ATMOSPHERIC OBSERVATIONS

U.S. ARCTIC STEAMER

JEANETTE.

1879-81.

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1879

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Atmospheric observations
on board
U.S. Artic Steamer
Jeanette
1879-81.

Dr. James M.M. Ambler, U.S.N.

REPAIRED BY
MAY
28
1947
THE NATIONAL ARCHIVES

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

MUSEUM
NOV 7 1883
OF HYGIENE

1877. August

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Str Jeannette, for the month of August, 1879.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	P. M. Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No. ..... Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
Cumberland	1	30.15	61°	10°	10°	100	30.17	60°	12°	11°	88	30.15	49°	8°	8°	100	20°	15°	83	22°	66	16°	13°	69	Calm	Foggy		0	Upper deck wet.
"	2	30.19	55°	8°	8°	100	30.21	58°	12°	11°	88	30.30	60°	10°	13°	100	16°	14°	79	15°	71	19°	16°	71	NNW	Foggy		0	" "
"	3	30.2	60°	13°	11°	77	30.27	62°	11°	13°	87	30.23	58°	12°	12°	100	22°	17°	58	19°	72	19°	16°	68	Calm	Foggy		0	Upper Deck dry. Berth Deck wet.
"	4	30.26	66°	22°	18°	66	30.26	70°	22°	18°	66	30.23	68°	21°	18°	73	23°	20°	61	27°	51	22°	19°	60	SW	clear		0	Dry.
"	5	30.08	66°	18°	15°	71	29.93	67°	15°	14°	89	29.90	69°	10°	9°	86	23°	19°	60	28°	62	16°	12°	59	W	cloudy		0	Wet
At Sea	6	30.1	62	8	8°	100	30.00	69°	8°	7°	86	30.02	56½	7°	7°	100	16°	11°	79	18°	68				WSW	Rain			Wet.
" "	7	29.80	59°	7°	7°	100	29.72	65°	8°	7°	86	29.78	48°	8°	8°	100	19°	15°	63	12°	76	14°	13°	84	ENE	misty		1	Wet.
" "	8	29.80	50°	8°	8°	100	29.21	48°	7°	6°	85	29.37	44°	6°	6°	100	18°	16°	71	14°	67	11	9	75	SW	misty		1	Wet. South Deck Dry
" "	9	29.53	47°	6.5	6.5	100	29.63	49°	6°	6°	100	29.68	44°	6°	6°	100	16°	12°	59	16°	69				NNW	O. C		0	Wet. " " "
" "	10	29.73	43°	5.5°	5.6°	100	29.74	44.2	6°	6°	100	29.73	43°	6°	6°	100	13°	11°	77	11°	96				NW/N	O. C.		0	Wet. " " "
" "	11	29.78	43°	6°	6°	100	29.73	50°	9°	9°	100	29.76	43°	8°	8°	100	19°	18°	90	21°	73	15°	13°	78	NW/N	O. C		0	Wet. " " "
C. H. Nichols	12	29.75	56°	12°	10°	76	29.75	52.5	11.5	10.5	100	29.75	52°	11°	10°	87	18°	16°	80			12°	11°	67	N	clear		1	Wet. " " "
" "	13	29.82	52°	10°	10°	100	29.83	51.6	12°	11°	88	29.86	54°	11°	11°	100	17°	13°	61	14°	63	17°	11°	48	NNE	O. C		2	Wet. " " "
" "	14	29.42	63.5	14°	12°	78	29.78	56.5	12°	11°	88	29.73	56.5	11°	10°	87	22°	17°	58	19°	28	22°	19°	17°	81	NNE	O.C.		2	Wet. " " "
" "	15	29.61	56°	13°	11°	77	29.52	54°	11°	9°	75	29.45	51°	10°	9°	86	19°	17°	81	18°	80	15°	12°	68	N	O C		2	Wet. " " "
" "	16	29.31	51.5°	10°	9°	86						29.42	41°	10°	9°	86	18°	15°	71						S/E	O C		2	" " " "
" "	17	29.54	56°	14°	11°	67	29.63	56.5°	12°	10°	76	29.68	52	11°	10°	87	20°	17°	74	21°	28	14°	12	28	Clear	O C		1	" " " "
" "	18	29.85	51°	10°	9°	86	29.93	53.5°	10°	9°	86	29.96	52	10°	8°	74	17°	11°	43	23°	68	18°	9	55	NW	clear		1	Dry. " " "
" "	19	30.04	51°	9°	7°	73	30.07	57°	11°	8°	63	30.09	51	11°	8°	68	13°	11°	77	17°	42	14°	10°	57	NNE	O C		0	" " " "
" "	20	30.21	50°	10°	8°	74	30.25	51°	9°	8°	86	30.30	51.5°	10°	8°	74	18°	16°	53	18°	53	13°	10°	66	NW	O C.		0	" " " "
" "	21	30.35	57.5	13°	11°	77	30.33	57°	16°	12°	59	30.36	54	12°	11°	88	17°	14°	70	21°	29°	14°	12°	78	Calm	O C		0	" " " "
At Sea	22	30.18	55°	12°	10°	76	30.10	57°	12°	9°	65	30.01	50°	9°	8°	86	17°	13°	26	14°	67	14	11	67	..	O C			Upper Deck wet from Water in water ways.
" "	23	30.03	43°	5°	4°	84	30.08	40°	4°	3°	83	30.11	38°	3°	2°	93	14°	13°							NW	O C		0	" " " " " " " "
" "	24	30.12	39°	3°	2°	83	30.12	38.5°	3°	2°	83	30.12	38°	4°	3°	83	13°	11°	77	14°	89	14°	13°	89	W	O C.		0	" " " " " " " "
St Lawrence Bay	25	30.18	47°	6°	5°	85	30.15	49°	8°	5°	59	30.14	43°	4°	3°	83	19°	13°	46			9°	6°	61	N	Clear		0	Wet.
" " "	26	30.09	43½	8°	4°	84	30.06	49½	9°	6°	61	30.05	45°	6°	5°	85	11°	8°	63	12°	66	12°	9°	66	Calm	Clear		1	Wet.
At Sea	27	30.01	52	11°	8°	63	30.03	64°	9°	7°	78	30.02	42°	4°	3°	83	15°	13°	78			14°	13°	57	N	Clear		1	Wet.
" "	28	30.01	42°	4°	3°	83	30.00	37°	2°	2°	100	29.99	36.5°	2°	1°	82	7°	5°	71			10°	6°	30	N/E	O C		1	Wet. Berth Deck wet - shipped a sea
" "	29	29.94	37°	2°	2°	100	29.93	35.8°	1.4	1.2	100(1)	29.93	37°	1.5	1°	100(1)	11°	8°	63	13°	76	10°			NW/N	O C.		2	" " " "
" "	30	29.87	37.5	2.5°	2°	100	29.91	38.5°	3.2	3	100	29.97	37	2	1.8°	82	12°	8°	54	17°	80	14°	11°	67	W/N	O C		2	" " Berth Deck Dry
	31	30.11	38.5°	2°	1°	82	30.17	37.2°	3	2	83	30.24	38	1	.5°		11°	9°	66	15°	68	11°	8°	68	N	O C		2	" " " "

AVERAGE .....

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

Sept 1879. 2

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

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Atmospheric Observations on board U. S. ~~Steamer~~ Arctic Str Jeanette, for the month of September, 1879.

SPAR DECK.

Place.	Date.	10 A. M. Barometer.	10 A. M. Attached Thermometer.	10 A. M. Dry bulb.	10 A. M. Wet bulb.	10 A. M. Relative humidity.	4 P. M. Barometer.	4 P. M. Attached Thermometer.	4 P. M. Dry bulb.	4 P. M. Wet bulb.	4 P. M. Relative humidity.	10 P. M. Barometer.	10 P. M. Attached Thermometer.	10 P. M. Dry bulb.	10 P. M. Wet bulb.	10 P. M. Relative humidity.	10 A. M. Dry bulb.	10 A. M. Wet bulb.	10 A. M. Relative humidity.
At Sea 69.10 N. 176.6 W.	1	30.17	37.5°	1.5°	1°	91	30.15	32°	0.8°	0.8°	95	30.11	33°	0.2°	-.5°	87	12°	10°	57
	2	30.00	39°	1°	0°	81	29.97	37.4°	3.6°	2.5°	.815	29.97	37°	2°	1.5°	91	15°	18°	482
70.30 N. 174.35 W.	3	30.08	32.5°	-1°	-1°	100	30.09	31°	-2.5°	-3°	89	30.14	33.2°	-2	-2	100	12°	10°	76
At Sea	4	30.15	36.5°	-1.56	-0.83		30.09	36.5°	0.28°	0°		30.09	32°	0°	-0.56		14°	13°	89
At Sea Herald Island	5	30.05	32°	-1.11	-.56		30.03	37.5°	-1.4°	-1.7°		30.03	36°	-4°	-4.17		13.5°	12°	83
" "	6	30.03	31°	-2.78	-1.94		30.06	33°	0.56	0.56		30.07	29.8°	-2.33	-2.78		16½°	14°	74
" "	7	30.14	30.5°	-2.78	-2.78		30.21	5°05°	-2.50	-2.78		30.19	24.5°	-6.67	-6.67		15°	12.5°	94
" "	8	30.17	31.5°	-3.89	-3.89		30.15	36°	-2.50	-2.50		30.14	27.5°	-3.89	-3.89		15°	12°	58
" "	9	30.11	32°	-3.89	-3.89		30.17	58°	-3.33	-3.61		30.04	24°	-6.11	-6.11		16°	13°	69
" "	10	30.00	26°	-5.56	-5.56		29.95	29°	-4.17	-4.33		29.90	22.5°	-3.89	-3.89		14°	11.5°	725
" "	11	29.84	39.5°	-0.56	-0.83		29.88	40°	0.00	-0.28		29.82	33°	-0.56	-0.56		15.5°	13°	74
" "	12	29.84	33.5°	-2.22	-2.50		29.83	33.5°	-1.11	-1.56		29.80	29.5°	-3.89	-3.89		15°	12.5°	72
" "	13	29.79	37°	0.00	-0.39		29.83	33.5°	-0.56	-0.83		29.83	34°	-1.89	-1.89		14°	13°	89
" "	14	29.84	36°	-0.83	-1.11		29.78	34°	-0.83	-1.00		29.70	32°	-2.22	-2.22		14°	12°	78
" "	15	29.66	29.5°	-1.67	-1.94		29.63	33°	-0.56	-0.67		29.67	30°	-2.22	-2.22		13°	10°	64
" "	16	29.76	28°	-3.61	-3.89		29.80	30.6°	-1.50	-1.83		29.83	30°	-1.67	-1.67		11.2	9°	74
" "	17	29.95	30°	-3.33	-3.61		30.01	35°	-0.83	-1.11		29.95	34°	-0.28	-1.11		14°	12°	78
At Sea in Pack	18	29.96	36°	-2.44	-2.44		29.76	36°	1.67	1.28		29.73	35°	1.11	1.00		18°	15°	71
" " "	19	29.67	36°	1.67	1.39		29.66	38°	1.67	1.56		29.65	34°	0.56	0.56		19°	16°	72
" " "	20	29.61	37°	2.11	1.94		29.67	34.8°	0.82	0.72		29.84	31.5°	-1.11	-1.12		12.5°	11°	77
" " "	21	29.98	34°	-0.94	-0.56		30.05	33°	0.00	0.00		30.09	31°	-1.67	-1.67		10°	8°	74
" " "	22	30.17	27°	-3.61	-3.89		30.18	30.2°	-2.56	-2.94		30.17	22°	-5.94	-6.11		12°	9.5°	71
" " "	23	29.18	36.5°	-4.44	-4.44		30.10	26.2°	-4.44	-5.00		30.12	24.5°	-6.11	-6.11		7°	5.5°	78
" " "	24	30.09	22°	-6.67	-6.67		30.07	24.4°	-5.22	-5.56		30.06	23°	-6.11	-6.11		11°	9°	75
" " "	25	29.86	22.5°	-5.56	-5.83		29.75	17°	-8.33	-8.33		*29.46	5°4	-8.33	-8.33		11°	8.5°	69
" " "	26	29.25	5°4	-7.50	-7.78		29.38	5°3	-11.94	-11.94		29.42	5°4	-11.11	-11.11		9°	6.5°	67
" " "	27	29.41	4.85	-12.22	-12.22		29.42	4°4	-12.22	-12.22		29.40	4°2	-11.94	-11.94		5°	3°	69
	28	29.40	38°	-11.11	-11.11		29.46	5°4	-9.44	-9.44		29.51	38°	-11.11	-11.11		8.8	5.6°	597
" " "	29	29.66	5°0	-10.94	-10.94		29.70	5°2	-11.39	-11.39		29.68	5°6	-13.33	-13.33		10°	8°	74
	30	29.70	5°0	-10.28	-10.00		29.67	5°7	-10.56	-10.00		29.65	5°0	-12.22	-12.22		9°	6.5°	67
	31																		
Average		29.86	34.4	-2.1			29.87	41.2	-2.9			29.86	30.6	-4.1			12.8	10.4	72.4

AVERAGE NUMBER OF SHIP'S COMPANY. No.

10 P. M. Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, exc luding injuries.	REMARKS.
67					
1.67	nw/n	Oc		2	Spar Deck wet. Berth Deck dry.
45	E/E	Clear		1	Spar Deck wet. " " "
1.88	E	Thick fog		1	" " " " " " "
1.80	E.S.E	Clear		1	" " " " " " "
1.70	E	Oc		1	" " " " " " "
1.74	E	fog		1	Ice on Spar Deck. " " "
1.685	N	fog		1	" " " " " " "
1.00	N	N.E		1	" " " "
1.58	N.E	Oc		1	" " " "
1.78	E	O f		1	" " " "
1.52	E	O f		1	" " " "
1.78	S	Oc		0	" " " "
1.75		fog		0	" " " "
1.74	E/N	Oc	.23 24 hr.	0	wet from melting ice taken at 10 PM. at the height of
1.55	E/S	Oc	.38 2.32 24 hr.	0	" " " " Barometer, Level of Upper Deck
1.78	E	Oc		0	" " "
1.73	S/E	Bc		0	Ice on Deck.
1.75	S.S.W	Bc		0	" " "
1.65	S.W	Oc, Snow	1.80 1/2 24 hr.	0	" " "
1.56	S.S.W	Oc		0	Snow on deck.
1.77	Calm	Snow		0	" " "
1.70	S/W	Oc	1.756 24 hr.	0	" " " " in the water room.
1.62	W/S	Oc		0	" " "
1.72	Calm	Oc		0	Snow.
1.85	N.E/E	Oc		0	Snow on Deck
1.5	N.E/E	Oc		0	Snow on Deck
U					
10.9 11.6 73.1	N.W.	Oc.14 Oc.14 S.2	2.6206	0	Upper deck wet. Berth dry

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations. Standard to 32 degrees F.

* 10 PM of the 25. Aneroid removed into the Cabin & corrected by mercurial

J. M. Ambler
Asst. Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Steamer Jeannette, for the month of October, 1879.

SPAR DECK.

Place.	Date.	10 A. M. Barometer.	10 A. M. Attached Thermometer.	10 A. M. Dry bulb.	10 A. M. Wet bulb.	10 A. M. Relative humidity.	4 P. M. Barometer.	4 P. M. Attached Thermometer.	4 P. M. Dry bulb.	4 P. M. Wet bulb.	4 P. M. Relative humidity.	10 P. M. Barometer.	10 P. M. Attached Thermometer.	10 P. M. Dry bulb.	10 P. M. Wet bulb.	10 P. M. Relative humidity.	10 A. M. Dry bulb.	10 A. M. Wet bulb.	10 A. M. Relative humidity.
Berth in Park	1	29.56		-7.78	-7.78		29.51		-9.44	-9.44		29.48		-10.00	-10.00		13	8.5	56
" " "	2	29.44		-7.22	-7.22		29.29		-1.39	-1.39		29.61		-3.33	-3.33		9	6	61
" " "	3	29.77		-5.00	-5.00		29.85		-2.44	-4.44		29.91		-6.11	-6.11		8	5.5	65
" " "	4	29.90		-5.11	-5.11		29.92		-5.56	-5.56		29.94		-6.11	-6.11		11	8.5	69
" " "	5	29.95		-8.33	-8.33		29.94		-9.33	-9.33		29.94		-10.00	-10.00		11	9	78
" " "	6	29.86		-8.06	-8.06		29.75		-12.33	-12.33		29.60		-13.33	-13.33		12	10	74
" " "	7	29.13		-5.56	-5.56		29.115		-5.83	-5.83		29.10		-3.33	-3.33		14	11	47
" " "	8	29.15		-2.78	-2.78		29.12		0.00	0.00		29.12		-0.56	-0.56		14	11	47
" " "	9	29.07		-0.56	-0.56		29.13		-10.56	-10.56		29.42		-12.22	-12.22		16.8	13.5	67.5
" " "	10	29.66		-10.83	-10.83		29.44		-3.06	-3.06		29.32		-1.67	-1.67		11	9	65
" " "	11	28.79		-0.00	-0.00		28.73		-0.56	-0.56		28.72		-1.11	-1.11		14	15	72.5
" " "	12	28.87		-1.67	-1.67		28.88		-5.00	-5.00		29.18		-6.67	-6.67		16.5	14	74
" " "	13	29.27		-10.00	-10.00		29.385		-11.11	-11.11		29.47		-11.67	-11.67		19	15.5	67.5
" " "	14	29.62		-9.44	-9.44		29.78		-10.83	-10.83		29.75		-11.36	-11.36		12	9.8	70.5
" " "	15	29.77		-8.06	-8.06		29.82		-8.06	-8.06		29.86		-8.33	-8.33		13	10	66
" " "	16	29.83		-6.94	-6.94		29.83		-8.06	-8.06		29.83		-7.78	-7.78		13	11	77
" " "	17	29.75		-5.28	-5.28		29.68		-7.50	-7.50		29.61		-5.56	-5.56		15	12	68
" " "	18	29.55		-3.06	-3.06		29.67		-5.83	-5.83		29.65		-6.67	-6.67		14	12	78
" " "	19	29.79		-8.33	-8.33		29.85		-8.61	-8.61		29.93		-8.61	-8.61		13	11	74
" " "	20	29.76		-8.89	-8.89		29.95		-15.00	-15.00		30.00		-15.00	-15.00		12.5	11.5	88
" " "	21	30.00		-15.83	-15.83		29.97		-22.50	-22.50		29.76		-21.11	-21.11		12	9.5	70
" " "	22	29.89		-16.67	-16.67		29.93		-18.89	-18.89		29.92		-20.28	-20.28		9	6.8	67
" " "	23	29.91		-22.22	-22.22		29.87		-22.78	-22.78		29.91		-22.22	-22.22		8	6	72
" " "	24	29.90		-21.67	-21.67		29.915		-21.94	-21.94		29.97		-20.56	-20.56		10	8	74
" " "	25	30.01		-21.67	-21.67		30.005		-20.28	-20.28		30.08		-22.78	-22.78		12	9.5	70
" " "	26	30.10		-26.11	-26.11		30.08		-27.22	-27.22		30.122		-25.00	-25.00		9	8.5	91
" " "	27	30.11		-25.00	-25.00		30.08		-20.28	-20.28		30.07		-21.11	-21.11		9	6½	67
" " "	28	30.02		-22.78	-22.78		29.965		-23.61	-23.61		29.93		-22.22	-22.22		9	7	73
" " "	29	29.80		-19.44	-19.44		29.76		-17.78	-17.78		29.75		-17.22	-17.22		9	7	73
" " "	30	29.70		-8.33	-8.33		29.61		-5.28	-5.28		29.65		-7.22	-7.22		11	8½	71
" " "	31	29.62		-14.17	-14.17		29.54		-13.61	-13.61		29.52		-8.33	-8.33		9	7	73
AVERAGE		29.66	32°	-M.1			29.65	32°	-11.4			29.68	32°	-11.5			11.8	9.5	71.2

AVERAGE NUMBER OF SHIP'S COMPANY. No.

10 A. M. Relative humidity.	10 A. M. Dry bulb.	10 A. M. Wet bulb.	10 A. M. Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, exc luding injuries.
57	14	10	57	E/N	hazy		0
47	12	11	88	NEN	oc		0
74	12½	10½	76.5	NE/E	oc		0
71.5	14	12	78	ENE	oc		0
75	12	10	76	NNW	oc		0
75	15	10	48	SE	Snowing		0
65.5	12.5	12	73	SE	oc		0
63	15	12½	73	E/N	Snowing	4 P.M. 1.1665	0
65	14	12	70	ESE	"		0
69	16	13.5	74	ESE	oc		0
67.5	17.5	16	75	E	oc		0
78	14	12	78	W/S	Snowing		0
70	15	13	78	W	S		0
63	14	12	78	WSW	S		0
73	15	12.5	73	ESE	S		0
72	14	11.5	72.5	E/S	oc		0
67.5	15	13.5	83.5	S/W	oc	Spar Deck 1.1715	0
73	15	13	78	NW	oc		0
72	16.5	14.5	79	SW	oc		0
73.5	11	8.5	69	W	oc		0
71	10	9	83	NW	oc		0
70	13	11	77	WNW	oc	1.1926	0
67	9	7.5	79.5	WNW	bc	1.1858	0
67	10.8	9	77	NNW	oc		0
64	10.5	8.8	76	WNW	bc		0
82	13	10.5	71.5	NW/W	bc		0
76	9	7	73	ENE	bc		0
75	11	8	63	SSE	bc		0
75	17	14	68	NE/E	oc		0
82	16.5	14	74	W	oc		0
72.3	14.8	11.6	69.7	Variable	oc	1.147	0

REMARKS.

Snow on Deck.
" " "
Ice on Deck.
" " "
" " "
Snow on Deck
" " "
" " "
" " "

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The formula for the correction for pressure is as follows:

$$30 : \text{observed height of bar.} :: \text{capacity} : z.$$

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

October 1879

3

Atmospheric Observations on board U. S. S ..... , for the month of November , 1874.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 A. M. Dry bulb.	Wet bulb.	Relative humidity.
On the Deck	1	29.47		-18.22	-18.22		29.45		-13.61			29.84		-15.28	-15.28		16.5	13.8	72
" " "	2	29.54		-16.67	-16.67		29.53		+15.0	+15.0		29.56		-14.44	-14.44		13	11	67
" " "	3	29.44		-16.11	-16.11		29.42		-14.72	-14.72		29.41		-16.39	-16.39		13	11	67
" " "	4	29.41		-16.67	-16.67		29.38		-16.67	-16.67		29.40		-16.39	-16.39		11.5	9	70
" " "	5	29.38		-16.11	-16.11		29.38		-16.11	-16.11		29.45		-17.50	-17.50		14	12	78
" " "	6	29.44		-23.06	-23.06		29.45		-17.78	-17.78		29.56		-17.22	-17.22		11	9	77
" " "	7	29.74		-20.83			29.685		-21.11			29.77		-19.44			16	18	69
" " "	8	29.77		-18.61			29.74		-20.00			29.78		-20.00			17.5	14.5	70
" " "	9	29.71		-20.56			29.66		-20.00			29.73		-16.94			14.5	12.5	78
" " "	10	29.76		-18.89			29.885		-25.28			29.95		-27.50			16	14	79
" " "	11	30.10		-25.00			29.96		-23.61			29.96		-17.50			17	14	70
" " "	12	29.85		-31.11			29.752		-27.22			29.74		-26.39			13.5	11	57
" " "	13	29.72		-24.44			29.77		-23.89			29.88		-23.89			12.5	10	71
" " "	14	29.74		-20.56			29.775		-22.23			29.89		-24.44			13	10.5	71.5
" " "	15	30.24		-22.78			30.28		-21.39			30.24		-20.56			13	10.5	71.5
" " "	16	29.82		-18.56			29.62		-11.83			29.54		-8.33			15.5	13	74
" " "	17	29.32		-5.2			29.375		-6.28			29.56		-11.39			15.5	13.5	80
" " "	18	29.64		-14.44			29.715		-17.50			29.76		-20.56			18	11	77
" " "	19	29.69		-21.67			29.645		-21.11			29.63		-20.56			17	14.5	78
" " "	20	29.52		-16.67			29.45		-13.89			29.53		-11.39			13	11	77
" " "	21	29.42		-21.11			29.44		-23.33			29.71		-26.67			15.5	13	74
" " "	22	29.41		-23.33			29.15		-18.89			28.92		-13.33			16	13	69
" " "	23	28.87		~~-5.00~~ -3.056			28.84		~~-25.32~~ -5.83			28.92		-10.00			16.5	13.5	71
" " "	24	29.21		-19.44			29.44		-20.00			29.63		-20.56			14.5	11	69
" " "	25	29.91		-22.22			30.10		-23.89			30.30		-18.33			10	8	74
" " "	26	30.34		-17.22			30.32		-13.44			30.30		-12.22			15	14	89
" " "	27	30.11		-11.11			30.00		-10.28			30.05		-10.56			13	11	77
" " "	28	30.02		-10.00			30.22		-7.44			30.32		-10.00			17	15	81
" " "	29	30.23		-11.11			30.28		-11.61			30.29		-11.11			13	12.5	94
" " "	30	30.28		-12.22			30.29		-13.89			30.30		-15.56			17	14	79
	31																		
Average		29.70		-19.9			29.73		-17.2			29.75		-17.2			14.4	12.1	73

DECK. 4 P. M. Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No. Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
79	14	13	89	NW/N	Snow		0	Snow in Spar Deck
58	15	13	78	N.N.W	O C		0	" " "
68	18	15	71	N.N.W	O C	B.D.	0	" " "
625	18	15	71	N/E	O C	2.3430	0	" " " CO_2 taken at 11 P.M.
67	17.5	14.5	70.5	N.W	O C		0	" " "
77	18	11	77	S.S.W	b c		0	" " "
79	17	14	70	Clear	b c		0	" " "
675	16	14	79	Clear	O C		0	" " "
78	17.5	14.5	68.5	E/N	O C		0	" " "
88	20	16.5	64.5	S.W/S	O C		0	Deck under deck house dry.
74	16	14	79	Clear	O C		0	" " " " "
68	12	10	76	S	b c		0	Dry on Deck.
78	15.5	13	74	S.W/S	O C		0	" " "
82	16	13.5	74	Clear	b c		0	" " "
79	14.5	13	83	W.N.W	b c		0	" " "
78	15	12.5	73	S.E/E	O C		0	" " "
86	17	15	80	S.E/E	O C		0	Wet on Spar deck.
74	18	15	71	N.N.W	O C		0	Ice + snow on deck
68	14	11	67	N.E/N	O C		0	" " " " "
76	16.5	14	74	N.E/E	O C		0	" " " " "
76	15.5	12	68	N.E/E	O C		0	" " " " "
69	16	13½	74	N.E	O C		0	" " " " "
79	17.5	14.5	70.5	E.S.E	O C		0	" " "
72	11	9.5	81	S.W/W	O C		0	" " " " "
78	12.5	11	81	S.W/W	O C		0	" " " " "
73	12	10.5	82	E.N.E	O C		0	" " " " "
74	15	13	78	S.S.E	O C		0	" " " " "
83	20	17	72	S.E/E	O C	1.079	0	" " " " " CO_2 7 1/2 M Berth deck 1.079
94.5	14	15.5	94.5	E	O C		0	For last two days, have been collecting in deck house
70	13	11.5	85	S.E/E	O C		0	
74.7	15.6	13.3	75.6	Monthly	O C	1.711	0	Dry -

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be stated in the column of Remarks.
Same instruments to be used in all hygrometric observations.

+ Barometer corrected to 32°. Owing to the low temperature the wet bulb readings on deck are worthless, & have simply been omitted. It is a matter of routine - will also be worthless

Surgeon, U. S. N.

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The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. Arctic Steamer Yantic, for the month of December, 1879.

Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 A. M. Dry bulb.	Wet bulb.	Relative humidity.
In the Pack 1	30.22		-16.67			30.48		-17.50			30.55		-18.44			13.5	11.5	72
" 2	30.64		-21.67			30.64		-21.50			30.70		-23.33			12	10	76
" 3	30.62		-21.67			30.295		-21.28			30.48		-21.11			9	8	84
" 4	30.32		-21.11			30.22		-19.72			30.22		-20.56			13.5	12	83
" 5	30.18		-17.78			30.18		-22.78			30.24		-25.00			14	13.5	94
" 6	30.32		-28.33			30.32		-25.78			30.30		-30.00			12	10.5	71
" 7	30.24		-30.00			30.19		-30.28			30.32		-29.72 -25.00			13	12	88
" 8	30.49		-27.22			30.475		-24.11			30.48		24.44			13	12	88
" 9	30.15		-24.67 -21.67			30.07		-19.72			29.27		-17.78			8	7	86
" 10	29.61		-19.72			29.70		-15.56			29.64		-13.89			11	10	87
" 11	29.50		-13.89			29.56		-13.61			29.74		-14.44			15	13.5	88
" 12	29.99		-26.67			30.04		-27.89			30.16		-28.33			15	12.5	78
" 13	29.92		-21.11			29.784		-14.11			29.80		-14.44			18.5 16	16	80
" 14	30.06		-25.00			30.193		-28.78			30.30		-28.38			13½	12	83
" 15	30.02		-20.56			29.92		-18.06			30.03		-19.44			15½	14	84
" 16	30.30		-29.44			30.38		-32.28			30.58		-32.22			12	10	76
" 17	30.31		-27.22			30.03		-21.11			29.80		-16.67			14	13	89
" 18	29.92		-21.11			30.08		-30.56			30.32		-32.22			15	13.5	83.5
" 19	30.32		-32.22			30.10		-23.06			30.05		-18.89			14	13	89
" 20	30.75		-16.11			29.575		-13.22			29.44		-11.11			11.5	10	80.5
" 21	29.08		-17.78			29.06		-22.56			29.33		-25.89			15	14	89
" 22	30.54		-28.33			29.82		-27.67			29.96		-25.56			14	12.5	83.5
" 23	31.12		-26.67			30.096		-28.22			29.13		-27.78			16	14½	84
" 24	30.00		-20.56			29.815		-18.72			29.90		-18.89			16	14.5	84
" 25	30.00		-20.00 -21.67			29.97		-16.11			29.87		-14.44			16	15	89
" 26	29.64		29.57			29.56		-14.11			29.52		-15.00			15.5	14	84
" 27	29.45		-25.56			29.505		-21.50			29.64		-22.22			20	18.5	80
" 28	29.92		-32.22			30.01		-31.67			30.02		-32.39			15	13	78
" 29	29.90		-29.44			29.84		-31.11			29.84		-32.22			14	13	89
" 30	29.97		-31.67			29.72		-31.11			29.70		-31.67			17.5	16	85
" 31	29.69		-28.89			29.70		-27.78			29.61		-29.44			17	16	85
Average	30.11		-23.6			29.98		-23.3			29.97		-23.5			14.1	12.5	83.3

Date.	SPAR DECK. 4 P. M. Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No. Wind.	Weather.	Carbonic acid correspond. Dry Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
1	77.75	14	12	78	N	bc		0	Atmosphere charged with steam from engine in dark house
2	72.5	13	12	88	N	oc		0	Atmosphere charged with steam from engine in dark house
3	72.5	13	11	77	E	bc		0	" " " " "
4	78	12	11.5	94	Calm	b		0	" " " " " "
5	77	12.5	11.5	76.5	S/W	bc		0	" " " " " "
6	74	17	14.5	77.5	W/N	bc		0	" " " " " "
7	69	14	11.5	84	NE/E	b		0	" " " " " "
8	87.5	10	8.5	86	E½S	bc		0	" " " " " "
9	87	11.5	10.5	88	SE	oc		0	" " " " " "
10	76.5	14.5	13	83	OE	oc	2.510 11a	0	Cabin. 10 P.M. 2.510 " " " " " "
11	89	14	12.5	83.5	ONW	oc		0	" " " " " "
12	88.5	15	13.5	83.5	W/S	bc		0	" " " " " "
13	83	18.5	16.5	77.25	E/N	oc		0	" " " " " "
14	75	16	15	89	W/N	bc		0	" " " " " "
15	89	16.5	15	84	E/N	bc		0	" " " " " "
16	75	17.5	16	84	W/N	bc	3.975	0	With Deck 10 P.M. " " " " " "
17	80	18	15.5	80.5	E/N	oc		0	" " " " " "
18	79	16.5	14.5	82.5	W	oc		0	" " " " " "
19	82	15.5	14	83	E/N	oc		0	" " " " " "
20	87	17	12.5	85	ENE	oc		0	" " " " " "
21	76	16	15	89	W/N	Snow		0	" " " " " "
22	83.5	16.8	15	81	W/S	bc		0	" " " " " "
23	82.5	16.5	15	84	OW/S	oc		0	" " " " " "
24	84	18	16	80	ENE	oc		0	" " " " " "
25	72	14½	13	88	E/N	oc		0	" " " " " "
26	84	18.5	14.5	77.25	SOE	oc		1	" " " " " "
27	95	16.5	15.5	82.5	W	bc		4	" " " " " "
28	84	16	14	79	W	bc		1	" " " " " "
29	78	16	14.5	84	S	bc		1	" " " " " "
30	78	25	14	89	C	bc		1	" " " " " "
31	82.25	16½	15½	90.5	SW	bc		2	" " " " " "
Average	84.8	15.3	13.7	83.6	Variable	bc 17 oc 14	2.510 0.975 Cab	0.2	damp

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be noted in the column of Remarks.
Same instruments to be used in all hygrometric observations.

Barometer Corrected 2.820 Z

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

1881 [illegible]

1880

Atmospheric Observations on board U. S. S. Arctic then Jeannette; for the month of January, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
	1	30.20		-38.8			29.42		-39.2			30.63		-39.4			19.5	18	87.5				1	Deck house damp from steaming. Condensation in fore end
	2	30.80		-37.4			30.88		-38.3			31.06		-39.4			14.	12	78				1	" " " " " " "
	3	31.05		-27.0			30.85		-32.7			30.72		-31.1			11.5	10	81.5				1	" " " " " " "
	4	30.36		-25.0			30.34		-20.9			30.24		-20.5			14	12	78				1	" " " " " " "
	5	30.46		-32.2			30.57		-35.0			30.72		-34.4			15.5	14.5	89.5				1	" " " " " " "
	6	30.74		-33.3			30.72		-33.0			30.80		-30.0			17	16	90				1	" " " " " " "
	7	30.96		-28.0			30.57		-24.4			30.62		-24.7			16	15	88				1	" " " " " " "
	8	30.64		-28.3			30.55		-27.2			30.56		-23.3			15	14	89				1	" " " " " " "
	9	30.40		-27.2			30.33		-23.3			30.40		-23.8			16.5	11	46.5				1	" " " " " " "
	10	30.50		-29.7			30.44		-28.3			30.43		-27.2			18.5	17.0	85				1	" " " " " " "
	11	30.36		-23.3			30.36		-21.8			30.47		-21.1			19.5	17.5	91.2				1	" " " " " " "
	12	30.46		-20.5			30.44		-23.8			30.45		-24.4			17.5	16	85				1	" " " " " " "
	13	30.60		-32.5			30.38		-36.1			30.32		-37.2			16	15	89				1	" " " " " " "
	14	30.14		-37.2			30.06		-35.8			29.96		-33.8			18	16.5	85				1	" " " " " " "
	15	30.72		-32.2			29.66		-31.3			29.97		-34.1			15.5	13.5	83.5				1	" " " " " " "
	16	29.51		-27.2			29.47		-25.0			29.60		-28.3			14	12	78				1	" " " " " " "
	17	29.81		-32.8			29.92		-40.8			30.01		-41.1			17	15	80				1	" " " " " " "
	18	30.14		-43.8			30.20		-44.7			30.24		-45.5			16	14	79				1	" " " " " " " in clock house
	19	30.31		-44.4			30.24		-43.6			30.27		-42.2			17	16.5	85				1	Fore cabl clamps from leak in boat, pumps going continuously
	20	30.20		-40.7			30.10		-38.8								12	10.7	82				1	" " " " " " "
	21	29.93		-37.7			29.97		-36.6			30.06		-37.5			12	11.8	94				1	" " " " " "
	22	30.11		-38.3			30.22		-36.9			30.28		-33.0			13.5	12.5	88.5				1	" " " " " "
	23	30.47		-34.4			30.46		-35.2			30.45		-34.2			13.8	13.5	95				1	" " " " "
	24	30.42		-31.0			30.42		-32.6			30.47		-32.1			14.5	13.5	88.5				1	" " " " "
	25	30.51		-35.8			30.48		-35.3			30.46		-35.8			14.5	14	94				1	" " " " "
	26	30.36		-35.0			30.24		-35.1			30.23		-35.5			16	15	89				1	" " " " "
	27	30.04		-38.3			30.01		-35.4			30.04		-34.6			17	16	90				1	Wet from evaporation
	28	30.00		-35.5			29.95		-34.4			29.84		-32.1			14	13	89				1	" " "
	29	29.82		-35.2			29.89		-35.5			29.98		-37.2			17.5	17	85				1	" " "
	30	30.06		-40.5			29.99		-40.2			30.02		-39.7			15.5	14	89				1	" " "
	31	30.08		-40.9			30.06		-40.8			30.10		-41.1			16	15	89				1	" " "
	AVERAGE	30.32		-33.7			30.23		-33.7			30.31		-34.6			15.6	14.1	82.7					

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

AVERAGE NUMBER OF SHIP'S COMPANY. No. .....

SPAR DECK. 4 P. M. Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
80	15	13	88	WNW	bc		1	Deck house damp from steaming. Condensation in fore end
78	13	12	78	NW	"		1	" " " " " " "
87	11.5	10.5	90.5	ENE	"		1	" " " " " " "
82.5	16	14	79	ESE	"		1	" " " " " " "
88	16	15	89	Clm	"		1	" " " " " " "
83	15.5	14	84	ENE	"		1	" " " " " " "
83.5	15.8	14	81	ESE	"		1	" " " " " " "
83.5	14	12	78	"	"		1	" " " " " " "
100	18	16	80	WSW	"	Bar. 28.4 clock 12 P.M.	1	" " " " " " "
75	19.5	15.5	68.8	Clm	"		1	" " " " " " "
80	18	16	80	W	OC		1	" " " " " " "
76	18	16	80	Clm	"	2.854	1	" " " " " " "
80	18	16	80	"	bc		1	" " " " " " "
80	17	15.5	85	W/N	"		1	" " " " " " "
78	16	14	79	W/S	"		1	" " " " " " "
81	17	15	80	WSW	OC		1	" " " " " " "
78	16	13	70	WNW	bc		1	" " " " " " "
85	16.6	14.5	81.5	NW/N	bcg		1	" " " " " " " in clock house
82	9.5	8	80	WNW	"		1	Fore cabl clamps from leak in boat, pumps going continuously
78				Clm	bg		1	" " " " " " "
79	12	10	76	WSW	bc		1	" " " " " "
88	14	13	89	W/N	"		1	" " " " " "
88	14	13	89	W	"		1	" " " " "
89	16.5	15	84	Clm	OC		1	" " " " "
88.5	16.5	15.5	90.5	"	bc		1	" " " " "
89	16	15	89	ESE	"		1	" " " " "
90	18	16	80	"	"		1	Wet from evaporation
85	16	15	89	W/N	"		1	" " "
80	17	15	80	ESE	"		1	" " "
84	17	15	80		"		1	" " "
89	15	14	89	W/N	"		1	" " "
83	12.8	11	80.1	W/N W & SW	OC 2 4 bg 3 OC 4		1	pumps.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Str Jeannette, for the month of February, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No. Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
In the Pack	1	30.07		-42.22			30.10	-~~44~~ 41.94				30.13	-41.67				14	13	89	13	12	88	13.5	12	83	WNW	bc		1	Deck damp from condensation.
"	2	30.012		-35.00			29.92	-31.94				29.82	-28.61				13	12	88	15	13	78	14.5	13.5	88.5	E/N	"		1	" " " "
"	3	29.98		-36.94			30.09	-39.44				30.198	-42.12				12	11	88	14	13	89	15	14	89	DOW	"		1	" " " "
"	4	30.08		-38.61			30.03	-34.44				30.025	-35.83				13	12	88	14	13	89	14	13	89	ENE	bc		1	" " " "
"	5	30.07		-40			30.08	-35.00				30.24	-34.72				12	11	88	12	11	88	14.5	13.5	88.5	DW/P	bc		1	" " " "
"	6	30.06		-37.34			29.94	-3017				29.88	-31.11				13	12	88	14	13	82	15	14	89	DS/E	bc		1	" " " "
"	7	29.79		-37.78			29.78	-39.17				29.91	-40.00				13	12	88	12	11	88	15	14	89	E	bc		1	" " " "
"	8	29.98		-43.89			29.995	-42.83				30.03	-42.61				14	13	89	14	13	89	13	11	77	W/S	bc	BD. 11 AM 5.304	1	" " " "
"	9	30.02		-41.28			29.90	-42.22				29.91	-41.06				11.5	11	94	14	13	78	14	13	89	calm	bc		1	" " " "
"	10	29.71		-42.22			29.717	-42.33				29.655	-40.56				12	11	88	13	12	81	13	12	88	E/N	bc		1	" " " "
"	11	29.617		-40			29.517	-39.17				29.58	-42.83				13	12.5	94	12	11	88	14	13	89	QW	bc		1	" " " "
"	12	29.545		-38.61			29.382	-37.30				29.725	-38.39				12.5	12	94	11.5	10.5	87.5	12	11	88	OW/W	bc		1	" " " "
"	13	29.775		-33.84			29.77	-32.22				29.78	-33.06				12.5	11.5	88	14.5	13	88.5	13	12	88	N.W/W	bc		1	" " " "
"	14	29.81		-31.39			29.78	-34.06				29.77	-37.50				12.5	11	82	15	14	87	14.5	13.5	88.5	NW	bc		1	" " " "
"	15	29.48		-33.61			29.43	-33.33				29.56	-38.89				15	14	89	12.5	11.5	88	14	13	89	NNE	bc		1	Decks wet from leak through skin
	16	29.75		-43.61			29.87	-43.61				29.87	-40.78				13	12	88	14.5	13.5	74	12.5	11.5	88	N	BC		1	" " " "
"	17	29.60		-34.67			29.18	-34.17				28.78	-29.33				12.5	11.5	88	12.5	11.5	88	11.5	11	94	E	bc		1	Decks wet from condensation
"	18	28.62		-29.33			28.805	-30.83				29.06	-33.33				~~11.5~~ 10	~~12.5~~ 9	~~88~~ 86	14.5	13.5	88.5	12.5	12	94	W	bc		1	" " " "
"	19	29.34		-40			29.47	-41.11				29.58	-41.67				13	12.5	94	14.5	13.5	94	12	11	88	WSW	bc		1	" " " "
"	20	29.72		~~-42.22~~ ~~-40.89~~ -41.67			29.71	~~-41.67~~ ~~-40.67~~ -41.67				29.78	-41.67				13	12	88	12.5	11.5	86	13	12	88	NW	bj		1	" " " "
"	21	29.83		-43.33			29.81	-43.33				29.82	-43.33				8.5	8	93	8.5	8	93	13	12	88	WSW	bj		1	" " " "
"	22	29.82		-41.67			29.77	-40				29.78	-40				12	11	88	11.5	10.5	75	13	12	88	WNW	bc		1	" " " "
"	23	29.72		-39.17			29.78	-38.78				29.84	-40.56				12.5	12	94	7	6	85	8.5	8	93	W	bj		1	" " " "
"	24	30.03		-40.83			30.08	-41.94				30.15	-41.67				9.5	9	93	10	9	86	11	10	87	W/S	bf		1	" " " "
"	25	30.17		-39.44			30.183	-38.33				30.20	-40.56				8.5	8	93	11	10	86	13	11.5	83.5	calm	bj		1	" " " "
"	26	30.11		-40.83			30.08	-40.83				30.11	-42.78				13	12	88	12.5	11.5	88	12.5	12	94	"	bc		1	" " " "
"	27	30.23		-39.44			30.23	-41.11				30.18	-40.56				10	9	86	13.5	12.5	94	14	13	89	"	bc		1	" " " "
"	28	30.15		-40.83			30.19	-40				30.215	-42.22				11	10	87	12	11.5	88	12	11.5	94	NW	bc		1	" " " "
"	29	30.12		-42.78			30.13	-41.67				30.25	-43.89				10.5	10	94	12.5	12	82	10	9.5	98	NNE	bc		1	" " " "
	30																												
	31																												
Mean		29.97		-38.8			29.92	-38.7				29.85	-38.9				11.6	10.8	89.8	12.9	12	86.3	13	12	89.4	Variable	bc 19 bj 5 bc 5		1	

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

February 7

Atmospheric Observations on board U. S. S Arctic Str Jeannette, for the month of March, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	10 P. M. Relative humidity.	Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	Remarks.
In the pack	1	30.50		-45.7			30.55		-45.72			30.46		-47.50			9.5	8.5	84	7	86	10.5	10	96	w/n	bc		1	Decks wet from thaw & Condensation
	2	30.64		-45			30.545		-42.78			30.295		-43.06			8	7.5	93	4	86	13	12	88	NNE	bc		1	" " " " "
	3	30.34		-42.78			30.33		-41.11			30.37		-43.61			9.5	9	93.5	14	89	12.5	10.5	93.2	ENE	bc		1	" " " " "
	4	30.35		-43.89			30.34		-42.22			30.40		-44.44			18	16.8	88	14	89	15	14	89	bc	clm		1	" " "
	5	30.20		-39.72			30.13		-38.33			30.11		-40.56			14	13	89	14	82	15	13	78	bc	E		1	" " " "
	6	30.13		-36.11			29.98		-34.44			30.00		-35.56			11	10	87	14	89	10.5	10	96	bc	E		1	" " " "
	7	29.90		-31.11			29.78		-30			29.72		-33.89			14	13	89	12	94	17	15	80	bc	E/S		1	" " " "
	8	29.54		-37.22			29.53		-36.11			29.57		-37.22			16.5	15	84	12	80	17	15	80	bc	"		1	" " " "
	9	29.66		-32.78			29.70		-30.00			29.84		-32.78			15.5	14	84	15.5	80.5	17	14	90	bc	clm		1	" " " "
	10	29.84		-29.44			29.84		28.33			29.94		-32.22			17.5	16	85	16.5	84	16.5	14	84	bc	"	4.32(?)	1	" " " " Berth Deck 10 PM
	11	29.97		-33.89			30.04		-30.39			30.18		-25.00			18.5	16.5	85	16	84	16.5	15	84	bc	w		1	" " " "
	12	30.05		-20.28			29.94		-20.00			29.72		-21.11			14	14.5	84	16.5	84	18	16	80	bc	ESE			" " " "
	13	29.36		-18.33			29.44		-17.17			29.63		-23.33			17	15	80	18	82.5	16.5	15	84	bc	NNE		1	" " " "
	14	29.62		24.17			29.75		-24.44			29.96		-25.56			15	14	89	16.5	84	15	14	89	oc	WNW		1	" " " "
	15	30.16		-29.72			30.25		-30.00			30.34		-32.22			14	14.5	84	14	69	17	15.5	85	bc	NE		1	" " " "
	16	30.48		-33.89			30.54		-32.78			30.45		-37.22			19.5	18	86	17.5	75	17.5	16	85	bc	N		1	" " " "
	17	30.60		-34.44			30.54		-31.67			30.58		-33.61			18	17	90	15.5	94.5	17	16	90	bc	NW		1	" " " "
	18	30.40		-30.56			30.28		-28.33			30.23		-28.33			16	15	89	16.5	84	16	15	89	bc	W		1	" " " "
	19	30.11		-28.33			30.13		-27.50			30.14		-26.67			14.5	13	88	15.5	84.5	15	14	89	bc	W		1	" " " "
	20	30.18		-27.78			29.93		-25.28			30.03		-31.67			14.5	13	88	16.5	84	16.5	15	84	bc	calm		1	" " " "
	21	30.21		-28.33			30.03		-26.33			29.90		-21.67			15.5	14.5	89.5	14.5	84.5	15	14	89	bc	WSW		1	" " " "
	22	29.34		-20			29.45		-21.94			29.57		-21.67			16	15	89						bc	NE/E		1	" " " "
	23	29.63		-22.78			29.76		-25.56			29.87		-29.44			17	16	90	17	80	17	16	90	bc	WSW		1	" " " "
	24	29.90		-24.39			29.92		-25.83			30.02		-28.61			14	13	89	13	88	14	13	89	bc	NW		1	" " " "
	25	30.14		-25.00			30.14		-23.61			30.13		-21.67			15	13.5	83.5	15	76	17	15	80	bc	calm		1	" " " "
	26	29.74		-17.78			29.71		-15.28			29.71		-15.28			19.5	17	76.5	19	81	16	15	89	oc	NE		1	" " " "
	27	29.71		-12.22			29.71		-11.11			29.78		-11.11			15	14	89	18	80	18	16	80	oc	E		1	" " " "
	28	29.80		-8.33			29.72		7.61			29.71		-11.11			17	15	80	18.5	85	18.5	17	85	bc	ESE		1	" " " "
	29	29.86		-13.33			30.05		-15.28			30.19		-17.22			15	14	89	19	81	17	15	80	bc	calm		1	" " " "
	30	30.35		-18.61			30.87		-16.06			30.40		-18.33			19	16.72	79	19	81	17.5	16.5	81	bc	NNW		1	" " " "
	31	30.34		-16.47			29.83		-12.22			29.87		-13.72			15	13	78	17	90	18.5	17	85	OCS	ENE	3D 2.349 10 PM 2.269	1	" " " "
AVERAGE		30.03		-28.1			30.01		-27.7			30.04		-31.4			13.3	12	85.8	15.3	84.7	15.8	14.5	86	bc			1	Cont

AVERAGE NUMBER OF SHIP'S COMPANY. No.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S Jeannette, for the month of April, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	SPAR DECK. 4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	SPAR DECK. 10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	Wet bulb.	BERTH DECK. 4 P. M. Relative humidity.	Dry bulb.	Wet bulb.	BERTH DECK. 10 P. M. Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No. ..... Wind.	Weather.	Carbonic acid, corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
In the Pack	1	29.86	-14.17				29.83	-14.44				29.79	-16.39				11.5	10.5	88	14.5	12	78	16.5	13.5	89.5	SW	BC		1	Decks damp from condensation
"	2	29.43	-12.78				29.27	-7.50				29.29	-14.44				9.5	8.5	84.7	13	12	88	16	15	89	SE	OC.D		1	" " " "
	3	29.40	-15.56				29.42	-18.89				29.51	-23.89				11	10	87	18	12	88	15	14	89	SW/S	OC f		1	" " " "
	4	29.40	-23.89				29.64	-21.67				29.73	-24.67				4	3	83	17.5	16	85	17	16	90	SW	OC 3		1	" " " "
	5	29.80	-28.33				29.84	-25.72				29.94	-28.89				9.5	9	93.5	14	12	78	15	13	78	NW	bc		1	" " " "
	6	29.99	-27.22				29.99	-25.56				29.99	-30.83				9	7.5	79.5	14.5	13	83	15.5	14	84	WNW	b c		1	Both decks damp. Spar deck frozen
	7	29.98	-25.00				29.99	-22.78				30.06	-26.11				7	6	85	14	13	89	14.5	13	83	"	bc		1	" " " " " "
	8	30.14	-21.67				30.14	-19.89				30.21	-27.50				8	7.5	93	18.5	18	90	15	14	89	NW	b3		1	" " " " "
	9	30.20	-20.83				30.18	-18.33				30.18	-29.44				9	8	86	15	14	89	16.5	15	84	S/W	bc		1	" " " " "
	10	30.02	-15				29.95	-12.22				30.05	-15				12	11	88	15	14	89	17	16	90	ESE	.OCM		1	" " " " "
	11	30.10	-11.94				29.94	-12.50				29.75	-13.89				13	12	88	19.5	17.5	81.25	19	17.5	85.5	NE	OCM		1	" " " " "
	12	29.53	-11.11				29.51	-6.33				29.53	-10				12.5	11	82	16.5	15	85	18	17	90	E	bc		1	" " " " "
	13	29.48	-11.67				29.57	-13.33				29.67	-12.50				12	11	88	17	15	80	18	15.5	75.5	W	OC M		1	Spar deck wet from melting
	14	29.76	-15				29.81	-11.67				29.86	-14.44				11	9	75	18.5	17	85	18	16.5	85	Calm	OC		1	" " " " "
	15	29.84	-15				29.82	-13.06				29.81	-15				16	15	89	18.5	17	85	20	18	81	OS	bc		1	" " " " "
	16	29.68	-13.89				29.66	-11.67				29.70	-17.22				12.5	11.5	88	17	15.5	85	17	16	90	SWS	bc		1	" " " " "
	17	29.61	-15.56				29.51	-12.78				29.47	-15.56				12	10	76	16.5	15	85	17	15.5	85	S	bc		1	" " " " "
	18	29.39	-10				29.41	-8.72				29.53	-15.56				11	10	87	16	15	89	18.5	16.5	81.5	N	O.C.D		1	Spar deck foggy + melting. B.D damp from clearing -
	19	29.68	-16.67				29.76	-12.89				29.83	-14.44				15	14	89	18.5	14	84	16.5	15	84	NNW	OC		1	" " " " " " dry -
	20	29.88	-12.78				29.78	-9.56				29.81	-9.44				12.5	11.5	88	18.5	11	82	14.5	13	83	ENE	OCM		1	" " " " " " damp condensation
	21	29.74	-10				29.70	-8.33				29.78	-16.67				13.5	12.5	88	14	12.5	83.5	18	14	79	E	OC P		1	" " " " " " "
	22	29.68	-8.33				29.69	-8.89				29.77	-17.78				12	10.5	79	18.5	14	84	15	14	89	E/S	OC		1	" " " " " " "
	23	29.81	-16.11				29.83	-9.72				29.90	-14.11				9	8	86	11.5	10.5	87	17	15	80	ENE	bc		1	" " " " "
	24	29.96	-10				30.00	-9.44				30.06	-11.67								19	17	81	18.7	15.5	69		OC		1	" " " " "
	25	30.09	-9.72				30.10	-9.72				30.16	-20				11	10	87	17.5	18	86	16.5	15	84	OE	OC.		1	" " " " from washing
	26	30.09	-8.89				30.04	-5.83				30.02	-7.22				11	10	87	14.5	12.5	78	17	15	80	ESE	bc	.45"	1	" " " " dry -
	27	29.96	-5.56				29.95	-3.89				29.98	-5.56				12.5	11	82	17.5	16	85	17	15.5	85	OE	OC.S		1	" " " " "
	28	29.93	-4.44				29.86	-5				29.84	-6.67				14	12	78	17	15.5	85	17	15.5	86	ENE	OCM		1	" " " " "
	29	29.74	-7.78				29.70	-3.06				29.77	-12.78				11.5	10.5	87	14	12.5	88.5	18	15.5	78.5	E	bc		1	" " " " "
	30	29.82	-5				29.86	-1.56				29.94	-11.11				14	13	89	16.5	15	85	17.5	16	85	ESE	bc		1	" " " " "
	31																													
Average		29.80	-13.9				29.79	-12.1				29.85	-16.2				11.2	10.4	85.9	15.5	14.3	84.3	16.7	15.2	80.7	Ordinary	bc 16 sc 14	4.5	1	Wet or damp-

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

24th * Preliminary formation of cirrus + cirro

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

April 1880
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Atmospheric Observations on board U. S. S. Jeannette, for the month of May, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.
In the pack	1	30.00	32 -4.44				29.97	-1.28				30.01	-8.33				12	10.5	82	-1.25
	2	29.92	-6.34				29.87	-6.67				29.79	-8.89				6	5	85	18
	3	29.65	-6.11				29.46	-8.33				29.38	8.33				9.5	8	80	18
	4	29.48	-10.28				29.61	-9.17				29.73	-10.56				12.5	11	82.5	16
	5	29.75	-13.33				29.77	-16.11				29.81	-15.56				12	11	88	14.5
	6	29.90	-17.78				29.96	-19.44				30.06	-18.33				9	8	86	14.5
	7	30.14	-13.61				30.13	-12.89				30.11	-18.33				9	7.5	77.5	11
	8	29.78	-15.00				29.62	-11.50				29.60	-11.11 14.44				10	8.5	80	13
	9	29.62	-6.11				29.73	-9.17				29.88	-14.44				9.5 13.5	9	98	15
	10	30.14	-15				30.25	-13.61				30.30	-18.56				15	12	88.5	16
	11	30.26	-15				30.18	-14.56				30.21	-16.11				12	11	88	15
	12	30.19	-15				30.14	-13.89				30.14	-13.89				14	12	78	16
	13	30.12	11.67 -18.33				30.13	-11.11				30.16	-18.33				11	10	87	13
	14	30.19	-13.89				30.22	-10.56				30.28	-16.11				8	7	86	13
	15	30.23	-11.11				30.16	-10.56				30.28	-12.78				10	9	86	14
	16	30.34	-9.44				30.28	-10.56				30.20	-11.67				14	13	89	11
	17	30.03	-8.61				30.13	-8.72				30.25	-12.22				10.5	9.5	87.5	12
	18	30.28	-8.89				30.23	-8.61				30.25	-12.78				9.5	8	80	10
	19	30.24	-2.17 2.50				30.20	-5.56				30.21	-13.33				10	8	74	11
	20	30.14	-9.72				30.06	-5.44				30.08	-10.11				9	7	73	9.5
	21	29.95	-5.83				29.94	-2.94				29.98	-6.11				9.5	8	80	12
	22	30.00	-4.72				30.01	-2.39				30.04	-6.11				9.5	8	80	13
	23	30.13	-4.72				30.11	-4.44				30.11	-8.06				9.5	8	85	15
	24	29.98	-8.33				29.84	-8.06				29.86	-8.89				9	7	73	14
	25	29.83	-7.78				29.86	-6.11				29.90	-9.44				10	9	86	16
	26	29.96	-3.33				29.96	-1.67				30.01	-7.22				13.5	12	83	17
	27	30.13	-4.44				30.14	-4.17				30.20	-5.56				9.5	8.5	83	12
	28	30.20	0				30.12	-1.67				30.07	-3.89				8	7	86	11.5
"	29	29.82	-1.39				29.88	0				29.90	-0.56				8.6	7	79.5	11.5
"	30	29.87	+0.83				29.80	-1.11				29.79	-2.78				9	8	86	12
	31	29.66	-1.36				29.61	-0.56				29.64	-1.11				10.7	10	91.5	11.5
Average		29.97	32° -8.4				29.98	32° -7.7				30.00	32° -10.6				9.9	8.9	85	13.6

Barometer corrected 32°.7

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

AVERAGE NUMBER OF SHIP'S COMPANY. No.

BERTH DECK. 10 P. M. Relative humidity.	Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
78	13.5	13.5	83.5	N	b		1	Dry on both decks
82	14	13	89	NNE	bc		1	" " " "
88	12.5	11.5	88.25	W	bc		1	S.D melting snow. B.D dry -
89	15.5	13.5	79	N W	bc		1	" " " " " "
79	13	12	78	N	oc	B.D. 10 P.M.	" " " Snow " "
83	13	12	78	N	bc	1.69	1	" " frozen " " "
87	12	10	76	NE/E	oc		1	" " " " " "
88	12.5	11	72	E	o cm		1	" " " " " "
78	17.5	16	85	E	o.c.m.s		1	" " melting " " " washed -
79.5	16	14.5	79.5	W	bc		1	" " dry " " dry -
89	14	12.5	88	W.N.W	o c		1	" " " " " "
89	14.5	12.5	78	"	o cm		1	" " " " " "
88	12	11	88	NE/E	"		1	" " " " " "
82.5	14.6	13.5	89.5	E.N.E	oc		1	" " " " " "
84	13.5	12	83	E.N.E	oc		1	" " " " " "
87	11	10.5	87	OE	oc		1	" " " " " "
87	12	10	76	ONE	bc		2	" " " " " "
76.7	9.6	8.6	76.7	E	bc		2	" " " " " "
71	11.5	9.5	75.7	E/N	bc		2	" " " " " "
88	16	14	79	E/N	bc		1	" " " " " "
84	16	14	79	OE/E	oc		1	" " " " " "
83.5	15.5	13.5	80	ENE	bc		1	" " " " " "
79	18	15.5	71	"	o.cm		1	" " " " " "
70	17	14.5	75	clm	o.c.m	B.D 1 0 P.M.	" " " " " "
86	10	9	86	ENE	bc	1.432	1	" " " " " "
94	11.5	11	94	clm	oc		1	" " " " " "
84	17	15	76	ONE	oc		1	" " " " " "
88	13.5	13	94	OE/E	ocm		1	" " " " " "
94	12.7	12.5	95	NE	oc		1	" " " " " "
84.3	13.7	12.2	82	Monthly	12 bc 19 oc	1.561	1.16	average dry

J. M. Ambler
Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748 +.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

$$30 : \text{observed height of bar.} :: \text{capacity} : z.$$

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

May, ~~June~~ 1880

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Atmospheric Observations on board U. S. S *Arctic Str Jeannette*, for the month of *June*, 18 80

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	4 P. M. Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No. Wind.	Weather.	Carbonic acid, corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
In Pack	1	29.54	-0.56				29.49	+0.72				29.56	-3.33				10.5	9.6	82.5	12	1.5	94	9.7	9	92.5	NE/E	O.C.S		1	S.D. snow - B.D. dry -
	2	29.56	-3.33				29.47	-2.50				29.56	0				8	7	86	10.5		94	10	10	100	NNE/E	O.C.D	-	1	" " wet melting S. " " damp
	3	29.83	-1.67				29.94	44 +0.28				29.99	31 -2.78				8	7.5	92.5	8.5		98	10.5	10	90	W/N	O.C.		1	" " dry " " damp.
	4	29.90	34	0			29.85	37	2	1.5	91	29.85	37	1	0.5	81.5	8.5	7.5	81	9.5		93.5	10.5	10	94	NNE	O.C.		1	" " " " " "
	5	29.95	37.5	0.5	0	90	29.93	48	2.5	1.5	91	29.80	30	-3.33			6	5.5	92.5	13.5		94	15.5	14	84	ONE	O.C.		1	" " " " " " dry
	6	29.35	35	0.5	0.5	100	29.34	36	0.2	0	96	29.53	27	-3.33			9	8	86	8.5		93	13.5	12.5	88.5	O	O.C.		1	" " " " " "
	7	29.73	28	-3	-4	78	29.77	34	-1.6	-2	71.5	29.77	28	-3.33	-3.33	87	6.5	6	92.5	6		95	92.5	8.5	7.5	81	NW	O.C.	2,307	1	10th M BD
	8	29.77	31	-1.94	-2.22	94	29.82	34	-0	-1.11	79	29.85	28	-3.33	-3.33	X	6.5	6	92.5	8.5		98	10.5	10	94	W	O.C.		1	" " " " " "
	9	29.88	34	-1.5	-2		29.85	44	-1	-1.5		29.74	27.5	+4	-4.5	89.5	9	8	86	9		93	11	10	87	E/S	O.C.		1	" " " " " "
	10	29.52	33	-2	-2.2	NW	29.45	36	-0.2	-0.5		29.42	32.5	-0.56	-0.56	NW	10.5	10	94	12.5		94	14	13.5	94.5	ENE	O.C.D		1	B.D. melting snow " " damp -
	11	29.44	39	+1.67	+1.67	NW	29.46	37.5	+2.5	+1.5	82	29.56	31.5	-0.5	-0.5	NW	11	10.5	94	12		92	NW	10	10	NW	O.C.E		1	" " damp " " "
	12	29.80	31.5	-2.5	-2.5	NW	29.67	33	-0.5	-0.5	NW	29.74	34	+0.5	+0.5	NW	8.5	8	93	14		94	NW	13.5	94	W	O.C.			. . . wet melting snow " " wet melting snow
	13	29.87	39.5	+2	+1.5	91	29.82	41	+4.5	+3	75.5	29.74	36	-3.5	-4	93	7.5	7	93	11.5		94	13	12.5	94	OW/W	O.C.		1	" " damp " " " damp.
	14	29.86	37	0	-0.5	81.5	29.95	36	+0.5	-0.5	85.5	29.95	30	-1.5	-2	90	10	9	86	9.5		93.5	12	11.5	94	W	O.C.		1	" " " " " "
	15	29.82	31	-1	-1.5	90	29.96	33.5	+2	0	68	30.00	30	-1.3	-1.6	94.5	8.5	8	93	11		93.5	11	10.5	93.5	W/N	O.C.		1	" " Dry @ " " Dry
	16	30.04	29	-2	-2.5	74.5	30.04	35	+.5	0	91	30.05	29.5	-1.5	frozen		10	9.5	93.5	11.5		94	12	13.5	94.5	WNW	O.C.		1	" " " @ " " "
	17	30.02	31.5	0	-0.5	81.5	29.90	35	+3	+2	80	29.73	30.5	-1	-1.5	91.5	10	9.5	93.5	9		98	9	8.5	98	OW/W	O.C.		1	" " wet melting snow " " wet
	18	29.40	29	-2.5	-3	90	29.41	37	-3	-3.5	89.5	29.45	31	0	0		8	7.5	92.5	10.5		94	12	11.5	94	SW	O.C.		1	" " dry " " dry -
	19	29.54	35	+0.8	+0.5		29.62	39	+5	+3.5	74.5	29.65	31	0	-0.5	81.5	9	8.5	93	10		93.5	12.5	12	94	NW	O.C.		1	" " " " " "
	20	29.54	34	+0.5	+0.2		29.37	35	+0.5	+0.5	NW	29.22	35	+1.11	+1.11	NW	8	7.5	92.5	10.5		NW	11	11	NW	O	O.C.E		1	air saturated snow sleet Rain
	21	29.38	36	+.8	+.5		29.32	38	+1.11	+.8		29.20	34	0	0	NW	8	8	NW	8.5		93	10.5	10	94	SW/S	O.C.	BD 2,495 10 pm	1	" " " "
	22	29.32	35	+.5	0	90	29.44	38.5	+3.5	+2.5	64	29.57	32	+1.6	+1.6	NW	8.5	8	93	9.5		93.5	12	11.5	94	W/S	O.C.		1	Deck comparatively dry -
	23	29.67	38.5	+1.5	+1	91	29.67	39	+2.5	+1.5	85	29.60	34	+0.2	0	96	8.5	8	93	10.2		97	10	12.5	94	S	O.C.		1	" " "
	24	29.60	38	+2	+1.5	91	29.66	37	+2	+1	92	29.76	33	0.5	0	90	9.5	9	93.5	8.5		93	9	8.5	93	OW/S	O.C.E		1	Both decks wet. Rain -
	25	29.92	42	+4.5	+3.5	77.5	30.00	37	+6	+5	85	30.04	35	+1.5	+1	91	8	7.5	93	10		86	12.2	12	98	NW/N	O.C.		1	" " dry
	26	30.08	41	+2.2	+2.2	NW	30.10	46	+7	+6	85	30.12	36	+1.5	+1	91	11	10	87	14		94.5	14.5	14	94	NE/N	O.C.		1	" decks washed down
	27	30.14	39.5	+2	+1.5	91	30.12	44	+4.5	4	91.5	30.22	37	+2	+1.5	91	8	7	86	10		93.5	13.2	13	98	W	O.C.		1	" " dry " "
	28	30.37	43	+3	+2.5	91.5	30.40	49	+7	+6	85	30.40	39	+2	+1.5	91	9	9	NW	10.5		94	11	10.5	93.5	N	O.C.		1	" " "
	29	30.38	39	+3.3	+2.5	85	30.36	47.5	12.7	10	69	30.06	41	+3.3	+2.5	85	8.5	8	93	10		93.5	11.2	11	97	NW	O.C.		1	" " "
	30	30.35	43	+3.5	+3	91.5	30.32	44	10	7.5	68	30.27	37	+2	+1.5	91	9.5	9	93.5	9.5		93.5	11.2	12.5	91	ENE	O.C.	2,462	1	" " "
	31	Average	29.78	35.4	.25	.03	90	29.78	39.5	2.4	1.8	83	29.78	32.8	-.5	-.3	92.5	8.7	8.15	92.3	10.2		94	11.6	11.1	93.3	variety	O.C. 15 D.C. 15	BD 10 pm		
		AVERAGE																										2,4213		17 days dry 13 wet

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

J M Ambler
P. Asst. Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748 +.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

June 1882

Atmospheric Observations on board U. S. S Arctic Ship Jeannette, for the month of July, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	AVERAGE NUMBER OF SHIP'S COMPANY. 4 P. M. Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid, corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, exc. cluding injuries.	REMARKS.
In the pack	1	30.16	39	3	2	83	30.12	39	10.5	9	81	30.08	37	2.5	2	91	9.5	9	96	8	98	9.8	9	87.5	SE	bc		1	Both decks dry.
	2	30.00	42	5	4	84	29.94	52	21.5	21	95	29.84	42.5	3.5	3	83.5	7.5	7.5	92.5	8.8	89	13	12.5	94	S	bc		1	" " "
	3	29.69	45.5	4.4	4.4	100	29.67	60	14.5	11.5	67.5	29.66	44	4.5	4	91.5	9	8.5	8		98	10.2	10	97	calm	bc		1	Both decks washed down
	4	29.71	45	5.5	4.5	86	29.74	49	5.5	5	95.5	29.74	37.5	1	+.5	90.5	8.7	8	90.5	12	94	13	12.5	94	NE/N	Of		1	" " dry.
	5	29.70	41	2.5	2	91	29.68	41.5	3	2.5	91.5	29.68	36	1.5	1	91	10.2	10	97	11.5	94	13.2	13	98	E	Oc		1	" " "
	6	29.64	39.5	3	2.5	91.5	29.61	42	3.5	3	91.5	29.57	35	1.3	1	94.5	10.3	10	96	10.8	90	14	13.5	94.5	E	Oc R		1	B'spar " damp. Rain. B.D. dry.
	7	29.50	37	1.94	1.94	100	29.51	36.5	3.3	3	95	29.54	36	1.9	1.6		13	13	100	13.8	85	13.2	13	98	SE/E	Oc R		1	" " " " " "
	8	29.62	41	4.5	4	91.5	29.63	42	5	4.5	92	29.63	38.5	2.5	2	94.5	13.2	13	98	9.5	96	11.5	11	94	NW	bc		1	Both decks dry.
	9	29.63	37.5	2	1.5	91	29.63	39	4	2.5	74.5	29.59	35	1.11	1.11	100	9.5	9	96	8.5	98	10.2	10	97	SW/W	bc		1	" " "
	10	29.68	35.5	1.11	1.11	100	29.48	34.5	0.5	0.5	100	29.48	36	1.11	1.11	100	7.5	7.5	100	8	100	12	12	100	SW/W	Oc. Rain	B.D. 10.5 P.M. 1852	1	Spar deck washed up. B deck washed.
	11	29.58	39	2	1.5	91	29.58	44	8.5	7	79.5	29.54	39	2.5	2	91	9.5	9	96	11.5	94	15	14	89	E	Oc		1	Both decks dry.
	12	29.56	44	5.5	5	95.5	29.58	50.5	16	8	24	29.59	39	2.5	2	91	10	9.5	93	8.5	98	12	11.5	94	E	bc		1	" " "
	13	29.60	44	5	4.5	92	29.61	46.5	10	8	74	29.65	36.5	2.2	2.2	100	9.5	9	96	9.5	93	11.5	11	94	NE/E	bc		1	" " "
	14	29.90	37	2	1.5	91	29.96	39	3.5	2.5	83	29.98	34	.5	0	90	7	6.5	92.5	8	86	11.2	11	97	W	Oc J		1	Spar Deck damp. B deck dry.
	15	29.95	41	3.5	3	71.5	29.86	37	2	1	82	29.77	37	.5	.5	100	7.5	7	92.5	9.5	96	10.2	10	97	SW/W	bc - R.P.M.		1	Wet from rain.
	16	29.76	35	1	.5	70.5	29.74	35	1	.5	90.5	29.72	33	.2	.0	96	6.5	6	92.5	9.5	96	10	9.5	93	W/N	bc	Sr. R.P.M.	1	Spar deck damp R at night. B.D. dry.
	17	29.42	35	1.3	1.3	100	29.31	34.5	1	.5	90.5	29.56	33	.2	.2	100	10.2	10	97	6.2	97	15	14	89	SE	Oc. R.P.M.		1	Spar deck washed down. BD washed.
	18	29.78	35	.8	.5		29.78	37	2.2	0	78	29.78	33	.2	0	96	9	8.5	93	12.5	94	13.5	13	94	W/N	Oc. S.P.M. 2,708	B.D. 10 P.M.	1	Both decks Damp.
	19	29.79	35	.2	0	96	29.74	39	3	2	83	29.65	33	.5	0	90	10	9.5	93	10.5	97	12.5	12	94	"	Oc W		1	" " dry.
	20	29.42	36	1.5	1	91	29.42	44	4.5	3.5	88.5	29.44	36	1.5	1	91	10.5	10	94	11.5	94	12	11.5	94	E.S.E	Oc		1	B Deck. wet rain. B.B. dry.
	21	29.38	36	1.5	1	91	29.47	39	4	3	83	29.51	33	0	-.5	90.5	9.5	9	93.5	12.5	97	11	10.5	93.5	W/S	Oc S.P.M.		1	" " " " " " "
	22	29.52	35.5	.5	.5	100	29.59	34.5	2	1.5	91	29.62	33	.5	.5	100	7.5	7	92.5	7.5	92.5	9.5	9	93.5	W	Oc N		1	B " " " melting snow. " " "
	23	29.66	33.5	0	0	100	29.67	35	3.5	1.6		29.64	31	-.5	-.8		8.5	8	92.5	11	93	10.5	10	94	W/N	bc		1	" " " " " " " "
	24	29.55	33	0	-.5	90.5	29.56	33	.5	0	90	29.60	32	0			6.5	6.5	100	14	89	14.8	14	91	W/S	Oc		1	B deck dry B.d. washed down
	25	29.47	35	1.5	.5	81.7	29.48	35	1	.5	90.5	29.60	33	0			8	7	84.5	7.5	92.5	11	10.5	93.5	W	bc. A.P.M.		1	" " wet. melting snow B.d. dry.
	26	29.57	36	1.3	1.3	100	29.64	41	3	2.5	91.5	29.69	30	0	-.5	90.5	9	8.5	93	11.5	97	12.2	12	98	SW/W	Oc	3.68	1	B deck. 10 P.M. " " " " " "
	27	29.74	33	.5	0	90	29.72	35	1.3	.5	84.7	29.70	31.5	-.8	-1.11		10	9.5	98	11.2	97	12.2	12	92	W	Oc S		1	" " " " " "
	28	29.57	34	-.5	-.8		29.48	35	.5	0	90	29.32	34	1	.5	90.5	9	8.5	98	8	93	10.2	10	97	SW/W	Oc		1	" " dry " "
	29	29.34	37	.2	0	96	29.44	38	1.3	.5	88.5	29.50	32	-.2	-.5		7.8	7	92.5	9	93	9	8.5	93	S/W	bc		1	" " damp " "
	30	29.53	37.5	2.2	1.5	87.5	29.53	36	1.5	.5	81.7	29.54	33	0	0	100	7	6.5	92.5	8	93	8.5	8	92.5	S/W	Oc. A.P.M.	B.D. 5 P.M.	1	B.B. wet from melting snow.
	31	29.65	35.5	.5	.5	100	29.68	36	.5	.2		29.70	33	-.5	-.5	100	6.5	6	92.5	11.5	94	10.5	10	94	SW	bc. B	2.088	1	Both decks washed.
	AVERAGE	29.65	37.4	2	1.5	92.8	29.64	40.1	4.5	3.4	80.9	29.63	35	1	0.76	90.1	8.9	8.5	94.1	9.8	93	11.7	11.2	94.3	Overhead	Oc	2.637	1	wet

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered
Same instruments to be used in all hygrometric observations.

should be selected. The results will not be entered unless the observer is certain of their accuracy.
in of Remarks.

J. M. Ambler
Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

July 1883

12

Atmospheric Observations on board U. S. S Arctic the Jeannette, for the month of August, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	Relative humidity.	Wet bulb.	Dry bulb.	Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No. Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, exc luding injuries.	REMARKS.
In the pack	1	29.66	34.5	3	2.5	91.5	29.60	38	2.5	2	91	29.60	33	-.5	0	90	6.5	6	92.5	9.5	9	93.5	9.5	9	93.5	N	OCn		1	Spar deck wet Berth deck dry.
	2	29.61	35	-.5	0	90	29.62	38	3	2	84	29.62	29.5	-2	-2		5	4.5	92	6.5	6	92.5	7	6.5	92.5	W/N	OCn		1	" " dry " " "
	3	29.64	32	-0.5	-0.5	100	29.22	35	1.11	1.11	100	29.21	34.5	-.8	.8	100	6	5.5	92.5	7	6	92.5	7.5	7	93	NNE	OCn		1	" " wet " " "
	4	29.16	35	+1.11	+1.11	100	29.30	37	+2	+1.5	91	29.42	31	-1	-1.5	100	6.5	6	92.5	8.5	8	93	9	8.5	93	WNW	OCJ		1	" " " " " "
	5	29.43	38	.5	0	90	29.47	33	0	-.5	90.5	29.52	31	-1.8	-1		7	6.5	92.5	9.5	9	93.5	10.5	10	94	NW	OCn		1	Both decks dry.
	6	29.57	35	0	0		29.60	37	1.8	1.6		29.54	32	-2	-.8		8	7.5	93	9	8	93.5	9.5	9	93.5	N	OC	1.959	1	" " "
	7	29.52	37	1.5	1	91	29.58	35	.8	.8	100	29.74	35	-0.5	-0.5	100	6.2	6	97	15	12	83.5	13.5	12.5	88.5	N	OC, R P M		1	Spar deck wet rain, B. d. washed up
	8	29.94	36	0	-.5	90.5	29.99	36	-0.2	-0.8		29.99	29	-3.06	-3.06		8	7	86	9	8	93	10	9.5	93	W/N	OC, mist		1	" " damp " " dry
	9	29.82	30	-1	-1.5	90	29.84	34	0	-.5	90.5	29.79	31	-1.11	-1.11	100	7.2	7	97	9.5	9	93.5	11	10.5	93.5	NE	OC, R P M		1	" " dry, a.m. " " "
	10	29.68	35	.8	.5		29.68	38	1.5	.5	81.7	29.63	35	-0.2	-0.2	100	10	9.5	93	12.5	12	94	12.5	12	94	N	OC, R, mist		1	" " wet " " "
	11	29.76	41	0	-0.2		29.73	39	2	1	82	29.70	35	1	2.5	90.5	8.5	8	93	10.2	9	94	11.5	11	94	N	OC	Both decks wet	1	" " damp " " "
	12	29.74	40	1.5	1	91	29.88	35	1.3	1	94.5	29.98	29.5	-1.5	-2	90	5.5	5	92.5	7	6	92.5	9	8.5	93	WNW	OC, R P M		1	" " dry " " "
	13	30.09	41	-.5	-1	90.5	30.08	42	3	2	83	30.04	35	0.5	0	90	6.2	5.5	89.5	8.2	7	97	10.5	10	94	SSE	OC	10 P.M.	1	" " " " " "
	14	29.90	37.5	1.3	1.3		29.84	38	1.1	1.1	94.5	29.88	35	0.8	0.8	100	10	10	100	19	8	95	15.5	15	94	NNE	OC, mist R	18.59	1	Both decks washed up.
	15	29.88	39	2.2	2.2	100	29.82	39	3	2.5	91.5	29.83	35	1.1	1.1	100	9.5	9	93.5	12.2	9	98	11.2	11	97	NNE	OC " "		1	B deck wet B deck damp
	16	29.82	37	1.5	1.5	100	29.81	35	1	1	100	29.87	35	0.5	0.5	100	8.2	8	97	8.5	8	93.5	11	11	100	NE/E	OC NR		1	" " " " " "
	17	29.78	36	1	1	100	29.73	36	1.3	1.3	100	29.72	34.5	0.5	0.5	100	9	8.5	93	11.2	11	97	11.2	11	97	N/E	OCJ		1	" " " " " "
	18						29.78	41	3.3	3.3	100	29.80	36	1.3	1.3	100				10	10	100	12	12	100	Clear	OCJ	8.10 A.M.	1	" " " " " "
	19	29.82	42	3.3	3	95	29.84	42	3.5	3.3		29.86	37	1.5	1.5	100	10	9.5	93	11	9	93.5	10.5	10.5	100	Clear	OC		1	" " dry " " dry
	20	29.94	45	2.5	2	91	29.95	45	4.8	3.8		29.95	38	1.1	1.1	100	10.2	10	97	11	9	93.5	12.5	12.5	100	[illegible]	OC		1	" " " " " "
	21	30.00	44	2.7	2.7	100	30.01	40	2.5	2.5	100	30.06	36	1.1	1.1	100	11.5	11.5	100	14	10	100	14	13.5	94.5	N/W	OC	3.5	1	Both decks washed up
	22	30.14	36	0.8	0.8	100	30.17	36	1.3	1.3	100	30.18	35	0.8	0.8	100	9	8.5	98	11.2	11	97	12.2	12	97	Clear	OC	Went down 8 a.m. 2.05	1	" " " " dumps.
	23	30.16	36.5	1.3	1.3	100	30.12	39	2.5	2.5	100	30.10	36	1.1	1.1	100	10	9.5	93	11	10	93.5	11.5	11	94	NE	OCJ		1	B Deck wet B deck damp
	24	30.04	38	2.5	2.	91	30.02	39	2.5	2	91	30.01	35	1.1	1.1	100	11	10.5	93.5	11.2	11	97	12.2	12	97	N/E	OCm		1	B deck damp " " "
	25	30.04	36.5	1.5	1	91	30.05	35	1	0.8	90.5	30.06	34	0.2	0.2	100	10.5	10	94	9.5	9	93.5	11.5	11.5	100	NNE	OCmJ		1	" " " " " "
	26	30.03	35	0.8	0.8	100	29.99	35	1.1	1.1	100	29.98	35	0.8	0.8	100	10.2	10	97	11	11	100	11	11	100	NE	OCm		1	" " " " " "
	27	29.92	36	1.5	1.5	100	29.86	37	1.3	1.0	94	29.82	35	1.0	0.5	90.5	9	9	100	18	15	95	20	18.5	86	NE	OCmJ	8.01 P.M.	1	B " wet " " "
	28	29.81	36	1.5	1.5	100	29.84	38	1.5	1.5	100	29.90	34	0.2	0.2	100	10.5	10	94	12.5	12	94	14	13.5	94.5	N/E	OCJ		1	Both decks washed up.
	29	29.98	36	0.8	0.5	91	29.99	36	1.5	1.5	100	30.00	34	0.5	0.5	100	12	11.5	94	16	14	94	16.5	15	84	ENE	OCJ	2.07	1	B deck damp B D damp
	30	29.96	35	0.5	0.5	100	29.94	36	1.1	0.8		29.90	32	-1.1	-1.1	100	11	10	87	13	12	94	13	12.5	94	NE/E	OCJm		1	" " wet " " "
	31	29.88	67	1.3	1.0	94.5	29.82	41	3.0	2.5	91	29.78	32	-1.0	-1.0	[illegible]	9.5	9	93.5	9.5	9	93.5	10.5	10	94	"	JE		1	Part melting ice. B.d. damp.
	AVERAGE	29.794	38	1.3	1.1	95.5	29.84	37.4	1.4	1.2	94	29.82	34.3	-.84	-.84	.06	98	88	88.2	97.2	10.2	94.6	11.6	11.2	94.5	Mostly	cloudy	18.54	1	Spar deck wet. B.D. damp.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

August 1882

13

Atmospheric Observations on board U.S.S. Arctic Ship Jeannette, for the month of September, 1880.

Place	Date	SPAR DECK. 10 A.M. Barometer	Attached Thermometer	Dry bulb	Wet bulb	Relative humidity	4 P.M. Barometer	Attached Thermometer	Dry bulb	Wet bulb	Relative humidity	10 P.M. Barometer	Attached Thermometer	Dry bulb	Wet bulb	Relative humidity	BERTH DECK. 10 A.M. Dry bulb	Wet bulb	Relative humidity	Dry bulb	AVERAGE NUMBER OF SHIP'S COMPANY. No. 10 P.M. Relative humidity	Dry bulb	Wet bulb	Relative humidity	Wind	Weather	Carbonic acid, corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, exclusive of injuries.	REMARKS.
In the pack	1	29.72	58	2.5	1.5	82	29.74	34	0.8	0.8	100	29.74	32	-1.0	-1.5	80	8.5	8	93	8.5	93	10.5	10	94	Clm	be		1	Spar deck damp. Berth deck dry.
	2	29.68	37	0.5	0.5	100	29.69	33	-0.5	-0.5	100	29.73	30	-1.5	-1.5	100	9.5	9	93.5	8.0	93	10.0	9.5	93	NE	OCS		1	" " wet " " damp
73° 52' N Lat 174° W Long	3	29.84	36.5	0.2	-0.2		29.86	47	-0.5	-0.8		29.86	49.5	0.0	-0.5	90.5	7.5	7	92.5	7.5	92.5	11.0	10.5	93.5	N	OCS	Berth deck 10 P.M.	1	" " " " " "
	4	29.92	49	-0.5	-0.5	100	29.93	53	-1.0	-1.5	90	29.91	57.5	-2.5	-2.8		8.0	7.5	93	18.5	90	15.0	14.5	94.5	N	OCS		1	Both decks were hosed up.
	5	29.90	51	-1.5	-2.0	90	29.91	47	-4.0	-1.5	90	29.94	48.5	-2.0	-2.5	74	7.0	6.5	92.5	11.0	93.5	12.0	11.5	94.0	N/W	bc. S. PM	1.63	1	" " damp.
78° 41' N Lat 177° 12' W Long	6	30.01	48.5	-1.0	-2.0	80	30.01	47.5	-1.0	frozen -1.0	100	29.96	47	-6.0	frozen -6.0		9.0	8.0	86	8.0	93	9.0	8.5	93.0	N	OC be S		1	Spar deck damp. Condensation on beams 3 Berth deck
	7	29.93	45.5	-1.0	-1.5	90	30.05	44.5	-3.3	-3.3	100	30.17	54.5	-6.0	-6.0		6.5	6.0	92.5	13.0	88	14	13.5	94.5	N	bc. S.		1	" " melting snow. B.D. damp.
	8	30.08	47.5	-4.4	-6.0	26	29.95	44	-4.4	frozen		29.84	52	-4.4	frozen		5.5	5.0	92.5	12.0	87	12	11.5	94.0	SSE	bc		1	Snow on Spar deck. " " "
	9	29.70	47.5	-0.2	-0.2	100	29.68	47	+0.8	+0.8	100	29.72	50	0.0	0.0	100	9.2	9.0	97.0	10.0	93	12.5	12.5	100.0	SSW	ocf. R.		1	Spar deck wet rain " " "
73° 40' 15" N Lat 176° 55' 36" W Long	10	29.76	47	0.0	-0.2		29.88	47	+0.2	0.0	96	29.98	48	-5.2	frozen		9.5	9.0	93.5	10.0	99	12.	12	100	NNW	bc-S		1	" " " melting snow " " "
	11	29.82	45.5	-1.5	-2.0	90	29.76	45.5	0.5	+0.0	90	29.78	56	-0.5	-0.5	100	8.0	7.5	93.5	17.5	95	12.5	12.5	100	SW	OC R.S.	1.902 Berth deck 10 P.M.	1	" " " " " Berth deck washed.
	12	29.72	50.5	-0.2	-0.2	100	29.63	51	0.0	-0.2		29.54	50.5	-1.5	-1.5	100	7.8	7.0	89	11.2	97	13.0	12.5	94.3	S	"J. R.S.		1	" " " " " damp.
78° 40' 30" N Lat 176° 30' 40" W Long	13	29.45	47.5	-1.3	-1.3	100	29.46	46	-0.8	-1.0	96	29.49	48	-3.4	-4.7		8.5	8.5	100	9.0	93	11.0	10.5	93.5	SW	bc		1	Berth decks damp
	14	29.47	44.5	-5.5	-6.0	87.5	29.45	44.5	-4.3	-4.7		29.37	44.6	-8.8	frozen		7.0	6.5	92.5	7.5	92.5	10.0	9.5	93.0	WSW	bc		1	" " dry
	15	29.16	40.0	-6.0	frozen		29.28	47.0	-7.5	frozen		29.45	51.5	-11.0	frozen		6.0	5.5	92.5	13.5	88.5	12.0	11.5	94.0	NE/N	OCS		1	Snow on Spar deck. Berth dry.
73° 36' N Lat 176° 42' W Long	16	29.55	48	-10.0	frozen		29.58	48	-9.4	"	"	29.63	50.5	-12.0	"	"	9.0	7.5	79.5	13.5	94.5	13.5	12.5	88.5	N W/N	bc	Berth deck 10 P.M.	1	Both decks dry.
73° 30' N Lat 176° 33' W Long	17	29.69	49	-12	"	"	29.65	51	-8.5	"	"	29.57	54	-9.5	"	"	9.0	8.5	93.	14.5	93	13.5	12.5	88.5	SW	bc		1	Spar deck dry. Berth deck damp, condensation.
73° 31' 45" N Lat 176° 37' 15" W Long	18	29.46	39-7	-7.5	86.5	29.42	52	-6.0	-6.3			29.55	55	-13.5			7.0	6.5	92.5	16.	84	14.	13	89	SW	bc		1	" " " " " washed -
	19	29.77	55	-7			29.83	56	-7.0			29.85	57	-8.5			7.0	6.5	92.5	8.	93	9.5	9.	93.5	WSW	bc	3.028	1	Both dry.
73° 31' N Lat 176° 56' W Long	20	29.92	54	-7.7			29.95	53	-8.0			29.94	56.5	-9.5			11.5	10.5	87.2	15	85	14.5	13.5	88.5	N/E	OC		1	Spar deck dry. B deck damp.
73° 24' 35" N Lat 176° 53' 45" W Long	21	30.05	53	-10.0			30.06	52.5	-11.0			30.05	54.5	-15.0			12	10.5	82.	14.5	88	14.	13	89	NW	bc		1	Both dry.
73° 23' N Lat 176° 37' W Long	22	30.03	52.5	-10			30.03	49.5	-7.5			30.06	54.5	-6.5			11	9.5	82	13.5	86	13.5	12.5	88.5	clm	bc		1	" "
73° 25' N Lat 176° 46' 15" W Long	23	30.07	52.5	-4.5			30.05	54	-6.5			30.02	54.5	-8.5			12	11.0	88	18	88	14.	12.5	83.5	NE	OC		1	" "
	24	29.98	51	-9.5			29.93	49	-7			29.92	55	-8.5			10.5	9.5	87.5	10	93	12.5	11.5	86.	E	OC	Berth deck 10 P.M.	1	" "
	25	29.93	53.5	-5.5			29.68	54.5	-7			29.56	54.5	-5.5			7.5	7.	92.5	13	94	15.5	14	84	NNE	OC		1	Snow on Spar deck. B deck. washed up -
	26	29.67	54.	-4.4			29.76	52	-08			29.74	55.	-7.0			10.	9.5	93	14.5	79	15	14	89	E	OC	3.575	1	" " " " " " " dry.
	27	29.91	54.5	-7.5			29.91	55.5	-4.5			29.95	55	-7.0			11.5	10.5	87.2	14.5	88	15	14	89	NE	OC		1	" " " " " " " "
	28	30.04	55	-8.			30.03	53.5	-3.5			30.04	57	-5			7	6.5	92.5	10.	86	12	11	88	ENE	OC		1	" " " "
	29	30.08	54	-10.5			30.06	53	-11.5			30.08	56.5	-10.5			7.5	6.5	85.5	10	86	13.5	12	85.5	N E/E	OC		1	" " " " " "
	30	30.03	53	-15.			30.00	49	-15			30.02	55	-15.5			5	4	84	9.5	73	10.5	9	81	NNE	OC		1	" " " " " "
	31	2																											
		29.76	49.6	-4.7	-1.7	87	29.80	48.7	-4.6	-1.5	95	29.82	51.5	6.4	-2.4	92.2	8.4	7.7	90.4	11.6	88.9	12.5	11.4	91.2	Variable	19 OC 11 bc	2.519	1	Average during

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748 +.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Sept 1882

14

Atmospheric Observations on board U. S. S. Arctic Str Jeannette, for the month of October, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	4 P. M. Wet bulb.	Relative humidity.	Dry bulb.	10 P. M. Wet bulb.	Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No. Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick excluding injuries.	REMARKS.
	1	29.86	49	-11.1			29.78	47	-8.3			29.73	56	-6.5			7.5	6	85	12.5	11	82	13.5	12.5	90.5	nnw	oc		1	Both decks dry.
	2	29.67	54.5	7.2			29.66	50.5	-6.5			29.72	55	-7.2			7	6	85	13.5	12	83	14	13	89	Ne	bc	Both decks dry	1	" " "
73° 41' N Lat 175° 50' W Lng	3	29.90	53.5	-12.2			29.99	53.5	-10.5			30.06	56	-15.5			9	8	86	11.2	11	85	10	9.5	93	sw/w	bc	2.017	1	" " "
	4	30.16	49	-11.3			30.12	53	-13.5			30.23	56	-16.5			5	3.5	77	9.5	8	80	11	9.5	81	..	OCS		1	" " "
	5	30.24	50	-15.5			30.25	49	-12.2			30.27	53	-11.5			5.5	4	76.5	8.5	7	79.5	10.5	9	81	wnw	bc		1	" " "
	6	30.30	50	-10.5			30.30	50	-10.5			30.38	53	-10.			8.5	2	74.5	9	7	78	10.5	9.5	86.2	N	oc		1	" " "
	7	30.35	54	-9.1			30.32	50	-9.5			30.30	53	-11			8.5	6.5	72.7	11.5	10	88	11	10	87	N	OCS	Both decks	1	" " "
	8	30.15	49.5	-11.			30.11	52	-11.			30.11	52	-11.5			9	7.5	79.5	12	10	82	14.5	13	83	NNW	OCD	Both decks 10 hours	1	" " "
	9	30.07	49	-11.5			30.05	51	-11.8			30.07	56	-11			7	5.5	72	12.5	11	88	14.5	13	83	nw/w	oc		1	Spar deck dry. Berth deck washed.
	10	30.08	52.5	-11			30.09	52	-11.3			30.10	53	-11.3			7	5.5	72	11.5	10	81.5	14.5	13	83	N	bc		1	Both decks dry.
	11	30.08	55	-12.2			30.07	50	-10.8			30.10	55	-11.1			9.5	8	80	13.5	12	83	15	13	78	E	OCD	3.129	1	" " "
	12	30.11	52	-11			30.14	50	-12.5			30.15	58	-12.8			10	8.5	80	12	11	78	11	10	87	clm	OC		1	" " "
	13	30.21	50	-12.5			30.22	51	-11.5			30.25	55	-12.5			8	7	86	11	10	87	10	9	86	E	OC		1	" " "
	14	30.19	50	-14.4			30.16	46	-12.3			30.13	50	-8.8			6.5	4.6	70.5	11	9	75	12	11	88	E	OC		1	" " "
	15	30.23	51	-6.5			30.28	49	-7.2			30.30	53	-12.2			10.5	9	81	12.5	11	82	11	10	87	ow/w	OC		1	" " "
73° 27' N Lat 178° 33' E Lng	16	30.30	53	-17.5			30.30	47	-20.0			30.35	53	-20.5			8.5	7.5	86	11.5	10	81.5	10	9	86	ww	bc	Both decks 1 hour	1	Spar deck dry. B.D. washed up
	17	30.44	52	-22.7			30.40	44	-22.2			30.39	52	-24.4			5.5	5.	92.5	11	10	87	7.5	6.5	86	w/s	bc	1.9069	1	Both dry.
	18	30.27	48	-17.7			30.25	48	-15.			30.24	53	-13.8			6	5	85	9	8	86	12	12	88	sw/s	OCD		1	" "
	19	30.24	53	-13.5			30.14	53	-15			30.13	53	-16.5			8.5	7	79.5	10.5	9	81	11	10	87	SE/E	bc		1	" " "
	20	30.00	52.5	-12.7			29.88	55	-10.5			29.79	53	-9.4			8.	6	72	12.5	10	76.5	10.5	9	81.5	E/N	OCD		1	" " "
	21	29.88	56	-12.7			30.00	55	-12.2			30.19	57	-10.5			10	8	74	12	10	82	13	12	88	W	OC		1	" " "
	22	30.38	57	-11.6			30.41	53	-11.6			30.49	53	-11.8			12	10	76	15	13	85.5	14	13	89	SW/W	OCS		1	" " "
	23	30.68	52	-18.8			30.72	52	-21.1			30.73	53	-18.3			10	8	74	14	12	78	14.5	13	83	NW	bc	Both decks 10 hours	1	" " "
	24	30.55	56	-15.			30.42	51	-15			30.30	52	-14.21			9	7	73	12	10	82	10	8.5	80	E/S	bc		1	" " "
	25	30.10	49	-22.5			30.02	43	-21.5			30.00	50	-22.2			7.5	5.5	71.5	11	10	87	9	7	73	OE	bc		1	" " "
	26	30.04	54	-20.5			30.07	46	-22.2			30.15	53	-20.5			4.5	3	75.5	11	10	87	9	8	86	E/N	bc	.9158	1	" " "
	27	30.26	47	-18.8			30.35	51	-18.3			30.42	52	-17.7			7.5	6	78.5	11	10	87	11.5	9	72	N/W	bc		1	" " "
	28	30.57	53	-15.5			30.60	50	-20.5			30.59	52	-19.4			9	7	73	15	12	78	11.5	10	84.5	"	"		1	" " "
	29	30.58	51	-20.5			30.59	49	-23.8			30.69	52	-25.5			7	6	86	13	11	87	10	8	74	"	"		1	" " "
	30	30.71	47.5	-28.5			30.73	52	-21.6			30.70	55.5	-23.3			9.5	8	80	12.5	11	82	11	9.5	81	NW	"		1	" " "
	31	30.62	49.5	-23.3			30.57	52	-22.2			30.50	51	-18.3			5.5	4	76.5	12	10	86	11.5	10	81.5	SE/S	"		1	" " "
	AVERAGE	30.23	51.2	-15			30.22	50	-14.5			30.24	53.7	-15.8			7.7	5.9	78.7	11.7	10	82	11.9	10.2	83.8	variable	bc	1.9421	1	day Both decks washed on alternate day

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Ship Jeannette, for the month of November, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	Wet bulb.	4 P. M. Relative humidity.	Dry bulb.	Wet bulb.	10 P. M. Relative humidity.	Wind.	Weather.	AVERAGE NUMBER OF SHIP'S COMPANY. No. Carbonic acid corrected for Temp. and Pressure per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
	1	30.38	54	-18.3			30.37	53	-16.6			30.39	55	-14.4			12.	10	76	12.5	12	76	14	12	78	N	be	1.5704	1	Both decks dry -
	2	30.26	50	-15.			30.15	51	-12.5			30.18	56	-16.1			16	13	69	12	12	76	13.5	12	83	WNW	Clr			" " "
73°.44° N Lat 179.57 E Lg	3	30.34	51	-19.4			30.38	50	-20.5			30.38	51.5	-26.1			17	15.5	85	15.5	13	74	13	11.5	82.5	WNW	be		1	" " "
	4	30.04	46	-13.3			29.89	46	-12.3			29.80	53	-12.5			15	12	66	14.5	12	73	14	12	79	NW/W	Clr		1	" " "
	5	29.77	50	-22.2			29.80	48	-23.3			29.88	53	-28.8			16	14.5	84	15	12	78	12	10.5	82	WNW	be		1	" " "
	6	29.92	51	-29.4			29.93	44	-31.1			30.00	52	-29.4			13	12	78	12	10	82	11.5	10	82	"	be		1	" " " "
	7	30.02	43	-30.5			30.05	45	-29.4			30.15	51	-30.5			11	9	75	11.5	9	85	12	10	76	WSW	be		1	" " "
73° 40' N 179° 27' W.	8	30.20	43	-28.8			30.19	44	-29.4			30.20	48	-27.7			11.5	9	81	9.5	8	80	10	9	86	ENE	be	1.0694	1	" " "
	9	30.09	48	-27.2			30.05	49	-26.1			30.00	53	-24.4			13.5	11	72	11.5	9	81	11	10	82	ESE	be		1	" " "
	10	29.83	49.5	-25.			29.78	48	-26.1			29.77	51	-26.1			13	11	77	12	10	76	11	10	87	NNE	be		1	" " "
	11	29.70	47	-27.7			29.67	46	-28.5			29.65	57	-28.5			13.5	11	72	10	8	85	12	11	88	N	be		1	" " "
	12	29.51	45	-28.8			29.46	44	-30.			29.50	53	-27.7			8.5	7	80	9.5	7	60.5	10	8.5	80	N	be		1	" " "
	13	29.69	49	-24.6			29.75	49.5	-24			29.79	54	-23.8			10	8	74	9	7	73	9	8	86	NE	be		1	" " "
	14	29.70	50	-24.4			29.90	49	-27.7			30.03	51	-28.4			11	9	75	12	10	82	13.5	12	83	SW/W	be		1	" " "
	15	30.45	49	-27.7			30.64	46	-27.7			30.92	50	-29.4			13.5	11	72	10	8	74	11	10	87	SSW	be		1	" " "
	16	31.11	50	-29.4			31.05	46	-28.3			30.95	51	-25.5			7	6	85	9.5	8	84.5	10	9	86	N/E	be		1	" " "
	17	30.48	50	-16.6			30.29	54	-14.4			30.18	58	-12.7			9	8	86	10	9	86	11	9	75	E	be	Wind blowing a gale	1	" " "
	18	29.93	60	-14.4			29.80	58	-13.3			29.70	57	-13.3			12	10	76	13.5	11	82.5	12	10.5	82	E/N	be		1	" " "
	19	29.67	60	-13.3			29.48	58.5	-13.8			29.80	56	-17.7			11.5	10	82	15	12	66	14.5	13	83	W/N	be	1.884	1	" " "
	20	29.93	56	-16.1			30.00	55	-18.8			30.09	60	-18.3			13	11	77	15.5	13	74	12	10.5	82	NW/W	be		1	" " "
72°.48' N 179° 48'.8	21	30.25	61	-14.8			30.20	57	-18.0			30.25	59	-15.5			14	11.5	70.5	13.5	11	82.5	12	11	88	NE	be		1	" " "
	22	30.23	55	-21.6			30.20	52	-23.3			30.20	58	-20.5			11	9	75	10.5	9	80.5	13	12	89	NNW	be	2.018	1	" " "
	23	30.19	54	-23.3			30.17	53	-23.8			30.20	54	-23.3			11	9	75	10	8	74	13	11	77	NW/N	be		1	" " "
	24	30.27	65	-22.7			30.30	56	-26.1			30.36	54	-24.4			14.5	12	73	12.5	11	71	11.5	10	82	SW	be		1	"
	25	30.39	60	-21.6			30.33	56	-24.1			30.29	55	-23.3			11.5	10	82	10	8	74	11.5	10	82	E	be		1	" " "
	26	30.14	63	-23.8			30.06	60	-21.6			30.05	57.5	-19.4			14	12	78	14.5	12	73	13	11.5	82.5	N	be		1	" " "
	27	30.01	59	-19.4			29.97	55	-17.1			29.95	61	-17.1			16	14	79	14	12	75	14	12.5	73	NE	be		1	" " "
73° 41' N 178° 39' E	28	29.96	60	-18.3			29.94	49	-18.8			30.03	61	-20			15.5	13	74	14.5	12	78	12	10.5	82	N/E	be		1	" " "
74°. 0 N	29	30.24	60	-20			30.20	56	-20			30.02	57	-17.7			12.5	10	71	13	11	77	14	12	79	ENE	be		1	" " "
	30	29.60	67	-6.6			29.58	63	-6.6			29.66	61	-6.1			14.5	12	73	16	14	79	16.5	15	84	ESE	be	2.0803	1	Spar deck untinuting in dock house
	31																													
AGE		30.10	52	-21.5			30.06	50.9	-21.9			30.07	55	-21.7			12.7	10.6	74.5	13.2	11	74	12.5	10.8	79.1			1.9049 1.884 WR	1	worked on anchorage -

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morn... should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in ... of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Str. Jeannette, for the month of December, 1880.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	10 P. M. Wet bulb.	Relative humidity.	Dry bulb.	AVERAGE NUMBER OF SHIP'S COMPANY. No. 98 Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
	1	29.53	64	-8.3			29.56	59	-9.4			29.82	60	-17.7			16	13.5	74	15	68	15	13	78	ENE	bc		1	A dark and misty in dark house
	2	29.88	63	-20.5			30.03	56.5	-23.3			30.10	57	-22.2			11	9	75	12	76	11	9.5	81	NW/S	bc		1	Dry.
	3	30.58	64	-25.5			30.60	61.5	-23.8			30.54	58	-20.			11.5	9	72	11	75	13	11.5	83.5	WNW	bc		1	dry.
	4	29.98	57	-10			29.90	53	-7.7			29.89	61.5	-18.6			12	10	76	14.5	83	13.5	12	83	N/E	oc		1	A. damp. B dry.
Lat 74° N Lon 179° 10' E Lat 73° 53' N Lon 179° 10' E	5	29.84	07	-12.2			30.23	57	-17.2			30.44	63	-22.8			15	13	78	16	79	15	13	78	NNW	oco	Lamp 12 hrs	1	" " " "
	6	30.52	58	-29.4			30.50	54	-28.8			30.48	60	-29.4			13	10.5	71.5	13	77	12	10	76	W/S	Bc	Lamp 12 hrs	1	dry -
	7	30.26	55	-24.6			30.00	60	-23.3			29.95	61	-23.3			12.5	10.5	76.5	13	77	13	11.5	88.5	N	Bc	2,2417	1	"
	8	29.80	55	-22.2			29.80	55	-21.1			29.88	61	-22.2			12.5	10	71	13.5	77.5	11	9	78	W/S	Bc		1	"
	9	29.87	53	-20.5			29.80	60	-28.			29.83	61	-27.7			12.5	10	71	12	76	11	9	75	W/S	Bc		1	"
	10	29.49	55	-24.4			29.62	62	-25.5			29.56	56	-23.8			11	9	75	9	86	8	6	85	"	Bc		1	"
	11	30.09	55	-28.3			30.19	62	-30.0			30.29	53	-31.6			12	10	70	10	74	85	7	79.5	WNW	Bc		1	"
	12	30.03	56	-28.3			30.05	62	-25.5			29.98	64	-23.8			9.5	7	67.5	11	75	9.5	9	93.5	NNW	Bc		1	"
	13	29.93	55	-23.3			29.75	54	-23.3			29.73	56	-23.8			13	11	77	15	78	13	11.5	83.5	N/W	oc		1	"
	14	29.70	60	-28.3			29.82	49	-30.			30.05	55	-32.7			10.5	9	81	11	75	13	12	88	WNW	bc		1	"
	15	30.37	52	-23.3			30.34	50	-34.4			30.38	55	-34.1			10	9	86	13.5	72	12.5	11	82	NNW	bc	Blank 1,0 rain	1	"
	16	30.24	57	-35.5			30.05	52	-33.3			29.96	56	-32.2			13.5	11	72	12	76	10.5	9.5	88.5	NW/N	bc		1	"
	17	29.75	53	-33.3			29.67	44.5	-34.4			29.65	53	-33.3			14.5	12	73	14	75	13	11	78	W	bc	2.683	1	"
	18	29.59	50	-28.3			29.62	49	-26.6			29.69	56	-21.6			8	6	72	11.5	81.5	12	10.5	82	N	bc		1	"
	19	29.68	54	-29.4			29.69	52	30.0			29.78	57	-31.1			13	11	77	12.5	82	11.5	10	81.5	E/N	bc		1	"
	20	29.90	59	-31.6			29.85	63	-28.8			29.72	64	-25.5			11	9.5	81	14	83.5	14.5	13	83	ENE	bc		1	"
	21	29.77	58	-24.4			29.70	49	-24.4			29.72	55	-23.8			10.5	11.5	77	13	77	11	9.5	81	W/N	oc		1	"
	22	29.75	52	-23.8			29.89	49.5	-25.5			30.06	52	-23.3			13	11	77	14	78.5	12.5	11	82	W	oc		1	"
	23	30.30	52	-26.6			30.30	48	-26.6			30.18	52	-26.1			11	9	77	14.5	83	12	11	88	NW/W	oc		1	"
	24	29.87	49	-21.1			29.90	47	-18.8			30.02	56	-17.7			14.5	12	70	12	78	11.5	10	81.5	N	oc		1	"
	25	29.75	57	-12.7			29.80	54	-18.5			29.80	55.5	-15.5			12.5	10	71	14.5	83	13	12	88	ENE	bc		1	"
	26	29.75	55	-15.0			29.55	53	-17.7			29.74	56	-23.8			15.5	13.5	77	16	84	15.2	14	87	W/N	oc		1	"
3 Lat 78° 37' N Long 179° 32' W	27	30.02	44	-28.3			30.06	52.5	-29.4			30.02	55	-29.4			15	13	78	16	79	15	13.5	82	N	bc	2,2292	1	"
	28	30.17	53	-31.1			30.20	52	-32.2			30.20	52	-32.2			13.5	11	72	15	78	13	11.5	83.5	N/E	bc		1	"
	29	30.14	50	-31.4			30.08	49	-26.6			30.05	55	-26.1			12	10	70	16	79	13	11	78		bc		1	"
	30	29.79	50	-24.6			29.50	50	-15.5			29.67	52.5	-22.2			11.5	9	72	11	77	11	9.5	81	E/N	bc		1	"
	31	30.13	56	-23.8			29.83	53	-29.1			29.97	62.5	-30.			15	13	78	14	78	12	10	78	WNW	bc		1	"
	AVERAGE	29.97	53.7	-24.7			29.93	53.3	-26.6			29.97	55.7	-24.4			12.2	10.7	74.8	13.3	78.5	12.5	10	82.1	Various	bc	2,3913	1	dry.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morn... should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in ... n of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S Arctic Ship Jeannette, for the month of February, 1881.

	SPAR DECK.												BERTH DECK.								AVERAGE NUMBER OF SHIP'S COMPANY. No. 33				REMARKS.
	10 A. M.					4 P. M.					10 P. M.					10 A. M.				4 P. M.			10 P. M.			
DATE.	Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	Wet bulb.	Relative humidity.	Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	
1	30.54	56	-14.1			30.63	58	-18.3			30.69	62	-18.8			14.5	14	76	14	12	78	14.5	12.5	78	E	bc		1	clear.
2	30.58	58	-18.3			30.40	53	-18.3			30.26	57	-18.0			14.5	13.5	69.5	15.5	12	85	15	13.5	83.5	NE/E	bc		1	"
3	29.96	56	-14.4			29.82	54	-15.5			29.74	60	-15.0			15	13	78	14.5	14	86	16	14	79	NNE	ocs	2.49	1	"
4	29.64	55	-14.4			29.68	53	-15.5			29.80	51	-21.6			16	14	77	17	14	74	17	15	80	WNW	ocs		1	"
5	30.03	58	-30.5			30.03	54	-31.6			30.02	60	-29.4			16	15.5	73.5	15.5	13	74	13	11.5	80	"	bc		1	washed B Deck
6	29.78	56	-25.5			29.75	55	-24.6			29.87	59	-31.1			15	13	78	13	11	77	14.5	10.5	87.2	ENE	bcs		1	dry.
7	30.15	56	-33.8			30.20	55	-33.3			30.27	57	-31.6			12	10	78	14.5	12	78	13.5	12	83	W	bc		1	"
8	30.16	56	-24.4			30.11	52	-21.6			30.18	56	-18.8			12	10	78	13	11	77	13.5	12	88	NE/E	bc		1	"
9	30.38	51	-18.3			30.48	52	-19.4			30.53	57	-21.1			14.5	12	73	15	12	73	14.5	13	88	NE	bc		1	"
10	30.45	56.5	-16.1			30.38	57	-13.3			30.37	61	-12.7			17	14.5	75	16	13	74	17	15.5	85	ENE	bc	2.758	1	"
11	30.57	58	-15.0			30.63	55	-14.4			30.64	61	-13.3			16.5	14	76	15	13	78	15	13.5	83.5	NNE	bc		1	"
12	30.30	54	-13.8			30.30	53	-9.4			30.56	57	-12.2			17	13	78	15	13	78	16	14	79	NE	bc		1	washed B deck.
13	31.02	60	-17.2			31.05	58	-20.0			31.07	60	-19.4			16	14	79	14.5	12	73	14.5	12.5	78	Variable	bc		1	clear
14	30.90	57	-17.7			30.83	57	-17.2			30.74	59	-16.1			14	11.5	72.5	14	12	78	15.5	13.5	79	E	bc		1	"
15	30.62	54	-17.7			30.60	53	-20.5			30.71	64	-21.1			17	14.5	78	15	12	78	14	12	78	NNW	bc		1	"
16	30.72	55	-21.1			30.70	50	-21.1			30.78	61	-21.4			15	12.5	73	13	11	77	13	11	77	E/N	bc		1	"
17	30.84	54	-22.7			30.84	56	-23.3			30.85	61	-23.8			12	9.5	71.5	12	10	78	13	11	72	NNE	bc		1	"
18	30.87	59	-24.4			30.73	57	-25.0			30.73	62	-25.0			10.5	8.5	75	14	12	78	14.5	12.5	78	N	bc		1	"
19	30.64	57	-24.4			30.57	57	-25.0			30.53	62	-24.4			11	9	75	14	12	78	11	9.5	81	N	bc		1	washed B deck.
20	30.28	54	-22.7			30.15	50	-23.8			30.14	58	-23.3			13	10.5	71.5	14.5	12	79	12	10	76	E/N	bc	1.8286	1	dry.
21	30.23	52	-23.3			30.29	52	-28.3			30.35	60	-28.3			10.5	8.5	75	13	11	77	10	8.5	80	WNW	bc		1	"
22	30.25	55	-29.4			30.39	50	-31.6			30.48	67	-32.2			10	8	74	9.5	8	80	10	9	86	ENE	bc		1	"
23	30.49	53	-31.6			30.45	51	-31.4			30.42	57	-30.5			12	10	76	11	9	75	13	12	88	NE	bc		1	"
24	30.24	53	-23.6			30.16	53.5	-19.4			30.19	58	-16.6			11	9	75	13.5	10	76.5	13.5	12	83	ENE	ocs		1	"
25	30.27	52	-18.3			30.32	53.5	-19.4			30.44	58	-21.1			14.5	12	78	12	10	78	13	13	78	E/N	ocs	1.2486	1	"
26	30.53	52	-21.1			30.60	49	-24.4			30.73	57	-26.6			12.5	10	71	13	11	77	13.5	12	83	E/N	bcs		1	washed B deck
27	30.73	53	-27.7			30.62	52	-27.7			30.57	56	-28.3			13	11	77	13	11	77	13.5	12	83	NNW	bc		1	
28	30.29	52	-26.1			30.33	51	-28.3			30.30	55	-27.2			14	13.5	78.5	14.5	13	78	14.5	15.5	89.5	NNW	bc		1	
29																													
30																													
31																													
AVERAGE	30.016	55	-21.7			30.08	53.7	-25.4			30.35	58	-22.4			13.9	11.6	74.9	13.8	11.8	76.3	13.8	12.2	81.3	Variable	bc 24 ocs 2 ocs 2	2.0808	1	Berth deck washed on stormy days.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Jan 18 1887

Atmospheric Observations on board U. S. S Arctic Str Jeannette, for the month of January, 1881.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No..... Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
	1	30.00	59	-24.1			29.95	55	-24.1			29.97	59	-25.5			14	12	78	15.5	13	78	14	12	78	NE/E	oc		1	dry.
	2	29.94	49	-24.4			29.97	49	-24.4			30.00	55	-23.8			12.5	11	82	14	12	78	12.5	11	82	ENE	oc		1	"
	3	30.03	53	-24.4			30.02	57	-23.3			30.10	52	-21.6			10.5	8.5	75	12.	9	65	12.5	11	82	ENE	oc		1	"
	4	30.28	50	-21.4			30.32	51	-22.7			30.39	53	-22.7			13	11	77	11.5	10	84.5	10.5	9.5	87	S/E	oc	1.5953	1	"
	5	30.33	55	-24.1			30.28	52	-23.8			30.24	57	-23.8			11.5	10	84	14.5	12	78	12.5	11	82	ENE	oc		1	"
	6	30.14	54	-24.4			30.09	52	-21.6			30.09	54	-21.1			14	12	78	13	11	77	12	11	88	N/W	oc		1	"
	7	29.95	56	-16.1			29.98	58	-14.4			29.96	60	-14.4			15.5	13.5	79	14	12	78	13	12	88	ENE	oc		1	"
	8	29.99	56	-18.3			30.12	59	-17.7			30.28	58	-17.2			12	10	76	13	11	77	13.5	12.5	88.5	WNW	oc		1	"
	9	30.46	55	-23.6			30.53	53.5	-27.2			30.53	58.5	-28.3			16	14	79	14	12	77	11.5	10.5	87.5	NE/N	oc		1	"
	10	30.31	57	-21.5			30.20	55	-19.4			30.10	58	-16.1			14	12.5	82.5	12.5	11	78	13	12	88	ENE	oc		1	"
	11	30.05	58	-11.4			30.05	57	-14.4			30.10	59.5	-19.1			15.5	13.5	79	14.5	12	78	12	11	88	NE/E	oc	2.4059	1	"
	12	30.05	56.5	-18.3			30.05	56	-15.5			29.98	56	-13.8			13.5	12	83	13.5	12	83	12.5	11	82	ENE	oc		1	"
	13	29.95	52	-15.5			30.00	54	-17.2			30.03	59	-14.4			16	14	79	15	13	78	15	14	89	WNW	oc		1	"
	14	30.03	56	-15.5			30.05	53	-18.6			30.10	52.5	-14.8			15.5	13.5	79	14.5	13	83	13	12	88	NW/W	oc		1	"
	15	30.18	54	-24.4			30.20	50	-29.4			30.23	53	-30			16.5	15	85	14.5	13	88	13.5	12	83	N2/N	oc		1	washed & deck
	16	30.14	53	-32.7			30.20	50.5	-26.1			29.98	54	-23.8			15.5	13	74	15.5	14	86	14	12	78	W	oc		1	dry.
	17	29.79	53	-23.8			29.72	53	-23.3			29.95	53	-21.6			14.5	12.5	79	14	12	78	14.5	12.5	79	NW/W	oc	1.4150	1	"
	18	29.60	51	-21.6			29.60	48	-23.8			29.69	54.5	-24.4			14.5	12	73	12.5	10	71	11	10	87	W/S	oc		1	"
	19	29.84	51	-26.6			29.90	49	-23.8			29.99	53	-28.8			15	12.5	73	15.5	13	79	14.5	12	78	SE	oc		1	"
	20	30.00	51	-32.2			29.99	51	-32.7			30.03	57	-33.3			14	13	78	16.5	14.5	79	13	11	77	SXE	oc		1	"
	21	30.04	51	-31.1			30.15	50	-32.2			30.22	54.5	-32.2			15.5	13	78	15	13	78	12.5	11.5	87.5	WNW	oc		1	"
	22	30.40	52	-31.1			30.48	51	-30.0			30.53	53	-33.3			12.5	10.5	76.5	13	11	77	11	10	87	S/E	oc		1	washed & deck.
	23	30.75	53	-35.5			30.87	56	-36.1			30.95	52.3	-35.5			13.5	11.5	77.5	12.5	11	82.5	12	11	88	SW/W	oc		1	dry.
	24	31.19	53	-35.5			31.10	50	-35.5			31.03	46	-34.4			11	10	87	13	11	88	11	10	87	SE/S	oc		1	"
	25	30.69	53	-28.8			30.42	47	-24.4			30.30	52	-20.5			10.5	9	81	10.5	9	81	10	9	86	ENE	oc		1	"
	26	30.10	55	-16.6			30.01	52	-15.5			30.07	59	-15.0			13.5	11	72	13.5	12	83	17.5	15	75	ENE	oc		1	"
	27	30.28	56	-16.1			30.42	65	-22.7			30.53	58	-28.0			15.5	13	79	16	14.5	84	17.5	15.5	80	SW/W	oc		1	"
	28	30.32	55	-18.3			30.37	53.5	-18.3			30.54	57	-22.2			17	15	80	17.5	15	75	15	13	78	S	oc		1	"
	29	30.65	55	-26.1			30.63	55.5	-24.4			30.59	60	-23.3			17	14	70	18	15	75	16.5	13	79	N	oc		1	washed & deck
	30	30.35	50	-20.0			30.26	56	-18.8			30.22	57	-17.7			19	16	72	18.5	14	84	14	12.5	83.5	ENE	oc		1	
	31	30.14	57	-15.2			30.23	55	-15.0			30.35	57	-14.4			17	15	80	16	13.5	74	12.5	11	82	E	oc		1	
Average		30.19	54.1	-23			30.23	55.1	-26			30.19	53.9	-23.1			14.6	12.7	78.5	14.5	12.8	78.4	13.1	11.9	83.4		bc 17 oc 14		1	washed on entire p.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

$$30 : \text{observed height of bar.} :: \text{capacity} : z.$$

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Feb. 1881.

19

Atmospheric Observations on board U. S. S. Arctic Str Jeannette, for the month of March, 1881.

Place.	Date.	SPAR DECK. 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	AVERAGE NUMBER OF SHIP'S COMPANY. No.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
	1	29.97	52	-22.2			29.93	49.5	-21.6			29.97	57	-21.6			13.5	12.5	88	16	13.5	69	15.5	14	84	NW	OC		1	
	2	30.06	54	-22.2			30.12	50	-22.7			30.21	55	-22.2			16.5	14	74	17	14	70	16	14	79	NW	bc		1	
	3	30.27	50	-24.1			30.21	51	-24.6			30.29	59	-28.3			15.5	13	74	16.5	14	74	16	14	79	NNW	bc		1	
	4	30.31	56	-29.1			30.29	54	-29.1			30.32	61	-30.5			18	16	71	15.5	12	64	17	15.5	85	NNW	oc	4.8479	1	Down in fore castle had been closed up to 10 PM.
	5	30.27	55	-31.9			30.28	48.5	-30.5			30.25	57	-32.7			14	11.5	70	13	11	77	14	11	67	NNW	bc		1	Berth deck washed up.
	6	30.22	49	-32.7			30.25	50	-31.6			30.30	59	-34.4			13	12	77	12.5	10	85	13	11	77	W	bc		1	
	7	30.30	57.5	-34.4			30.22	52	-30.3			30.25	57	-33.8			18	15	71	15	12	68	10	8.5	80	WSW	bc		1	
	8	29.83	56	-27.2			29.59	52	-25.5			29.46	63	-24.4			13.5	11	72	13.5	10	66.5	13	10	66	SW	oc g		1	
	9	29.62	49	-29.4			29.72	47	-31.1			29.83	57	-34.4			11	10	82	13	10	46	13	11	77	WSW	bc		1	
	10	29.85	53	-35.0			29.78	48.5	-28.4			29.63	63	-24.4			15.5	12	68	16	12.5	64	15	13	78	SW/S	bc		1	
	11	29.65	53	-24.4			29.80	51	-28.3			29.97	60	-31.1			17.5	15	75	15	12	68	12	10	76	W	bc	1.5408	1	Co2 Taken at 10 p.m. Berth deck.
	12	30.04	54	-34.4			30.09	48	-32.2			30.09	55.5	-33.8			15.8	13	74	15	12	68	12	10	76	WSW	bc		1	
	13	29.92	47	-27.7			29.89	49	-25.0			29.85	56	-23.8			17.5	14.5	70.5	16.5	13.5	70	18	15	71	S/W	oc		1	
	14	29.50	52	-27.2			30.12	49	-27.7			30.32	57	-32.2			17	14	70	15.5	12.5	68	12.5	10.5	76.5	SW	bc		1	
	15	30.52	50	-33.8			31.45	52	-32.2			30.43	57.5	-33.4			15	13	78	16	13.5	75	17.5	9.5	75.7	S E	bc		1	
	16	30.28	55	-32.7			30.18	50	-30.0			30.13	53	-29.4			15	12	68	16	13	69	14	12	68	SE	bc		1	
	17	30.06	54	-25.5			30.06	49	-26.1			30.12	53	-28.8			15	12	68	17	14	70	14.5	12.5	78	S/E	oc s		1	
	18	30.07	53	-27.7			30.00	50	-23.8			29.97	49	-26.1			15.5	13	74	14.5	11.5	67.5	10	9	97	ESE	bc	1.9266	1	
	19	29.95	58	-25.0			29.95	54	-23.3			30.00	59	-25.0			16.5	13	74	15.5	13	74	14	12	68	ESE	bc		1	Berth deck washed up.
	20	30.15	56	-22.7			30.22	52	-21.6			30.30	59	-25.2			13	10	66	16	13	69	13.5	10.5	66.5	S E	bc		1	
	21	30.31	53	-25.2 -23.2			30.28	55	-26.2 -25.0			30.33	57	-30.0 -30.0			11	9	70	12.5	10	71	10.5	8.5	78	ESE	bc		1	
	22	30.35	55	-30.6			30.35	51	-28.3			30.49	57	-30.0			14.5	11.5	67.5	14	11	67	11.5	9.5	76.7	E	bc		1	
	23	30.39	55	-29.4			30.27	52	-27.2			30.23	57	-29.4			13.5	10.5	66.5	15.5	12	68	13.5	11	72	ENE	bc		1	
	24	30.06	52	-27.7			30.00	51	-24.6			30.00	53	-27.7			13	10	66	12	9	65	9	7	73	ENE	bc		1	
	25	30.00	55	-25.0			30.00	53	-24.4			30.08	58	-27.7			10	8	74	12	9.5	75.5	12.5	9.5	65.5	ENE	bc		1	
	26	29.99	45	-27.7			29.90	42	-24.6			29.85	57	-17.5			13	11	77	12	10	76	11.5	10.5	81.5	ENE	bc		1	
	27	29.86	56	-12.2			29.84	58	-17.2			30.10	63	-24.1			15.5	13.5	79	14	12	67	13	11.5	82.5	ENE	oc		1	
	28	30.30	57	-23.8			30.38	58	-21.6			30.43	57	-23.8			14	13	89	13.5	11	72	12	10.5	82	E	bc		1	
	29	30.34	52	-21.6			30.23	62	-18.3			30.18	58	-20.0			13	11	77	14.5	12	78	10	8	74	NE/E	bc		1	
	30	30.20	63	-18.3			30.20	63	-19.4			30.25	58	-23.3			15	12.5	78	15.5	14	84	13	11	77	E	bc		1	
	31	30.28	56	-24.4			30.29	64	-22.2			30.35	57	-26.1			12	10	76	14	12	79	12	10	76	ENE	bc		1	
Average		30.19	53.3	-27.1			30.12	51	-25.9			30.12	56.5	-27.6			14.8	12	73	14.6	12.3	70.5	12.9	11	79	T	bc 25 oc 4 ccs 2	2.7714	1	Berth deck washed up as extra duty

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit. above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

March 1881

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Atmospheric Observations on board U. S. S

, for the month of , 18

SPAR DECK. BERTH DECK.

Place.	Date.	10 A. M. Barometer.	10 A. M. Attached Thermometer.	10 A. M. Dry bulb.	10 A. M. Wet bulb.	10 A. M. Relative humidity.	4 P. M. Barometer.	4 P. M. Attached Thermometer.	4 P. M. Dry bulb.	4 P. M. Wet bulb.	4 P. M. Relative humidity.	10 P. M. Barometer.	10 P. M. Attached Thermometer.	10 P. M. Dry bulb.	10 P. M. Wet bulb.	10 P. M. Relative humidity.	10 A. M. Dry bulb.	10 A. M. Wet bulb.	10 A. M. Relative humidity.	4 P. M. Dry bulb.	4 P. M. Wet bulb.	4 P. M. Relative humidity.	10 P. M. Dry bulb.	10 P. M. Wet bulb.	10 P. M. Relative humidity.
	1																								
	1879 2nd	29.80	38.4	-2.1			29.87	-1.2	-2.9			29.86	30.6	-1.1			12.8	10.4	72.4	13.7	11.0	73.1				
	3rd	29.66	32	-11.1			29.65	32	-11.4			29.68	32	-11.5			11.8	9.5	71.3	10.1	7.6	73.3	14.3	11.6	69.5	
	Thr	29.70	32	-19.9			29.73	32	-17.2			29.75	32	-17.2			14.4	12.1	74	14.3	12.7	77.7	15.6	13.3	75.6	N
	Dec	30.11	32	-23.6			29.98	32	-23.3			29.97	32	-23.5			14.1	12.5	83.5	14.1	12.4	84.8	15.3	13.7	83.6	
	1880 Jan	30.32	32	-33.7			30.23	32	-33.7			30.31	32	-34.6			15.6	14.1	82.1	15.2	13.3	82.3	15.8	14	81	
	5th	29.97	32	-38.8			29.92	32	-38.7			29.85	32	-38.9			11.6	10.8	89.8	12.1	11.3	89.3	13	12	88	
	March	30.03	32	-28.1			30.01	32	-27.7			30.04	32	-31.4			15.3	14	86	15.6	14.4	87.7	15.8	14.5	86	
	April	29.80	32	-13.9			29.79	32	-12.1			29.83	32	-16.2			11.2	10.4	85.9	15.8	14.3	84.3	16.7	14.2	80.2	
	May	29.97	32	-8.4			29.98	32	-7.7			30.00	32	-10.6			9.9	8.9	88	10.6	12.4.3	84.3	10.6	12	92	A
	June	29.78	35.6	+2.5	+4.03	90	29.78	39.5	+2.4	1.8	88	29.78	32.8	-1.5	-1.8	92.5	8.7	8.1	92.2	10.2	9.4	94	11.6	11.1	93.3	W
	July	29.65	37.4	2	1.5	92.8	29.64	40.1	4.5	3.4	89.9	29.63	35	1	0.7	90.1	8.9	8.5	94.1	9.6	9.3	93	11.7	11.2	94.3	A
	Aug	29.79	38	1.3	1.1	95.5	29.84	37.4	1.6	1.4	94	29.82	34.3	0.3	0.06	98	8.6	8.2	97.2	10.9	10.6	96	11.6	11.2	94.5	NW
	Sept	29.76	49.6	-4.7			29.80	48.7	-4.6			29.82	51.5	-6.4			8.4	7.7	90.4	11.6	10.8	88.9	12.5	11.4	91.2	
	Oct	30.23	51.2	-1.5			30.22	50	-1.4.5			30.24	53.7	-15.3			7.7	5.9	78.7	11.7	10.2	82	11.9	10.2	79	W
	Nov	30.10	52	-21.5			30.06	50.9	-21.9			30.07	55	-21.7			12.7	10.6	76.5	12.2	10.7	77.1	12.5	10.8	79.1	NE
	Dec	29.97	53.7	-24.7			29.93	53.3	-24.6			29.87	55.7	-24.4			12.2	10.7	74.5	13.2	11.5	76.5	12.1	10	82.1	
	1881 Jan	30.19	54.1	-23			30.23	55.4	-26			30.19	53.9	-23.1			14.6	12.7	78.5	14.5	12.5	78.4	13.1	11.9	83.4	
	19	30.01	55	-21.7			30.38	53.7	-25.4			30.38	58	-22.4			13.9	11.6	74.9	13.9	11.8	76.8	13.8	12.2	81.3	
	March 20	30.09	53.5	-27.1			30.12	51	-25.9			30.12	56.5	-27.6			14.5	12	78	14.4	11.9	70.5	12.9	11	79	W
	April	30.15	53	17			30.00	51	-16			30.08	52.8	-16.9			7.1	6.1	79.9	10.3	8.4	78.8	9.9	8.4	80	W
	22																								
	23																								
	24																								
	25																								
	26																								
	27																								
	28																								
	29																								
	30																								
	31																								
	Average																								

AVERAGE NUMBER OF SHIP'S COMPANY. No.

10 P. M. Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	Remarks.
79.1		Dec 16			
		Dec 14.82	2.6206	0	Spar deck with from melting snow + ice
		Dec 16			
		Dec 7			
		8	1.447	0	
		Dec 15			
75.6	N	Dec 24	1.711	0	
		Dec 17	2.5184		
83.6		Dec 14	0.975 Dec	0.2	D4 Telling in Decks towards Camps.
		Dec 24			
81		Dec 31	2854	1	" " " " "
		Dec 19	(3)		
88		Dec 15	3.304	1	" " " " "
		Dec 26			
86		Dec 7	2.369	1	" " " " "
		Dec 16			
80.2		Dec 14	.45	1	" " " " "
		Dec 12			
92	A	Dec 19	1.561	1	Decks washed up twice a week.
93.3	W	Dec 15			
		Dec 15	2.423	1	17 Days dry. 13 with melting snow + Rain
		Dec 13			
94.3	A	Dec 18	2.637	1	R 5. decks washed 5. S. G. (2 Dec Amos)
		Dec 28			
94.5	NW	Dec 3	1.8756	1	R 5 " " 4 " 6
		Dec 19			
91.2		Dec 11	2.579	1	R. 1. " " 2 " 8. R 4 5 2.
		Dec 15			
79	W	Dec 16	1.9921	1	" " 2 " 6
		Dec 6	1.9049		
79.1	NE	Dec 24	1.884 Dec	1	Berth Decks washed 1 a week, 1 2
		Dec 8			
		Dec 23	2.3413	1	" " " 1 " " D. 2.
		Dec 17	1.8170	1	" " " 1 " "
		Dec 22			
		Dec 24	2.0803	1	" " " 1 " "
		Dec 25			
79		Dec 2	2.2714	1	
		Dec 14			
		Dec 8	1.2574	1	
		Dec 4			

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the mo[rning] should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in [the] column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.