EXPLANATIONS AND SAILING DIRECTIONS

TO ACCOMPANY THE

WIND AND CURRENT CHARTS,

APPROVED BY

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CHIEF OF THE BUREAU OF ORDNANCE AND HYDROGRAPHY,

AND PUBLISHED BY AUTHORITY OF

HON. ISAAC TOUCEY,
SECRETARY OF THE NAVY.

BY

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WASHINGTON.

VOLUME I.

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ABSTRACT LOG.

(1)_____

(2)_____

(3)_____

(4)_____

(5). LOCAL DEVIATION:

Before sailing.

SHIP'S HEAD.	DEGREES OF DEVIATION.	SHIP'S HEAD.	DEGREES OF DEVIATION.
NORTH . .		SOUTH . .	
N.NE. . .		S.SW. . .	
NE. . . .		SW. . . .	
E.NE. . .		W.SW. . .	
EAST . .		WEST . .	
E SE. . .		W.NW. . .	
SE. . . .		NW. . . .	
S.SE. . . .		N.NW. . .	

When arrived.

SHIP'S HEAD.	DEGREES OF DEVIATION.	SHIP'S HEAD.	DEGREES OF DEVIATION.
NORTH . .		SOUTH . .	
N.NE. . .		S.SW. . .	
NE. . . .		SW. . . .	
E.NE. . .		W.SW. . .	
EAST . .		WEST . .	
E.SE. . .		W.NW. . .	
SE. . . .		NW. . . .	
S.SE. . . .		N.NW. . .	

(1). Enter the class of the vessel, her name, country, and the name of the captain.

(2). If the vessel is of iron or wood, and mention the quantity of iron, if any, in the cargo.

(3). Enter the names of the places at which the vessel has called during her voyage.

(4). Name the meridian from which the longitude is calculated.

(5). Give the table of local deviation at the commencement and at the end of the voyage; and state in the log the manner in which it was determined, and if the vessel was loaded with any iron when the observation was made, or whether any iron as cargo was taken on board after the observation was made.

If practicable, the operation should be repeated during the voyage.

New Holland with Polynesia in the South Pacific, may make a difference there. But of this I cannot now speak, for the thermal charts of that ocean have not yet been prepared.

189. Pursuing the study of the climates of the sea, let us now turn to Plate XIV. Here we see at a glance how the cold waters, as they come down from the Arctic Ocean through Davis' Straits, press upon the warm waters of the Gulf Stream, and curve their channel into a horse-shoe. Navigators have often been struck with the great and sudden changes in the temperature of the waters hereabouts. In the course of single day's sail, in this part of the ocean, changes of 15° or 20°, and even of 30°, have been observed to take place in the temperature of the sea. The cause has puzzled navigators long, but how obvious is it not now made to appear! This "bend" is the great receptacle of the icebergs which drift down from the north; covering frequently an area of hundreds of miles in extent, its waters differ as much as 20°, 25°, and in rare cases even as much as 30° of temperature from those about it. Its shape and place are variable. Sometimes it is like a peninsula, or tongue of cold water projected far down into the waters of the Gulf Stream. Sometimes the meridian upon which it is inserted into these is to the east of 40°, sometimes to the west of 50° longitude. By its discovery we have clearly unmasked the very seat of that agent which produces the Newfoundland fogs. It is spread out over an area frequently embracing several thousand square miles in extent, covered with cold water, and surrounded on three sides, at least, with an immense body of warm. May it not be that the proximity to each other of these two very unequally heated surfaces, out upon the ocean, would be attended by atmospherical phenomena not unlike those of the land and sea breezes? These warm currents of the sea are powerful meteorological agents. I have been enabled to trace, in thunder and lightning, the influence of the Gulf Stream in the eastern half of the Atlantic, as far north as the parallel of 55° north; for there, in the dead of winter, a thunder-storm is not unusual.

190. These isothermal lines of 50°, 60°, 70, 80°, &c., may illustrate for us the manner in which the climates in the ocean are regulated. Like the sun in the ecliptic, they travel up and down the sea in declination, and serve the monsters of the deep for signs and for seasons.

191. The hottest water at sea, particularly in the trade-wind regions is, it should be borne in mind, not at the surface, but a little below. To assist in comprehending why it is so, let us imagine a sheet of cold water from the poles to be brought down and spread out from the tropic of cancer to the equator. As soon as it is so spread, the inter-tropical sunbeam and the trade-wind begin to play upon it with antagonistic forces. The sunbeam with its heat warming it and expanding it to make it lighter; the trade wind with its forces converting it into vapor and making it cooler, while it takes away fresh water, thus leaving it salter and therefore heavier. It continues to grow both warmer and salter, but finally the trade wind force prevails, and it sinks a little way. It is now beyond the reach of the trade wind, but within reach of the sun beam. Here it continues to grow warm, until that at the top has been cooled by evaporation, when the warm comes up to replace it, that in its turn it may grow cooler and salter and then sink again.

Observations show a difference of temperature in the water at the surface and below of about 2°. That below being the warmer.

192. It should be borne in mind that the lines of separation, as drawn on Plate XIV., between the cool and warm waters, or, more properly speaking, between the channels representing the great polar and equatorial flux and reflux, are not so sharp in nature as this plate would represent them. In the first place, the plate represents the mean or average limits

for safe and proper navigation, more particularly as the whole of these observations are not to be made in person by the officer of the watch. As a general rule, he will appoint one of his subordinates whom he may consider qualified for that purpose. In the United States Navy these observations are obtained without difficulty."

Captain James observed that in the trigonometrical survey of Great Britain non-commissioned officers and privates of the royal sappers and miners were employed in making the observations necessary in determining the latitude and longitude of the trigonometrical stations, and the distances between them; that they used for these purposes the most expensive and delicate instruments, and that the officers superintending the operation of the survey had as much confidence in the observations made by them as they had in the observations taken by the officers themselves; and consequently, he was of opinion that the meteorological observations, which were considered necessary by the Conference, might, under the superintendence of the officers of the ship, be confided to steady persons acting under their orders.

TEMPERATURE OF THE WATER AT THE SURFACE.—"There is a convenient method, which consists in hauling the water up, in a clean wooden bucket, and placing it in the shade; and after the thermometer has remained in the bucket for two or three minutes, the thermometer should be read, the bulb remaining immersed until the observation is completed."

"Besides the stated periods, occasional observations, made in the same manner, should be entered under the head of Remarks, whenever, for any reason, such as changes in the color of the water, vicinity of ice, shoals, &c., approaches to the Gulf Stream, the mouth of large rivers, or other currents, the temperature of the water be tried."

"The temperature of the water should also be tried during thunder storms, and the heavy display of electrical phenomena."

"The water for surface temperature should be drawn from the quarter boats, in order to get it as far from the ship's side as possible."

TEMPERATURE OF THE WATER AT CERTAIN DEPTHS.—"The temperature *below* the surface of the water to be tried may be taken from any depth that may to the observer seem good, stating in the column the temperature as a fraction, with the depth as the denominator: thus, $\frac{40^{\circ}}{200}$ fathoms" [*i. e.*, temperature at 200 fathoms, $\frac{40}{\circ}$].

"A hollow cylinder of wood, eighteen inches long, about 6 inches in diameter, with a valve near each end opening upwards, will be found, when attached to the deep-sea lead, convenient for bringing up the water from moderate depths."

"It is desirable frequently to try the temperature of the water at the depths of the ship's cock below the surface; before catching the water in the bucket, let it run freely for ten minutes; then put the bucket under, and, when full, let the thermometer stand before reading, as in the case of the surface water."

"Though it is important to have these observations as to temperature made in all parts of the ocean, yet there are parts in which the difference of temperature between the water at and below the surface possesses a peculiar interest; these parts are in the trade-wind regions generally, in the Indian Ocean, Indian Archipelago, and of the Cape of Good Hope, especially in and near Lagulla's Current, near the mouth of large rivers, and in the arctic and antarctic regions."

SPECIFIC GRAVITY OF WATER.—"The specific gravity, whether of water at or below the surface, should be given without any correction, except such as the instrument used may involve; the object of these two columns being to ascertain the specific gravity of sea water

ABSTRACT LOG _____ CAPTAIN _____

DATE.	HOUR.	LATITUDE BY		LONGITUDE BY		CURRENTS.		MAGNETIC VARIATION OBSERVED.	WINDS.		BAROMETER.	
		Observation.	D. R.	Observation.	D. R.	Direction.	Rate.		Direction.	Rate.	Height.	Ther. attached.
I. 31.	2											
	4											
	6											
	8											
	9											
	10											
Noon.	12											
	2											
	3											
	4											
	6											
	8											
	10											
	12											
II. 1.	2											
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
[a]	[b]	[a]	[c]	[a]	[c]	[a]	[a]	[a]	[a]	[a]	[a]	[a]

ABSTRACT LOG FOR THE

DATE.	HOUR.	LATITUDE.	LONGITUDE.	CURRENTS.		BAROMETER.		THERMOM.		FORMS AND DIRECTION OF CLOUDS.	PROPOR. OF SKY CLEAR.	HOURS OF FOG A. RAIN B. SNOW C. HAIL D.	MAGNETIC VARIATION OBSERVED.
				Direction.	Rate.	Height.	Ther. attach'd	Air.	Water.				
I. 31	4												
	9												
Noon.	12												
	3												
	8												
II. 1.	4												
	9												
Noon.	12												
	3												
	8												
2	4												
	9												
Noon.	12												
	3												
	8												
3	4												

FROM _____ TO _____, 185 .

THERMOMETER.		FORMS AND DIRECTION OF CLOUDS.	PROPOR. OF SKY CLEAR.	HOURS OF FOG A. RAIN B. SNOW C. HAIL D.	STATE OF THE SEA.	WATER.			STATE OF THE WEATHER.	REMARKS.
Dry bulb.	Wet bulb.					Temp. at surface.	Specific gravity.	Temp. at depth.		
										This form is intended more especially for men-of-war.
(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
[a]	[b]	[a]	[a]	[a]	[c]	[a]	[b]	[b]	[c]	[a]

MERCHANT SERVICE.

WINDS.	RATE.	REMARKS.
(Latter part.)		This form contains the minimum of what must be furnished by American merchantmen, in order to entitle them to a copy of Charts and Sailing Directions. It is hoped, however, that many of them at least will be willing to do more, and to fill up the man-of-war log. Forms of this will be given to all who will ask for them. ☞ When the abstract log is filled and returned for one voyage, the master should take care to provide himself with another; for every master who is once supplied with the Charts is expected to give his co-operation, and keep abstracts as long as they are required for the perfection or completion of the Charts. A blank chart of engroved squares has been prepared to show the daily march of the barometer with the force and direction of the wind, the hours of rain, &c. This will be very useful to those who will adopt it. Copies of it will be furnished to all who will apply for them.
(First part.)		
(Middle part.)		
(Latter part.)		

Describe on a blank page, in the beginning of your abstract, the instruments you have on board, the manner of using them, and of making the observations.

BAROMETER (corrections to) . . . { Index error. Capacity. Capillarity. Mean height above the sea.

Compared by Mr.
with the standard at 185

THERMOMETERS, (correction to.) [Number your thermometers, and state the corrections that are to be applied to the various readings of each, to make them correct.]

FORCE OF THE WIND indicated by numbers, (sailing by the wind.)

0. Calm.
1. Ship has steerage.
2. Clean full 1 to 2 knots.
3. Clean full 3 to 4 knots.
4. Clean full 5 to 6 knots.
5. With royals.
6. Top gallants over single reefs.
7. Double-reefed topsails.
8. Triple-reefed topsails.
9. Closed-reefed topsails and courses.
10. Closed-reefed main topsail and reefed foresail.
11. Staysails.

FORMS OF CLOUDS ARE: cirrus, (*Ci.*;) cumulus, (*Cu.*;) stratus, (*St.*;) nimbus, (*Ni.*;) &c. [See Plate IV, Vol. II.]

The original reports in English and French having been read and signed by all the members of the meeting, the President declared the Conference closed.

QUETELET.

Naval Order.

This abstract log is to be faithfully kept, and at the end of the cruise returned to the Bureau of Ordnance and Hydrography.

It is desirable, nevertheless, to have, from time to time, abstracts of the different passages as they are made during the cruise.

For this purpose loose blank sheets are furnished.

The commanding officer of the vessel is charged with the execution of this order.

The above has been approved by the Secretary of the Navy, and you will please have it printed and pasted in the abstract log before distribution, and take the necessary measures to supply the loose sheets proposed.

C. MORRIS,
Chief of Bureau of Ordnance and Hydrography.

Lieutenant M. F. MAURY,
National Observatory, Washington.
FEBRUARY 9, 1854.

EXPLANATORY NOTES FOR KEEPING THE ABSTRACT LOG.

The name of the *last* place from which the vessel sailed, and the place to which she is going, should be stated in the abstract.

1*st Column.*—THE TIME inserted in the abstract log should be civil time, but if astronomical [or sea] time is inserted, it should be so stated at the commencement of the log. The months should be indicated by the Roman letters from I to XII, January being I, [December XII.]*

2*d Column.*—HOURS; this column contains all the hours at the even numbers, and in addition 9 A. M. and 3 P. M. The hours 4 A. M. and 9 A. M., noon, 3 P. M. and 8 P. M. are printed in larger type, to indicate that it is at these hours that observations are especially required, as will be further explained.

3*d Column.*—LATITUDE OBSERVED.

4*th Column.*—LATITUDE BY DEAD RECKONING.

5*th Column.*—LONGITUDE OBSERVED.

6*th Column.*—LONGITUDE BY DEAD RECKONING.

The latitude and longitude should be observed frequently at sea, and more especially about 4 A. M., noon, and 8 P. M., and the result referred by the log to the hour nearest to which the observations were made, in order that the ship's position may be as accurately determined as possible at those times. This should be particularly attended to, when the ship is expected to cross or enter upon any of the great streams and currents of the ocean, the trade or periodical winds. The position by dead reckoning should be deduced from the last observation for latitude and longitude. If the longitude is determined by lunar distances, note it in the column with its proper sign ☉ ☾, * ☾, and if by chronometer ☉ or *. When in sight of land, and the ship's position is determined by bearings, it is still desirable that the position of the ship should be given in latitude and longitude, in the proper column.

7*th* and 8*th Columns.*—DIRECTION AND RATE OF CURRENTS: on ordinary occasions, the currents should be determined at noon on each day, by comparing the position of the ship as determined by observation, and its position as found by dead reckoning; the direction and rate of the current in nautical miles for the last twenty-four hours should be given, [or, better, for the time during which it has been felt;] besides the daily entry at noon, the rate and direction of currents should be noted at shorter intervals, when the ship is in the vicinity of the great oceanic currents, or when it is supposed that the currents may sensibly vary in the twenty-four hours.

9*th Column.*—THE OBSERVED VARIATION should be entered in degrees and minutes; and when the variation is determined by observation of the moon or a star, the sign ☾ or * should be placed after the entry, thus: 23° 16′ W. ☾.

The variation should be corrected for local attraction; in other words, the variation

* The remarks contained in brackets [ ] are added by me.—M. F. M.

entered should be what the variation would have been had the ship been heading at the time of observation upon the course in which the local variation would be 0.

It is desirable that every vessel should be provided with a *standard compass*, with which all the observations for variation should be made. The position of the standard compass, or of the one used, should be that at which the local attraction is the least, and the compass should always be placed in the same place. When the variation has not been observed, the variation *used* should be corrected for local attraction, and noted.

10*th Column.*—DIRECTION
11*th Column.*—FORCE
} of the WIND. { The direction and force of the wind should be regularly entered at 4 A. M., noon, and 8 P. M. The force and direction entered should be that which has been most prevalent during the eight preceding hours. The direction should be by compass, and expressed in points. The force of the wind should be indicated by the figures given on page 342; if there are squalls, their force should be given in a parenthesis ( ), opposite the hour at which it takes place.

[Lieut. Vaneéchout, of the French Navy, to whom the task was assigned by his government of translating this work into that language, suggests that fuller explanations should be given as to these two columns. Ready at all times to answer, to the best of my ability, any call for information upon so important a subject as the abstract log, and bearing in mind the distinguished source whence this call proceeds, I have thought I would be rendering the best service to the common cause to give so much of that accomplished officer's letter as relates to the difficulties suggested by him, and of my explanations thereof.

First, he wishes to know if it would be contrary to the plan to make more than three entries a day in columns 10 and 11? To that and his other questions the following is the reply:

It would not be contrary to directions to enter the force and direction of the wind more than three times a day; the observer may enter them for every hour, but he should sum up and give the *prevailing force* and *direction*, according to his judgment, three times a day.

"Must I *always* enter the observations of calm, or only when the calm has been prevalent during the eight hours?"

Answer.—Enter it only when "calm" has been the most prevalent condition for the eight hours.

"I have had one hour of calm, six of north wind, and another hour of calm; what must I enter?"

Answer.—North wind.

"I have had one hour of north wind, six of calm, and an hour of westerly wind; what shall I note?"

Answer.—Calm.

"If I have only an hour or less of calm, must I note it?"

Answer.—It is desirable that you should note it in the column of remarks.

"I have had four hours of N.NW. wind and four of S.SW.; must I enter both, or the resultant—eight hours from the west?"

Answer.—Enter as 8 hours from the west, and call attention to it in your remarks.

"What must I put down for four hours of north wind and four of south wind?"

Answer.—Enter the wind as prevailing from the point from which, in the case supposed, it has been strongest, but note in the column of remarks the fact that it blew four hours from north and four from south.

You remark also, "The instructions issued at Bruxelles are completely silent as to calms, so that many a captain may be tempted to consider them only as the wind zero. I don't think that right." Neither do I. It is seldom that there is such a calm at sea that a vessel moves not for eight hours. There is almost always air enough astir to give her some motion through the water, however slight, during every hour; and the question, therefore, very properly arises what should we call a "calm"?

The more proper classification, perhaps, would have been "light airs and calms," for such I have considered to be the true meaning of the word as used by the Brussels Conference.

In the investigations of this office I have considered and treated as calms not only the absence of wind, but those light baffling airs which are not sufficient to send a vessel more than two knots an hour through the water. Such a classification I consider important and necessary. Perhaps you may differ in opinion with me as to the degree of motion to be classed as a calm; suffice it to say, such is the measure that I have adopted for it, and by this measure all my investigations concerning winds and calms have been conducted.]

12*th* and 13*th Columns.*—THE BAROMETER AND ITS THERMOMETER should be observed, if possible, at all the hours given in Column 2, and at least at 4 and 9 A. M., noon, 3 and 8 P. M. [The thermometer attached to the barometer—and if none be attached, one should be tied to the lower end—should be carefully noted whenever the barometer is observed, for we depend upon it for an important correction for the Bar.]

14*th* and 15*th Columns.*—THE DRY AND WET BULB THERMOMETERS should be observed at the same hours as the barometer. If it rains at the time when the observation with the wet bulb is taken, put the letter B after the temperature. Before reading the wet bulb thermometer, the bulb [or, rather, a thin old linen rag should be tied tightly about the bulb, and then the bulb] should be moistened with fresh water, and allowed to remain a few minutes in the open air, in the shade, and where strong currents of wind from the sails cannot affect it.

no screen?

All the thermometers ought to have two scales, one that of the country to which the ship belongs, the other the centigrade.

16*th Column.*—THE FORM AND DIRECTION OF THE CLOUDS should be noted at least at 4 A. M., noon, and 8 P. M., and as they appear at the time of observation. The form of the clouds should be indicated by the letters given at page 342. When the clouds are observed to be going in different directions at the same time, the direction of the upper one should be stated above that of the lower, and separated by a bar, thus: $\frac{\text{N.NE. Ci}}{\text{SW. Cu}}$. [Plate IV, Vol. II, shows the form of Clouds.]

17*th Column.*—THE PROPORTION OF THE SKY CLEAR should be indicated by figures from 0 to 10. Thus 8 indicates that $\frac{8}{10}$ of the sky is clear.

18*th Column.*—FOG, RAIN, SNOW, AND HAIL. The number of hours of fog, rain, snow, and hail, in the eight preceding hours, should be noted at 4 A. M., noon, and 8 P. M.

The letter A indicates fog; C, snow;
B, rain; D, hail.

One or two bars placed under the hours indicate degree [intensity or quantity]; thus 3 B, is 3 hours of light rain; 3 B, rain; 3 B, heavy rain.

The direction and force of the wind, &c., before, during, and after the rain, should be stated in the column of remarks.

19*th Column.*—THE STATE OF THE SEA during the eight preceding hours should be stated at 4 A. M., noon, and 8 P. M., by means of the signs given on the second page. [These signs were omitted to be inserted in the original, but I recommend for general adoption those used by Mr. Meldrum, of Mauritius, in his valuable contributions to the meteorology of the Indian Ocean. They are as follows: — for a smooth sea; ∧ for a heavy sea; × for a cross or confused sea; ∩ for a swell. Put the course after the sign, to designate direction, thus ∧ E. means a heavy sea from the east; ⏠ S., *very* heavy swell from the south.]

20*th Column.*—TEMPERATURE OF THE WATER AT THE SURFACE. For the hours at which the observations should be taken, see directions for the barometer and thermometer. The water should be taken up in a wooden bucket, as far as possible from the ship's side, and placed in the shade on deck; the thermometer should then be placed in the water, and left there for two or three minutes [five], and read afterwards, whilst the bulb is in the water. In addition to the ordinary observations, the temperature of the water should be taken when any particular circumstances may seem to make it desirable, as when there are changes in the color of the water, [or when the vessel is] in the neighborhood of ice, shoals, the gulf or other streams, and at the mouths of great rivers.

The temperature of the water should also be taken during thunder storms, and when any electrical phenomena are observed. [Note also the temperature of the rain.]

21*st Column.*—THE SPECIFIC GRAVITY OF THE WATER AT THE SURFACE OR AT DIFFERENT DEPTHS should be noted at least once a day; when the water is taken from a certain depth, the depth should be entered under the specific gravity, and under a line ($\frac{0}{1}\frac{2}{0}\frac{3}{0}$). The specific gravity is stated without any other correction than that which the instrument employed may require. The temperature of the water should be placed in the 20th and 22d columns. It is desirable that a uniform scale should be adopted in the instruments used in ascertaining the specific gravity; that the specific gravity of distilled water should be the unit, and that of the sea water expressed in decimals. [The hydrometer of commerce, that is, the one of glass, and in the shape of a thermometer with its bulb slightly loaded, used for proving spirits, is the one recommended for the American service.]

22*d Column.*—THE TEMPERATURE OF THE WATER AT DIFFERENT DEPTHS should be taken at least once a day, according as circumstances may be more or less favorable; the temperature [at the surface] should be entered above the specific gravity, and separated from it by a bar ($\frac{54}{30}$°;) the unit of measure in depths is [fathoms of six feet each, English.] In taking water from moderate depths, it may be hauled up in a cylindrical box, 18 inches long and six inches in diameter, having two valves in the ends opening upwards. This box may be either of wood or iron, and attached to the deep-sea lead.

It is desirable, frequently, to try the temperature of the water at the depth of the ship's cock below the surface; the cock should be left open for 8 or ten minutes before the bucket is filled, and the thermometer should be left two or three minutes [five] in the water, as before enjoined, before reading it, and it may be well to note the speed of the ship at the time the

cock was open. The temperature of the water at the surface should be observed whenever the temperature at different depths is taken.

When there is a great difference between the temperature of the water at the surface, and at some depth, observe the indications of the wet and dry bulb thermometers, and note them in the column of remarks.

Although these observations are of importance in every part of the globe, still, there are certain regions where the differences between the temperature at the surface and the temperature at certain depths have a particular interest. We may mention the regions of the trade-winds, the Indian Ocean, the Cape of Good Hope, and especially in the Lagullas current, and near the mouths of great rivers.

COLUMN OF REMARKS.—The column of Remarks will contain everything which the captain may consider useful. We direct the attention to the following points:

1*st*. If the vessel is a steamer, state whether she was steaming or under sail at the time the observations are made.

Tempests, tornadoes, whirlwinds, typhoons, or hurricanes, &c.—Every circumstance connected with these should be stated in great detail, the different changes of the wind, the appearance of the sky and the clouds, of the sea and electrical phenomena, rain, hail, &c. The height of the barometer should be frequently noted, at least as often as there is a change of a tenth of an inch, and the time when the remarks are made [*i. e.* when the phenomena are seen, or when the observations are made] should be stated.

When *waterspouts* are observed, the time of their duration, their successive appearances, their formation, gyratory movement, translation, and breaking up, should be described.

Note the circumstances attending storms, the thunder, lightning, &c.; and when phenomena of this nature are observed by navigators, they should be guided in their observations by a reference to analogous phenomena, which they may have observed in other regions, more especially upon the edge of the Gulf Stream.

It is desirable to have the *temperature of the rain* compared with the temperature of the air.

When it *hails*, describe the *hailstones*, and the electrical phenomena.

Note the quantity of *dew*, the time when it commences to fall, and, in cases of extraordinary deposits, note the temperature of the air as close to the surface of the sea as possible, and at the same time at the masthead.

When *red fogs* or *showers of dust* are met with, describe the weather and the appearance of the sky, and obtain, if possible, specimens of the dust.

Observe the height of the *waves*, the distance between them, and their rate of progress.

Note the *tide-rips* seen, particularly in the tropics, and the age of the moon at the time.

When the surface of the sea is covered with *pink or white patches* of water, as is often the case in the Pacific Ocean, describe them, and preserve specimens of the water in phials with ground glass stoppers; if practicable, get a cast of the deep-sea lead, and take the temperature of the water at the surface, and at some depth.

When *deep-sea soundings* are taken, state the time the lead takes to descend each 100 fathoms, and carefully preserve whatever the lead brings up from the bottom. [Deep-sea soundings should always be made from a boat.]

It is much to be desired, for the sake of comparison, that the same sized line and the same shaped lead, of equal weight, should be used. [For description of those used in the United States Navy, see pages 120–193.]

In places where *ice* may be met with, observe the temperature of the water frequently; these observations are most valuable when there are fogs which may prevent the ice from being seen, as they may indicate its presence even at the distance of 2 or 3 miles, especially when the ice is to leeward.

Note the appearance of the ice, and the direction in which it has been drifted.

In addition to the *thermometers* usually supplied to ships, it is desirable that they should be furnished with others *with white, black, and blue bulbs*, colored with water colors. These three thermometers should be exposed simultaneously to the sun, in fine weather, for some minutes, at 9 A. M., noon, and 3 P. M., and occasionally at night [to the open sky] in time of dew; their indications should be entered in the column of Remarks.

Note the *shooting stars;* their point of departure and the point to which they appear to converge, the constellations which they traverse, their numbers in a given time. They should be especially observed about the 10th of August and the middle of November.

The *aurora borealis*, the time of its appearance and disappearance, extent, form, position, intensity of light, color, its motions, and changes should be described.

Halos, rainbows, meteors, &c., should also be noted.

Carefully note the appearance of *birds, insects, fish, sea-weed, drift wood*, and mention any circumstances which may throw light upon their appearance.

[In light winds and calms keep a small hoop net overboard for catching insects of the sea. This is an interesting branch of natural history. It opens a wide field, and one in which but few laborers have been. Officers of the medical corps, who can use the pencil and the microscope, have a fine opportunity here presented to them of helping to lay the corner stones of almost a new department in natural history.]

When at anchor, *tidal observations* should not be neglected, and the times of high and low water, if possible, should be observed; state the time also of change of tide, the rate and direction of the current at various stages, both on the flow and ebb, and everything relative to this important question. Hourly meteorological observations, especially at the times of the equinoxes and solstices, would be very valuable.

In addition to the observations mentioned in the abstract log, it is desirable that each captain should write at the end any general remarks which his personal experience may suggest, [as to the route pursued, currents, winds, &c., encountered by the way,] more especially if he has frequently made the same voyage."

REPORT OF THE CONFERENCE HELD AT BRUSSELS,

At the Invitation of the Government of the United States of America, for the Purpose of concerting a Systematical and Uniform Plan of Meteorological Observations at Sea.

"In pursuance of instructions issued by the governments respectively named in the margin, the officers whose names are hereunto annexed assembled at Brussels, for the purpose of holding a Conference on the subject of establishing a uniform system of meterological observation at sea, and of concurring in a general plan of observation on the winds and currents of the ocean, with a view to the improvement of navigation, and to the acquirement of a more correct knowledge of the laws which govern those elements.

The meeting was convened at the instigation of the American Government, consequent upon a proposition which it had made to the British Government, in reply to a desire which

had been conveyed to the United States, that it would join in a uniform system of meteorological observation *on land*, after a plan which had been prepared by Captain James, of the Royal Engineers, and submitted to the Government by Sir J. Burgoyne, Inspector-General of Fortifications.

The papers connected with this correspondence were presented to the House of Lords on 21st February last,* and have been further explained in the minutes of the Conference. And it is here merely necessary to observe that, some difficulties having presented themselves to the immediate execution of the plan proposed by the British Government, the United States availed themselves of the opportunity afforded by this correspondence, of bringing under the notice of the British Government a plan, which had been submitted by Lieutenant Maury, of the United States Navy, for a more widely extended field of research than that which had been proposed; a plan which, while it would forward the object entertained by Great Britain, would at the same time materially contribute to the improvement of navigation and to the benefit of commerce.

An improvement of the ordinary sea route between distant countries had long engaged the attention of commercial men, and both individuals and nations had profited by the advances which this science had made through a more correct knowledge of the prevailing winds and currents of the ocean. But experience had shown that this science, if it did not now stand fast, was at least greatly impeded by the want of a more extended co-operation in the acquirement of those facts which were necessary to lead to a more correct knowledge of the laws which govern the circulation of the atmosphere, and control the currents of the ocean; and that the subject could not receive ample justice, nor even such a measure of it as was commensurate with the importance of its results, until all nations should concur in one general effort for its perfection. But could that happy event be brought about—could the observations be as extensive as desired, and receive that full discussion to which they were entitled—the navigator would learn with certainty how to count upon the winds and currents in his track, and to turn to the best advantage the experience of his predecessors.

Meteorological observations to a certain extent had long been made at sea, and Lieutenant Maury had turned to useful account such as had, from time to time, fallen into his hands;† but these observations, although many of them good in themselves, were but isolated facts, which were deprived of much of their value from the absence of observations with which they could be compared; and above all, from the want of a constant and uniform system of record, and from the rudeness of the instruments with which they had been made.

The moment, then, appeared to him to have arrived, when nations might be induced to co-operate in a general system of meteorological research. To use his own words, he was of opinion that "the navies of all maritime nations should co-operate, and make these observations in such a manner and with such means and implements, that the system might be uniform, and the observations made on board one public ship be readily referred to and compared with the observations made on board all other public ships, in what ever part of the world. And, moreover, as it is desirable to enlist the voluntary co-operation of the commercial marine, as well as that of the military of all nations, in this system of research, it becomes not only proper, but politic, that the forms of the abstract log to be used, the description of the

* See Parlimentary Papers, No. 115. 1853.

† See Sailing Directions, by Maury.