~~	~~20 36 57.87~~

Example of use of this.

$W - 19.35$ to be tabulated beforehand for each day.

Jan 30.8, 1880

Lamb. Sid. T. for Boston Mean Noon	20° 36' 57.87
Time by Solar Block 294	+ 19 14 12.
For converting 19° 14' 12" into a Sidereal Interval.	{ + 3 9.573 + .033
	(-24+) 39 54 19.48
Time by Sid. Clock 1327	- 15 55 06.
	23 59 13.48
	00 00 46.52

Discrepancy

Error of 1327 when last found 40.92

Gain since comparison

Total error at comparison

Discrepancy as above

Error of 294 as found above
by former method in time since record.

Time by sid 1327 15° 55' 06.

Or rather

For error + rate

40.

When Sid. clock is gaining and is also fast it is especially simple. This

Hand. ^{Time} for Port. ~~Star~~ Noon	20	36	57.87
Time by Solar & clock ^{at conjunction of stars} 394	19	14	12.
For counting 19 ^h 14 ^m into Sid.		3	09.573
" " 12 ^s " "			00.033
1327 <u>fast</u> at last determination			40.92
" <u>gained</u> since " "			05.87
Time by 1327 <u>provided</u> 394 be right	(247)	15	55 06.27
" " " <u>observed</u>		15	55 06.
Error of 394			+0.27

But 1327 Sid. clock is slow and losing it is also simple, the negative signs of the following form disabusing.

Time by Sid. clock 1327	15	55	06
1327 <u>slow</u> at last			-40.92
" <u>lost</u> since "			-05.87
	15	54	19.21
Error of 394			+0.27
Hand. Time for Port. Noon	20	36	57.87
Time by Solar 394	19	14	12.00
19 ^h 14 ^m into Sid.		3	09.573
12 ^s " "			.033
		15	54 19.48
		19.48	
		19.21	
		+0.27	

When Sid. is fast & long, or slow & gaining especial care of signs must be taken. But when its error and its rate have the same sign (as will oftentimes occur) choose one of the above forms, so as to have everything in a column addition.

This last form indeed seems to recommend itself for use in the mixed cases as the best; so that the one at the top of page would seem to be overburdened by the desirability of a single form.

Pair of Twin Stars without Pole Star.

Let the declination of the two stars be respectively

$$\delta_1 > \phi \text{ (the latitude) and } \delta_2 < \phi$$

The weights of their transits will be as their ^{respective} polar distances nearly i.e. as their ^{respective} velocities of transit.

If w = weight of

The square of prob.^l error of a transit may be assumed roughly $a^2 + \left(\frac{b}{90^\circ - \delta}\right)^2$ i.e. a constant plus a quantity inversely proportional

to the polar distance.

$$\text{So weight of a transit} = \frac{(90^\circ - \delta)^2}{a^2(90^\circ - \delta)^2 + b^2} \text{ due to uncertainty of observation.}$$

The effect of an uncertainty in the value of w (Laplace's formula) will be proportional to $\tan \phi - \tan \delta$

$$\text{Hence weight of a transit} = \frac{1}{(\tan \phi - \tan \delta)^2} \text{ due to uncertainty of } w.$$

Art 10 Let the two declinations be so taken that the relative weights derived from these ^{separate} considerations shall be the equivalent same.

$$\text{Then } \frac{\tan \delta_1 - \tan \phi}{\tan \phi - \tan \delta_2} = \left(\frac{90^\circ - \delta_2}{90^\circ - \delta_1} \right)^2 \cdot \frac{a^2(90^\circ - \delta_2)^2 + b^2}{a^2(90^\circ - \delta_1)^2 + b^2}$$

Sidereal Clock.

Error by Plotted Residues.

Assume a rate of 3^s per 24 sidereal hours.
or $\frac{1}{8}^s$ per sid. hour.

Hour	Gain	Hour	Gain	Hour	Gain	Hour	Gain
1	0.125 ^{0.062}	9	1.125 ^{1.062}	17	2.125	25	3.125
2	.25 ^{.187}	10	1.25	18	2.25	26	3.25
3	.375 ^{.312}	11	1.375	19	2.375	27	3.375
4	.5 ^{.437}	12	1.5	20	2.5	28	3.5
5	.625 ^{.562}	13	1.625	21	2.625	29	3.625
6	.75 ^{.687}	14	1.75	22	2.75	30	3.75
7	.875 ^{.812}	15	1.875	23	2.875	31	3.875
8	1.00 ^{.935}	16	2.	24	3.	32	4.

9 1.125

10 1.25

11

Or Rather

Hour Gain

.8 0.100

.85

Minute Gain

Hour

.05 .006

.1 .012

.15 .019

.2 .025

.25 .031

.3 .037

.35 .044

.4 .05

.45 .056

.5 .062

.55 .6

.05 0.006

.1 .012

.15 .019

.2 .025

.25 .031

.3 .037

.35 .044

.4 .050

.45 .056

.5 .062

.55 .069

.6 .075

.65 .081

.7 .087

.75 .093

Assume also a date at which the
assume error is to be zero. Take time
of day at which corresponding to 0^h sid.
In the case before us, the clock was
high about 20^s at Jan 27.2

Take from 0^h sid. at about
Jan 26.2 Day

< Feb. - ~~14.8~~ - 15.8 days

This has no reference to the
actual error existing Jan 16th

Minute Gain Hour Minute Gain

0	.000	7.5	.01
12	.025	15	.02
24	.050	22.5	.03
36	.075	30	.04
48	.087	37.5	.05
		45	.06
		52.5	.07

Or Rather; - ~~+~~ 60. .08
 67.5 .09
 75. .10

Hour + Min. Gain

1	00.	.08
1	07.5	.09
1	15.	.10
2	30.	.2
3	45.	.3
5	00	.4
6	15	.5
7	30	

Minute Gain

4.8	0.01
9.6	.02
14.4	.03
19.2	.04
24.0	.05
28.8	.06
33.6	.07
38.4	.08
43.2	.09
48.	.10
52.8	.11
57.6	.12
62.4	.13
67.2	
72.0	
76.8	

Hour + Min. Gain

0	48	0.1
1	36	.2
2	24	.3
3	12	.4
4	00	.5
4	48	.6
5	36	.7
6	24	.8
7	12	.9
8	00	1.0
~~8~~	48	1.1
9	36	1.2
10	24	1.3

Hour Gain

8	1.
16	2.
24	3.
32	4.
40	5.
48	6.
56	7.
64	8.
72	9.
80	10.
88	11.
96	12.
104	13.

~~Comparison~~ For the determination of day made Feb. 5, 1880

App. Solar Date.	we have. Approx. Solar Time for in Solar Day. = Presiding - Jan 16.2	Sidereal Hour at which Determination was made.	School Pictorial Corresponding Rightly Bright in Secs.	Corresponding Pictorial Arithmetic in Secs.	Result
Errors. + 20.44	Jan 23.4	7.2	5 ^h 49	7 ^h 5 ^m 49 ^s	21.73 - 1.29
23.11	24.2	8.0	0 37	8 0 37	24.08 - 0.97
26.88	25.2	9.0	1 30	9 1 30	27.19 - .31
30.40	26.2	10.0	1 19	10 1 19	30.17 + 0.77
37.90	28.3	12.1	3 25	12 3 25	36.43 + 1.47
46.92	29.1	12.9	0 05	13 0 05	39.01 + 1.91
47.69	31.2	15.0	2 00	15 2 00	45.25 + 2.44
57.25	Feb. 1.2	16.0 ~~17.0~~	2 00	17 2 00	51.25 ~~+ 3.00~~
54.19	2.2	17.0 ~~18.0~~	2 00	18 2 00	51.25 ~~+ 3.06~~
60.52	3.9	18.7 ~~19.7~~	18 39	19 ^d 18 ^m 39 ^s	52.57 ~~+ 4.19 + 3.49~~
61.50	4.2	19.0 ~~20.0~~	1 38	20 ^d 1 ^m 38 ^s	57.60 ~~+ 4.30 + 3.30~~

Hours.	Days	Hours Days	Hours Days
1 ^h 12 ^m	1.2	.05	13 ^h 12 ^m 13.2 .55
2 24	2.4	.1	14 24 14.4 .6 ~~+ 4.4~~
3 36	3.6	.15	15 36 15.6 .65
4 48	4.8	.2	16 48 16.8 .70 8
6	6.0	.25	18 18.0 .75
7 12	7.2	.3	19 12 19.2 .8
8 24	8.4	.35	20 24 20.4 .85
9 36	9.6	.4	21 36 21.6 .9
10 48	10.8	.45	22 48 22.8 .95
12	12.0	.5	24 24.0 1.0

† Mentally taken in practice. See *

* Comparing the tenth of day with the sidereal hour in next column will enable the right number of sidereal days from the assumed year to the year, ^(Jan 16.2) based upon finding the determination.

<i>Date.</i>	<i>App. Solar</i>	<i>App. Int.</i>	<i>Std. Time 4 Sideron.</i>	<i>Observed</i>	<i>Comp</i>	<i>Resid?</i>
Feb. 5.2	20.0	1 ^h 46		60.22	64.82	+4.60
" 6.2	21.0	1 ^h 28 ⁵		63.18	67.82	4.64
" 7		1 30		63.19	68.17	4.98
" 7		1 35		63.20	68.25	5.05
" 7		1 39		63.21	68.18	4.83
" 7		1 46		63.22	68.09	4.87
" 7		2 56		63.37	68.47	5.10
" 7		3 00		63.38	68.57	5.19
" 7		4 06		63.51	68.75	5.24
" 7		4 13		63.53	68.59	5.06
" 7		4 21		63.54	68.69	5.15
Feb 7.3	22.0	3 ^h 42 ⁰		64.46	71.85	5.39
" 7.3		3 42		66.46	71.95	5.49
" 7.3		3 46		66.47	71.92	5.45
" 8.2	23.0	2 ^h 32		69.32	74.85	5.53
" 8.2		2 36		69.33	74.69	5.36
" 8.2		2 43		69.34	74.69	5.35
" 9.2	24.0	2 ^h 41		72.34	77.91	5.57
" 9.2		2 56		72.37	78.00	5.63
" 9.2		2 57		72.37	78.25	5.88
" 9.2		3 00		72.38	78.20	5.82
" 9.2		3 03		72.38	78.21	5.83
" 10.8	25.6	17 39		77.21	83.30	6.09
" 11.2	26.0	2 31		78.31	83.47	6.16
" 13.3	27.1	6 17		81.79	84.62	6.83

Polan stars

A polan star is observed.

Two others of respectively greater & less declination are taken at the other culmination. They are combined with such respective weights as to be equivalent as regards ^{effect of} collimation ^{error} to a single star of same declination as the ~~observed~~ star observed at other culmination. They are also combined with such respective weights as to be equivalent as regards effect of declination error (Hansen's Formula) to a single of that declination.

Let sub. a represent the single star, sub. 1 and sub. 2 the pair, and sub. c and sub. n the two mean stars.

$$-\Delta T = (T - a) + b \sec \phi + n (\tan \delta - \tan \phi) + c \sec \delta$$

Let weight of star 1 be w

Let sum of weights of stars 1 & 2 be unity, ~~weight~~ in each case.

Let wt. of star 1 be w_1 and w_2 respectively in the two cases.

Then

$$-w \Delta T_1 = w(T_1 - a_1) + w b \sec \phi + w n (\tan \delta_1 - \tan \phi) + w c \sec \delta_1$$

$$-(1-w) \Delta T_2 = (1-w)(T_2 - a_2) + (1-w) b \sec \phi + (1-w) n (\tan \delta_2 - \tan \phi) + (1-w) c \sec \delta_2$$

adding

$$-\Delta T = \frac{(T_1 - a_1) + w(T_2 - a_2) - (T_1 - a_1)}{1 + w} + b \sec \phi + n (\tan \delta_1 - \tan \phi) + c \sec \delta_1$$

$$-[\Delta T_1 + w(\Delta T_2 - \Delta T_1)] = \left\{ \begin{aligned} &+ w n (\tan \delta_1 - \tan \delta_2) + n [w(\tan \delta_1 - \tan \delta_2) + \tan \delta_2] - \tan \phi \\ &+ c [w(\sec \delta_1 - \sec \delta_2) + \sec \delta_2] \end{aligned} \right\}$$

Now taking $w = \frac{\sec \delta_2}{\sec \delta_1 + \sec \delta_2}$

Comparing this with $-\Delta T_0 = (T_0 - a_0) + b \sec \phi + n \tan \delta_0 + c \sec \delta_0$

$$-\Delta T_0 = (T_0 - a_0) + b \sec \phi + n \tan \delta_0 + c \sec \delta_0 \quad \text{which}$$

would be the equation for the transit of a star of declination δ_0

we must have $w_n (\tan \delta_1 - \tan \delta_2) + \tan \delta_2 = \tan \delta_0$ or $w = \frac{\tan \delta_0 - \tan \delta_2}{\tan \delta_1 - \tan \delta_2}$

and $w_c (\sec \delta_1 - \sec \delta_2) + \sec \delta_2 = \sec \delta_0$ or $w = \frac{\sec \delta_0 - \sec \delta_2}{\sec \delta_1 - \sec \delta_2}$

to obtain

$$-[\Delta T_1 + w(\Delta T_2 - \Delta T_1)] = w_n (T_1 - a_1) + (1-w_n)(T_2 - a_2) + b \sec \phi$$

Comparing this with Gauss's formula for the radial transit of the ideal star $-\Delta T_0 = (T_0 - a_0) + b \sec \varphi + n(\tan \delta_0 - \tan \varphi) + c \sec \delta_0$ we must have

$$w_n(\tan \delta_1 - \tan \delta_2) + (\tan \delta_2 - \tan \varphi) = \tan \delta_0 - \tan \varphi \text{ or } w_n = \frac{\tan \delta_0 - \tan \delta_2}{\tan \delta_1 - \tan \delta_2}$$

$$\text{and } w_c(\sec \delta_1 - \sec \delta_2) + \sec \delta_2 = \sec \delta_0 \text{ or } w_c = \frac{\sec \delta_0 - \sec \delta_2}{\sec \delta_1 - \sec \delta_2}$$

to obtain

$$-\left[\Delta T_2 + w_n(\Delta T_1 - \Delta T_2)\right] = w_n[T]$$

$$-\left[\Delta T_2 + w_n(\Delta T_1 - \Delta T_2)\right] = (T_2 - a_2) + w_n[(T_1 - a_1) - (T_2 - a_2)] + b \sec \varphi + n(\tan \delta_0 - \tan \varphi) + c[w_n(\sec \delta_1 - \sec \delta_2) + \sec \delta_2]$$

$$\text{or } -\left[\Delta T_2 + w_c(\Delta T_1 - \Delta T_2)\right] = (T_2 - a_2) + w_c[(T_1 - a_1) - (T_2 - a_2)] + b \sec \varphi + n[w_c(\tan \delta_1 - \tan \delta_2) + \tan \delta_2 - \tan \varphi] + c \sec \delta_0$$

But for the transit of star zero we have, it being assumed that the 12^h will be directly overhead at that value of a which makes it:

$$-\Delta T_0 = [T_0 - (a_0 + 12^h)] + b \sec \varphi + n(\tan \delta_0 + \tan \varphi) - c \sec \delta_0$$

since $\tan 180^\circ - \delta_0 = -\tan \delta_0$ and $\sec 180^\circ - \delta_0 = -\sec \delta_0$

From this it is evident that the employment of w_n will serve no useful purpose. $\therefore$ ~~use~~ ^{write} w for w_c

Adding,

$$-\left[\Delta T_0 + \Delta T_2 + w_c(\Delta T_1 - \Delta T_2)\right] = \left[T_0 - (a_0 + 12^h)\right] + (T_2 - a_2) + w[(T_1 - a_1) - (T_2 - a_2)] + 2b \sec \varphi + n[w(\tan \delta_1 - \tan \delta_2) + (\tan \delta_2 - \tan \delta_0)]$$

$$-n = \frac{(T_0 + \Delta T_0 - a_0) + (T_2 + \Delta T_2 - a_2) + w[(T_1 + \Delta T_1 - a_1) - (T_2 + \Delta T_2 - a_2)] + 2b \sec \varphi}{(\tan \delta_2 - \tan \delta_0) + w(\tan \delta_1 - \tan \delta_2)}$$

$$\text{where } w = \frac{\sec \delta_0 - \sec \delta_2}{\tan \delta_1 - \tan \delta_2}$$

Or if $T + \Delta T - a = s$ and remembering that $w(\tan \delta_1 - \tan \delta_2) =$ ^{$\sec \delta_0 - \sec \delta_2$} n

$$n = - \frac{s_0 + s_2 + w_1(s_1 - s_2) + 2b \sec \varphi}{(\tan \delta_2 - \tan \delta_0) + (\sec \delta_0 - \sec \delta_2)} \text{ where } w_1 = \frac{\sec \delta_0 - \sec \delta_2}{\tan \delta_1 - \tan \delta_2}$$

$$\text{Similarly } n = - \frac{s_0 + s_1 + w(s_2 - s_1) + 2b \sec \varphi}{(\tan \delta_1 - \tan \delta_0) + (\sec \delta_0 - \sec \delta_1)} \text{ where } w_2 = \frac{\sec \delta_0 - \sec \delta_2}{\tan \delta_1 - \tan \delta_2}$$

Evidently not "delicate" enough.

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Polaris. U. G. Feb. 6.2, 1880

 $1^h 10^m$ 10.4

19.3

25.3

44.3

50.2

56.0

Elevation at Keamsburg S of line Wachu^{at} - Moore $\frac{1}{10}$
 Forman Appalachia Vol 11 p 37

$$h = H_0 + (H_1 - H_0) \frac{K_0}{K} - \frac{2}{3} \cdot \frac{K_0}{1000} \cdot \frac{K_1}{1000}$$

$$H_1 = 2943 \text{ ft} \quad \text{Keamsburg } 2943 \text{ ft}$$

$$H_0 = \quad \text{Moosilauk } H_1 = 4811 \text{ ft. or say } 4866$$

Wachusett

$$H_1 - H_0 = \frac{2022}{2844 \text{ ft.}}$$

$$\text{Moosilauk to Wachusett} = 170.2 \text{ km} = K_0 K$$

Wachusett " H_0

Latitude Moosilauk	44	01' 23.1"	} 38' 25"	} 92' 04"
Keamsburg	43°	22' 58.4"		
Wachusett	42	29 19.		

$$\log 38.41 = 1.5844$$

$$\log 92.09 = 1.9641$$

$$\log 53.65 = 1.7296$$

$$3.3140$$

$$3.9282$$

$$9.3858 = \log 0.243$$

$$3.9282 = \log$$

$$\log 2844 = 3.4539$$

$$3.2194$$

$$K = 170.2 \quad \log = 2.2309$$

$$\text{Allow for curvature & refraction} = 469.3$$

$$= -1540 \text{ ft.}$$

$$\log 15 = 1.1761$$

$$+1658'' \text{ for slope}$$

$$+2022'' \text{ ht. of Wachu}$$

$$3.2857$$

$$9.3886$$

$$2.6715$$

$$9.4840$$

$$3.1875$$

$$5.220$$

$$2.140$$

$$3.0$$

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		Err of 3451 relative to 1327	Err of branch for 1327	
18 $\frac{K}{H}$	Par. 5.6	+13.25	+6 ~~-(8)~~ .77	20.02 ~~+6.48~~
17	20.3	+12.77	+6 ~~-(8)~~ .93	19.70 ~~+5.84~~
17	10.5	+12.32	+7 ~~-(9)~~ .06	19.38 ~~+5.26~~
17	7.1	+12.26	+6 ~~-(8)~~ .90	19.16 ~~+5.36~~

Radical intervals for coincidences

0	0	
1 ^s	6 ^m	5 ^s
2	12	11 ^s
3	18	16
4	24	21
5 ⁻	30	26
6	36	31
7	42	36
8	48	42
9	54	47
10	60	53
11	66	58
12	73	03
13	79	08
14	85	13
15	91	19
16	97	24
17	103	29
18	109	34
19	115	39
20	121	45
21	127	50
22	133	55
23	130	01

Apr 15:1 1880 East-6 chronograph

Comparison
Coincidences

3	16	10 ^m	9 ^s		
4	16	13	6 ^m 04	-2	
5	22	21	8	+2	
6	28	29	8	+2	
7	34	33	4	-2	
8	40	37	4	-2	
9	46	47	10	+4	
10	52	49	3	-4	
11	58	55	6	0	
12			} 2x 4		
13	2	11			
14		17	10	+4	
15		23	6	0	
16		29	10	+4	
17		35	6	0	
18		41	4	-2	
19		47	8	+2	
20			$\begin{array}{r} 14 \overline{) 30} \\ 28 \\ \hline 2 \end{array}$		
21					
22					
23					
24					
25					

$$\begin{array}{r} 47 \quad 47 \\ 10 \quad 04 \\ 16 \overline{) 97 \quad 38} \\ 6 \quad 6.1 \end{array}$$

June 23, 1887

Determination (by Miss Willard)
of Constant of Micrometer-Level-D, using
vertical circle of variation transit,
Feet set in for precision.

1060.3

0.5

1.1

a bad setting

3.2 Looking again at the telescope this seems to be
After another setting it was found that the
servers hand resting on the support prevent-
ed perfect setting.

Instrument disturbed and feet settings
recommenced.

452.8

2.9

2.6

3.2

4.4

Circle reading

Micrometer reading

A

B.

3° 8' 50"

3° 9' 10"

144.2

4.6

4.8

202

Time	Temperature of Air	Barometer.	Atmospheric Humidity	Barometric Correction	Wind & Sky
Nov. 1878					
Nov. 26					
4 P.M.	38.8 F 37.5	29.741	66.8 F		
6 "	32.0 34.0	.767	65.0		
27 th 5 1/2 A.M.		.801	53.2		
7 1/2 "	28.2 26.5	.803	58.0		
9 "	39.8 39.5	.810	59.4		
Dec. 78					
1 st 10 1/2 A.M.	40.8 41.5	30.108	62.8		
1 1/2 "	42.0 44.0	.101	62.8		
6 th 7 1/4 A.M.	21.6 23.0	29.281	51.8		Windy
9 1/2 "	30.6 31.0	29.326	58.4		"
2 P.M.	31.4 33.0	.321	61.0		"
3 1/2 P.M.	31.6 33.0	.321	59.2		"
5 1/2 "	29.6 29.0	.354	60.8		"
12 th 9 1/4 A.M.	32.8 35.5	29.623	56.0		
13 th 6 3/4 "	30.4 31.0	29.755	49.4		
14 th 9 1/4 "	31.4 32.0	29.771	55.2		Mild
1 P.M.	36.5	.729	63.0		"
3 "	34.5	.721	65.2		"
5 1/2 "	29.5	.704	60.6		"
16 th 9 1/4 A.M.	26.5	29.438	58.0		Mild & Clear
12 3/4 P.M.	30.0	.480	64.2		Mild & Clear
3 "	29.0	.519	65.6		Mild & Clear
5 3/4 "	24.5	.597	58.0		Mild & Clear

1978phue.proj.1395E