EXPLANATIONS AND SAILING DIRECTIONS

with the compliments of Lt. Maury

TO ACCOMPANY THE

WIND AND CURRENT CHARTS,

APPROVED BY

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THE WIND AND CURRENT CHARTS.

THE great demand for these Charts among seamen, and the interest which they have excited among philosophers, make it proper that I should give a more detailed account than I have yet given as to the origin and progress of the work, the objects it has in view, and the prospects of success.

This seems to be the more proper, because I hope, by giving such an account, to impress seafaring men and others, who have it in their power to facilitate the work, with the importance of the undertaking.

And to show the importance of the undertaking, it may be as well to quote what one of the most profound of philosophers has said with regard to the subject-matter in hand:—

"In the present condition of the surface of our planet," says Baron Humboldt, the most celebrated traveller of the age, "the area of the solid is to that of the fluid parts as 1 to $2\frac{4}{5}$ (according to Rigaud, as 100 to 270). The islands form scarcely $\frac{1}{22}$ of the continental masses, which are so unequally divided that they consist of three times more land in the northern than in the southern hemisphere; the latter being, therefore, pre-eminently oceanic. From 40° south latitude, to the antarctic pole, the Earth is almost entirely covered with water. The fluid element predominates in like manner between the eastern shores of the old, and the western shores of the new continent, being only interspersed with some few insular groups. The learned hydrographer, Fleurieu, has very justly named this vast oceanic basin which, under the tropics, extends over 145° of longitude, the Great Ocean, in contradistinction to all other seas. The southern and western hemispheres (reckoning the latter from the meridian of Teneriffe) are, therefore, more rich in water than any other region of the whole earth.

"These are the main points involved in the consideration of the relative quantity of land and sea, a relation which exercises so important an influence on the distribution of temperature, the variation in atmospheric pressure, the direction of the winds, and the quantity of moisture contained in the air, with which the development of vegetation is so essentially connected. When we consider that nearly three-fourths of the upper surface of our planet are covered with water, we shall be less surprised at the imperfect condition of meteorology before the beginning of the present century; since it is only during the subsequent period that numerous accurate observations on the temperature of the sea at different latitudes, and at different seasons, have been made and numerically compared together."—*Humboldt's Cosmos.*

"I beg you to express to Lieut. Maury, the author of the beautiful *Charts of the Winds and Currents*, prepared with so much care and profound learning, my hearty gratitude and esteem. It is a great

undertaking, equally important to the practical navigator and for the advance of meteorology in general. It has been viewed in this light in Germany by all persons who have a taste for physical geography. In an analogous way, anything of isothermal countries (countries of equal annual temperature) has for the first time become really fruitful, since Dove has taught us the isotherms of the several months chiefly on the land; since two-thirds of the atmosphere rest upon the sea, Maury's work is so much the more welcome and valuable, because it includes at the same time the oceanic currents, the course of the winds, and the temperature. How remarkable are the relations of temperatures, in Sheet No. 2, South Atlantic, east and west of longitude 40; how much would this department of meteorology gain if it were filled up according to Maury's proposition in Commodore Lewis Warrington's Log-Book. The shortening of the voyage from the United States to the equator, is a beautiful result of this undertaking. The bountiful manner in which these Charts are distributed raises our expectations still higher."—*Baron Von Humboldt to Dr. Flügel, U. S. Consul, Leipsic.*

It is not for the benefit of navigation alone that seamen are invited to make observations and collect materials for the Wind and Current Charts; other great interests besides those of commerce have their origin in the ocean or the air; and, without doubt, these interests are to be benefited by a better knowledge than we now have of the laws which govern the circulation of the atmosphere, and regulate the movements of the aqueous portions of our planet.

The agricultural capacities of any place are as dependent upon the hygrometrical as upon the thermometrical condition of the atmosphere. This is obvious, and of easy illustration:—

Each kind of plant requires for its most perfect development a certain degree of moisture, and the winds which bring it that moisture can only get it from the sea or other evaporating surfaces.

It is often argued because wine and olives, or other staples, are produced upon a given parallel of latitude, that therefore they should be produced upon the same parallel wherever the proper soil is to be found.

Whereas, the consideration as to the route which the winds from the ocean have to pursue in order to reach the situation of the supposed parallel, has much to do with the case.

Virginia and California are between the same parallels, yet how different their agricultural resources, the character and the flavor of their fruits; all owing, not so much to difference of soil as to the way the winds blow, the quantity of moisture they bring with them, the proportion of clouds and sunshine allotted to each place.

The system of researches embraced by the Wind and Current Charts, therefore, it would appear, concern the philosopher and the husbandman, as well as the mariner, the merchant, and the statesman.

A wider field, or one more rich with promise, has never engaged the attention of the philosopher. Though much trodden and often frequented, it has never been explored, if we take exploration to mean the collecting and grouping all those phenomena which mariners observe in relation to the ocean and the air above it, with the view of tracing, in the true spirit of inductive philosophy, fact into effect, and effect up to cause.

The mariner, therefore, should bear it always in mind when he is making and recording out upon the wide ocean an observation in connection with these Charts, that upon the fidelity with which that observation and the record of it are made, depends the ability here to read aright the workings of those physical agents that are employed in the grand scheme of creation, to produce those results which are the subject of observation with him.

The wind and rain; the vapor and the cloud; the tide, the current, the saltness and depth, and temperature and color of the sea; the shade of the sky; the temperature of the air; the tint and shape of the clouds; the height of the tree on the shore, the size of the leaves, the brilliancy of the flowers;—each and all may be regarded as the exponent of certain physical combinations, and, therefore, as the expression in which Nature chooses to announce her own meaning; or if we please, as the language in which she writes down the operation of her own laws. To understand that language, and to interpret aright those laws, is the object of the undertaking which those who co-operate with me have in hand. No fact gathered in such a field as this, therefore, can come amiss to those who tread the walks of inductive philosophy; for in the handbook of Nature, every such fact is a syllable; and it is by patiently collecting fact after fact, and by joining together syllable after syllable, that we may finally seek to read aright from the great volume which the mariner at sea and the philosopher on the mountain see spread out before them.

Dr. Buist, a learned and eminent *savant* of India, has drawn a beautiful picture of the field in which navigators are so earnestly invited to labor and lend their help.

In the report on the affairs of the "Bombay Geographical Society," presented by the Secretary at the annual meeting, in May, 1850, the Doctor remarks: "The Assistant Secretary of your Society,* Mr. Macfarlane, has made considerable progress in the construction of Wind and Current Charts, founded on the information supplied by ships' logs, and on the principle of Lieutenant Maury. It is more than probable that, besides the currents occasioned by the trade-winds, monsoons, and set of the tides, we have a group of movements intermingled with those dependent mainly on evaporation. When it is remembered that on the western shore of the Arabian Sea, including in this the Red Sea and Persian Gulf, from the line northward, we have an expanse of coast of not less than 6,000 miles, and a stretch of country of probably not less than 100 miles inland from this, where the average fall of rain does not amount to four inches annually, where not one-half of this ever reaches the sea, and where, to the best of our knowledge, the evaporation over the ocean averages at least a quarter of an inch daily, all the year round, or close on eight feet annually, some idea of the enormous abstraction of water in the shape of vapor may be formed. On the assumption that this extends no further, on an average, than 50 miles out to sea, we shall have no less than 39 cubic miles of water raised annually in vapor from the northern and northwestern side of the basin, which must be supplied from the open ocean on the south or the rain on the east. The fall of rains on the western side of the ridge of the mountain chain, from Cape Comorin to Cutch, averages pretty nearly 180 inches annually, and of this, at least 160 is carried off to the sea; that on the Concan to 70

* *Vide* Transactions Bombay Geographical Society, Vol. IX. 1850, p. 80, *et seq.*

inches, of which probably 30 flow off to the ocean; or betwixt the two, over an area of twenty miles from the sea-shore to the ghauts, and about 1,200 miles from the north to the south, or an area of 24,000 square miles in all, we shall probably have an average discharge of nine feet, or close on forty cubic miles of water—an amount sufficient, were it not diffused, to raise the sea on our shores three feet high, over an area of 72,000 square miles.

"The waters of the ocean cover nearly three-fourths of the surface of the globe; and of the thirty-eight millions of miles of dry land in existence, twenty-eight millions belong to the northern hemisphere. The mean depth of the ocean is somewhere about four miles—the greatest depth the sounding-line has ever reached is five and a quarter miles.* The mean elevation of the land, again, is about one thousand feet—the highest point known to us, is nearly as much above the level of the sea, as the great depth that has been measured, is below it. The atmosphere, again, surrounds the earth like a vast envelop; its depth, by reason of the tenuity attained by it, as the superincumbent pressure is withdrawn, is unknown to us—but is guessed at somewhere betwixt fifty and five hundred miles. Its weight, and its constituent elements, have been determined with the utmost accuracy. The weight of the mass is equal to that of a solid globe of lead sixty miles in diameter. Its principal elements are oxygen and nitrogen gases, with a vast quantity of water suspended in them in the shape of vapor, and commingled with these a quantity of carbon in the shape of fixed air, equal to restore from its mass many fold the coal that now exists in the world. In common with all substances, the ocean and the air are increased in bulk, and consequently diminished in weight, by heat; like all fluids, they are mobile, tending to extend themselves equally in all directions, and to fill up depressions in whatever vacant space will admit them; hence, in these respects, the resemblance betwixt their movements. Water is not compressible or elastic, and it may be solidified into ice or vaporized into steam; the air is elastic—it may be condensed to any extent by pressure, or expanded to an indefinite degree of tenuity by pressure being removed from it—it is not liable to undergo any change in its constitution beyond these, by any of the ordinary influences by which it is affected. These facts are few and simple enough—let us see what results arise from them. As the constant exposure of the equatorial regions of the Earth to the Sun must necessarily here engender a vast amount of heat—and as his absence from the polar regions must in like manner promote an infinite accumulation of cold—to fit the entire Earth for a habitation to similar races of beings, a constant interchange and communion, betwixt the heat of the one and the cold of the other, must be carried on. The ease and simplicity with which this is effected, surpasses all description. The air, heated near the equator by the overpowering influences of the Sun, is expanded and lightened; it ascends into upper space, leaving a partial vacuum at the surface to be supplied from the regions adjoining. Two currents from the poles towards the equator are thus established at the surface, while the sublimated air, diffusing itself by its mobility, flows in the upper regions of space from the equator towards the poles. Two vast whirlpools are

* Lieutenant Walsh, U. S. N., while co-operating, in the U. S. schooner Taney, with me, in these researches, reports a sounding in the North Atlantic of 6½ miles (5,700 fathoms), without bottom.—M.

thus established, constantly carrying away the heat from the torrid towards the icy regions, and these becoming cold by contact with the ice, carry back their gelid freight to refresh the torrid zone. Did the Earth, as was long believed, stand still while the Sun circled around it, we should have had two sets of meridional currents blowing at the surface of the Earth, directly from north and south, towards the equator, in the upper regions flowing back again to the place whence they came. On the other hand, were the heating and cooling influences just referred to to cease, and the Earth to fail in impressing its own motion on the atmosphere, we should have a furious hurricane rushing round the globe, at the rate of 1,000 miles an hour,—tornadoes of ten times the speed of the most violent now known to us, sweeping everything before them. A combination of the two influences, modified by the friction of the Earth, which tends to draw the air after it, gives us the trade-winds, which sweep round the equatorial region of the globe unceasingly, at the speed of from ten to twenty miles an hour, the aerial current, quitting the polar regions with the comparatively tardy speed, from east to west, imposed on it by the velocity due to the 70th parallel, is left behind the globe, and deflected into an oblique current, as it advances southward, till, meeting the current from the opposite pole near the equator, the two combine and form the vast stream known as the trades—separated in two, where the air ascends by the belt of variable winds and rains. Impressed with the motion of the air, constantly sweeping its surface in one direction, and obeying the same laws of motion, the great sea itself would be excited into currents similar to those of the air, were it not walled in by continents, and subjected to other control. As it is, there are constant currents flowing from the torrid towards the frigid zone, to supply the vast mass of vapor there drained off; while other whirlpools and currents, such as the gigantic Gulf Stream, come to perform their part in the same stupendous drama. The current just named, sweeps from the Cape of Good Hope, across the South Atlantic, to the Gulf of Mexico, and by the Straits of the Bahamas. Here it turns to the eastward again, travelling along the coast of America at the rate of from forty to a hundred miles a day. It now stands once more across the Atlantic, and divides itself into two branches; one finds its way into the northern sea, warming the adjoining waters as it advances, and turning back, most likely to form a second great whirlpool, rejoining the original stream near Newfoundland. The main branch seeks the northern shores of Europe, and, sweeping along the coast of Spain and Portugal, travels southward by the Azores to rejoin the main whirlpool. The waters of this vast ocean river are, to the north of the tropic, greatly warmer than those around; the climate of every country it approaches is improved by it, and the Laplander is enabled by its means to live and cultivate his barley, in a latitude which, everywhere else throughout the world, is condemned to perpetual sterility. But there are other laws which the great sea obeys, which peculiarly adapt it as the vehicle of interchange of heat and cold betwixt those regions where either exists in excess. Water which contracts regularly from the boiling point downwards, at a temperature of 40°, has reached its maximum of density, and thence begins to grow lighter and expand. But for this most beneficent provision, the vast recesses of the Northern Ocean would be continually occupied with a fluid at the freezing point, which the least access of cold would convert into one solid mass of ice. The non-conducting power of water, which at present acts so valuable a part in the general

economy, so far from being a blessing would be a curse. No warmth could ever penetrate to thaw the foundations of the frozen mass—no water find its way to float it from its foundations; so that, like the everlasting hills themselves, rooted immovable in its place, every year adding to its mass, the solid structure would continually advance to the southward, hermetically sealing the polar ocean, thus condemned to utter desolation, and encroaching on the North Sea itself. Under existing circumstances, so soon as water is cooled down to 40°, it sinks to the bottom, and, still eight degrees warmer than ice, it attacks the basis and saps the foundations of the icebergs—themselves gigantic glaciers, which have fallen from the mountains into the sea, or which have grown to their present size in the shelter of bays and estuaries, and by accumulations from above. Once forced from their anchorage, the first storm that arises drifts them to sea, where the beautiful law which renders ice lighter than the warmest water enables it to float—and drifts southward a vast magazine of cold to cool the tepid water which bears it along—the evaporation at the equator causing a deficit, the melting and accumulation of the ice in the frigid zone giving rise to an excess of accumulation, which tends, along with the action of the air and other causes, to institute and maintain the transporting current. These stupendous masses, which have been seen at sea in the form of church spires, and gothic towers, and minarets, rising to the height of from 300 to 600 feet, and extending over an area of not less than six square miles, the masses above water being only one-tenth of the whole, are often to be found within the tropics. A striking fact dependent on this general law, has just been brought to light; there is a line extending from pole to pole, at or under the surface of the ocean, where an invariable temperature of 39.5 is maintained. The depth of this varies with the latitude; at the equator it is 7,200 feet—at latitude 56° it ascends to the surface, the temperature of the sea being here uniform throughout. North and south of this the cold water is uppermost, and at latitude 70° the line of uniform temperature descends to 4,500. But these, though amongst the most regular and magnificent, are but a small number of the contrivances by which the vast and beneficent ends of nature are brought about. Ascent from the surface of the Earth, produces the same change in point of climate, as an approach to the poles; even under the torrid zone, mountains reach the line of perpetual congelation at nearly a third less altitude than the extreme elevation which they sometimes attain. At the poles snow is perpetual at the ground, and at the different intervening latitudes, reaches some intermediate point of congelation, betwixt one and 20,000 feet. In America, from the line south to the tropics, as also, as there is now every reason to believe, in Africa, within similar latitudes, vast ridges of mountains, covered with perpetual snow, run northward and southward in the line of the meridian right across the path of the trade-winds. A similar ridge, though of less magnificent dimensions, traverses the peninsula of Hindoostan, increasing in altitude as it approaches the line—attaining an elevation of 8,500 feet at Dodabetta, and above 6,000 in Ceylon. The Alps in Europe, and the gigantic chain of the Himalayas in Asia, both far south in the temperate zone, stretch from east to west, and intercept the aerial current from the north. Others of lesser note, in the equatorial or meridional, or some intermediate direction, cross the paths of the atmospherical currents in every direction, imparting to them fresh supplies of cold, as they themselves obtain from them warmth in exchange; in strictness, the two operations are the same. Mag-

nificent and stupendous as are the effects and results of the water and of air acting independently, on each other, in equalizing the temperature of the globe, they are still more so when combined. One cubic inch of water, when invested with a sufficiency of heat, will form one cubic foot of steam—the water before its evaporation, and the vapor which it forms, being exactly of the same temperature; though in reality, in the process of conversion, 1,700 degrees of heat have been absorbed or carried away from the vicinage, and rendered latent or imperceptible; this heat is returned in a sensible and perceptible form the moment the vapor is converted once more into water. The general fact is the same in the case of vapor carried off by dry air, at any temperature that may be imagined, for down far below the freezing point, evaporation proceeds uninterruptedly, or raised into steam by artificial means. The air, heated and dried as it sweeps over the arid surface of the soil, drinks up by day myriads of tons of moisture from the sea—as much indeed as would, were no moisture restored to it, depress its whole surface at the rate of four feet annually over the surface of the globe. The quantity of heat thus converted from a sensible or perceptible, to an insensible or latent state, is almost incredible. The action equally goes on, and with the like results, over the surface of the earth, as over that of the sea, where there is moisture to be withdrawn. But night, and the seasons of the year, come around, and the surplus temperature thus withdrawn and stored away, at the time it might have proved superfluous or inconvenient, is reserved, and rendered back so soon as it is required; and the cold of night, and the rigor of winter, are modified by the heat given out at the point of condensation, by dew, rain, hail, and snow.

"There are, however, cases in which, were the process of evaporation to go on without interruption and without limit, that order and regularity might be disturbed which it is the great object of the Creator apparently for an indefinite time to maintain, and in the arrangements for equalizing temperature the equilibrium of saltness be disturbed in certain portions of the sea, and that of moisture under ground in the warmer regions of the earth. To prevent this, checks and counterpoises interpose just as their services come to be required. It could scarcely be imagined that, in such of our inland seas as were connected by a narrow strait with the ocean, and were thus cut off from free access to its waters, the supply of fresh water which pours into them from the rivers around would exactly supply the amount carried away by evaporation. Salt never rises in steam, and it is the pure element alone that is drawn off. We have in such cases as the Black and Baltic Seas an excess of supply over what is required, the surplus in the latter case flowing off through the Dardanelles, in the former through the Great and Little Belts. The vapor withdrawn from the Mediterranean exceeds by about a third the whole amount of fresh water poured into it; the difference is made up by a current through the Straits of Gibraltar in the latter; and a similar arrangement, modified by circumstances, must exist in all cases where circumstances are similar—the supply of water rushing through the strait from the open ocean being in exact proportion to the difference betwixt that provided from rain or by rivers, and that required by the afflux of vapor; seas wholly isolated, such as the Caspian and the Dead Sea, attain in course of time a state of perfect equilibrium—their surface becoming lowered in level and diminished in area, till it becomes exactly of the proper size to yield in vapor the whole waters poured in. The Dead Sea, before attaining this condition

of repose, has sunk thirteen hundred feet below the Mediterranean, the Caspian about one-fourth of this. Lakes originally salt, and which to all appearance are no more than fragments severed from the sea by the earthquake or volcano, and which have no river or rain supplies whatever, in process of time dry up and become a mass of rock salt in their former basin. Such is the formation in progress in the lake near Tadjurra, nearly five hundred feet below the level of the sea, its waters having been thus much depressed by evaporation, having now almost altogether vanished, one mass of salt remaining in their room. As it is clear in a case such as that of the Mediterranean, that where salt water to a large extent was poured in and fresh water only was drawn off, a constant concentration of brine must occur, the proposition was laid down by the most distinguished of our geologists, and long held unquestionable, that huge accumulations of salt, in masses larger than all that Cheshire contains, were being formed in its depths. The doctrine, eminently improbable in itself, is now met by the discovery of an outward under-current, in all likelihood of brine. It is matter of easy demonstration that, without some such arrangement as this, the Red Sea must long ere now have been converted into one mass of salt, its upper waters at all events being known in reality to differ at present but little in saltness from those of the Southern Ocean. The Red Sea forms an excellent illustration of all kindred cases. Here we have salt water flowing in perpetually through the Straits of Babelmandeb, to furnish the supplies for a mass of vapor calculated, were the strait shut up, to lower the whole surface of the sea eight feet annually—and even with the open strait, to add to its contents a proportionate quantity of salt. But an under-current of brine, which, from its gravity, seeks the bottom, flows out again to mingle with the waters of the great Arabian Sea, where, swept along by currents, and raised to the surface by tides and shoals, it is mingled by the waves through the other waters, which yearly receive the enormous monsoon torrents, the Concan and the Ghaut's supply, become diluted to the proper strength of sea water, and rendered uniform in their constitution, by the agitation of the storms which then prevail. Flowing back again from the coasts of India, where they are now in excess, to those of Africa, where they suffer from perpetual drainage, the same round of operations go on continually; and the sea, with all its estuaries and its inlets, retains the same limit, and nearly the same constitution, for unnumbered ages. A like check prevents on shore the extreme heating and desiccation from which the ground would otherwise suffer. The Earth is a bad conductor of heat; the rays of the Sun which enter its surface, and raise the temperature to 100 or 150°, scarcely penetrate a foot into the ground; a few feet down, the warmth of the ground is nearly the same night and day. The moisture which is there preserved free from the influence of currents of air, is never raised into vapor; so soon as the upper stratum of earth becomes thoroughly dried, capillary action, by means of which all excess of water was withdrawn, ceases; and even under the heats of the tropics, the soil two feet down will be found on the approach of the rains sufficiently moist for the nourishment of plants. The splendid flowers and vigorous foliage which burst forth in May, when the parched soil would lead us to look for nothing but sterility, need in no way surprise us; fountains of water, boundless in extent and limited in depth by the thickness of the soil which contains them, have been set aside and sealed up for their use, beyond the reach of those thirsty winds or burning rays which are suffered only to carry off the water which is superfluous, and would be pernicious,

removing it to other lands, where its agency is required, or treasuring it up in the crystal vault of the firmament, as the material of clouds and dew—and the source, when the fitting season comes round again, of those deluges of rain which provide for the wants of the year.

"Such are some of the examples which may be supplied of general laws operating over nearly the whole surface of the terraqueous globe. Amongst the local provisions ancillary to these, are the monsoons of India and the land and sea-breezes prevalent throughout the tropical coasts. When a promontory such as that of India intrudes into the region of the trade-winds, the continuous western current is interrupted, and in its room appear alternating currents from the northeast and southwest, which change their direction as the Sun passes the latitude of the place. On the Malabar coast, as the Sun approaches from the southward, clouds and variable winds attend him, and his transit northward is in a week or ten days followed by that furious burst of thunder and tempest which heralds the rainy season. His southward transit is less distinctly marked; it is the sign of approaching fair weather, and is also attended by thunder and storm. The alternating land and sea-breezes are occasioned by the alternate heating and cooling of the soil, the temperature of the sea remaining nearly uniform. At present, when most powerfully felt, the earth by noon will often be found to have attained a temperature of 120°, while the sea rarely rises above 80°.* The air, heated and expanded, of course ascends, and draws from the sea a fresh supply to fill its room; the current thus generated constitutes the breeze. During the night the earth often sinks to a temperature of 50° or 60°, cooling the conterminous air, and condensing in the form of dew, the moisture floating around. The sea is now from 15° to 20° warmer than the earth—the greatest difference between the two existing at sunrise; and in then rushes the air, and draws off a current from the shore.

"We have not noticed the tides, which, obedient to the Sun and Moon, daily convey two vast masses of water round the globe, and which twice a month, rising to an unusual height, visit elevations which otherwise are dry. During one-half of the year the highest tides visit us by day, the other half by night, and at Bombay, at Springs, the depths of the two differ by two or three feet from each other. The tides simply rise and fall, in the open ocean, to an elevation of two or three feet in all; along our shores, and up gulfs and estuaries, they sweep with the violence of a torrent, having a general range of ten or twelve feet—sometimes, as at Fundy in America, at Brest and Milford Haven in Europe, to a height of from forty to sixty feet. They sweep our shores from filth and purify our rivers and inlets, affording to the residents of our islands and continents the benefits of a bi-diurnal ablution, and giving a health and freshness and purity wherever they appear. Obedient to the influence of bodies many millions of miles removed from them, their subjection is not the less complete; the vast volume of water capable of crushing by its weight the most stupendous barriers that can be opposed to it, and bearing on its bosom the navies of the world, impetuously rushing against our shores, gently stops at a given line, and flows back again to its place when the word goes forth: 'Thus far shalt thou go, and no farther;' and that which no human power or contrivance could have repelled, returns at its appointed time so regularly and surely, that the

* The temperature of certain parts of the Indian Ocean—the hottest sea in the world—is 90°.—M.

hour of its approach, and measure of its mass, may be predicted with unerring certainty centuries beforehand. The hurricanes which whirl with such fearful violence over the surface, raising the waters of the sea to enormous elevations, and submerging coasts and islands, attended as they are by the fearful attributes of thunder and deluges of rain—seem requisite to deflagrate the noxious gases which have accumulated—to commingle in one healthful mass the polluted elements of the air, and restore it fitted for the ends designed for it. It is with the ordinary, not with the exceptionable, operations we have at present to deal, and the laws which rule the hurricane form themselves the subject of a treatise.

"We have hitherto dealt with the sea and air—the one the medium through which the commerce of all nations is transported, the other the means by which it is moved along—as themselves the great vehicles of moisture, heat, and cold, throughout the regions of the world—the means of securing the interchange of these inestimable commodities, so that excess may be removed to where deficiency exists, deficiency substituted for excess, to the unbounded advantage of all. We have selected this group of illustrations for our views, because they are the most obvious, the most simple, and the most intelligible and beautiful that could be chosen. Short as our space is, and largely as it has already been trenched upon, we must not confine ourselves to these.

"We have already said that the atmosphere forms a spherical shell, surrounding the Earth to a depth which is unknown to us, by reason of its growing tenuity, as it is released from the pressure of its own superincumbent mass. Its upper surface cannot be nearer to us than fifty, and can scarcely be more remote than five hundred miles. It surrounds us on all sides, yet we see it not; it presses on us with a load of fifteen pounds on every square inch of surface of our bodies, or from seventy to one hundred tons on us in all, yet we do not so much as feel its weight. Softer than the finest down—more impalpable than the finest gossamer—it leaves the cobweb undisturbed, and scarcely stirs the lightest flower that feeds on the dew it supplies; yet it bears the fleets of nations on its wings around the world, and crushes the most refractory substances with its weight. When in motion, its force is sufficient to level the most stately forests, and stable buildings, with the earth—to raise the waters of the ocean into ridges like mountains, and dash the strongest ships to pieces like toys. It warms and cools by turns the Earth and the living creatures that inhabit it. It draws up vapors from the sea and land, retains them dissolved in itself, or suspended in cisterns of clouds, and throws them down again as rain or dew, when they are required. It bends the rays of the sun from their path, to give us the twilight of evening and of dawn—it disperses and refracts their various tints to beautify the approach and the retreat of the orb of day. But for the atmosphere, sunshine would burst on us and fail us at once—and at once remove us from midnight darkness to the blaze of noon. We should have no twilight to soften and beautify the landscape—no clouds to shade us from the scorching heat, but the bald Earth, as it revolved on its axis, would turn its tanned and weakened front to the full and unmitigated rays of the lord of day. It affords the gas which vivifies and warms our frames, and receives into itself that which has been polluted by use, and is thrown off as noxious. It feeds the flame of life exactly as it does that of the fire—it is in both cases consumed, and affords the food of consumption—in both cases it becomes combined with charcoal, which

requires it for combustion, and is removed by it when this is over. 'It is only the girdling encircling air,' says a writer in the *North British Review*, 'that flows above and around all that makes the whole world kin. The carbonic acid with which to-day our breathing fills the air, to-morrow seeks its way round the world. The date-trees that grow round the falls of the Nile will drink it in by their leaves; the cedars of Lebanon will take of it to add to their stature; the cocoanuts of Tahiti will grow rapidly upon it; and the palms and bananas of Japan will change it into flowers. The oxygen we are breathing was distilled for us some short time ago by the magnolias of the Susquehanna, and the great trees that skirt the Orinoco and the Amazon—the giant rhododendrons of the Himalayas contributed to it, and the roses and myrtles of Cashmere, the Cinnamon-tree of Ceylon, and the forest older than the flood, buried deep in the heart of Africa, far behind the mountains of the Moon. The rain we see descending was thawed for us out of the icebergs which have watched the Polar Star for ages, and the lotus lilies have soaked up from the Nile, and exhaled as vapor, snows that rested on the summits of the Alps.' 'The atmosphere,' says Maun, 'which forms the outer surface of the habitable world, is a vast reservoir, into which the supply of food designed for living creatures is thrown—or, in one word, it is itself the food in its simple form of all living creatures. The animal grinds down the fibre and the tissue of the plant, or the nutritious store that has been laid up within its cells, and converts these into the substance of which its own organs are composed. The plant acquires the organs and nutritious store thus yielded up as food to the animal, from the invulnerable air surrounding it.' But animals are furnished with the means of locomotion and of seizure —they can approach their food, and lay hold of and swallow it; plants must await till their food comes to them. No solid particles find access to their frames; the restless ambient air, which rushes past them loaded with the carbon, the hydrogen, the oxygen, the water—everything they need in the shape of supplies, is constantly at hand to minister to their wants, not only to afford them food in due season, but in the shape and fashion in which alone it can avail them."

Surely a more tempting field for philosophical research, for useful and honorable labor, or a field more abounding with the elements of useful and practical results, never engaged the attention of man.

By studying the winds at sea we might expect to find them blowing more conformably there than on the land to the general laws which govern the circulation of the atmosphere. And in endeavoring to learn these laws, we may look for the rule at sea; for the exceptions on the land. It might therefore be expected that any undertaking to group the observations of mariners upon the winds in all parts of the ocean and at all seasons of the year would be regarded, as the illustrious Humboldt says this is, and as the learned Dr. Buist shows it is, with no little interest by philosophers and philanthropists, by good and wise men in all conditions of life, and in all parts of the world.

In the progress of this undertaking, many new facts of interest to science have been brought to light, or their existence suggested. Our knowledge of the laws which govern the circulation of the atmosphere, which control the currents of the sea, which regulate climates, and by which heat and moisture, clouds and sunshine, are distributed over the surface of the Earth, has been considerably enlarged even by the results so far obtained.

Navigation has already reaped a rich reward from this undertaking, and commerce is profiting by it. In consequence of the increase of knowledge which it has given to the practical navigator, with regard to the prevailing winds and currents of the sea, the average sailing passage between distant parts of the earth has been materially shortened.

Practically, for commercial purposes, these investigations have lifted up, as it were, the markets of the southern hemisphere, and placed them nearer to our doors by several—and in some cases, by many—days sail than they were before; for the time which it required a ship to carry a cargo from one hemisphere to another, has been shortened more than two weeks at some seasons of the year; and it is not going too far to say that the voyage hence to California has in consequence of these researches been shortened to a more remarkable extent. The average passage out, by vessels not having the results of these researches to guide them, is upwards of 180 days; but vessels with these Charts on board have made it in 107, in 97, in 96, in 91, and even in 90 days; and their masters, after making allowance for the improved models of their ships, ascribe this great success to the information which they derived from these Charts as to the winds and currents by the way.

The merchants and shipmasters of India, perceiving the great benefits which American commerce and American merchants, shipmasters and owners, were deriving from this system of investigations as developed in part only for the Atlantic Ocean, have promptly stepped forward, raised a subscription for the purpose, and directed a set of Wind and Current Charts upon the plan of these, to be undertaken for the Indian Ocean; and the Geographical Society of Bombay, composed of men eminent for their virtue and learning, has given the undertaking its countenance.

After having spent much time and labor upon this undertaking, and after having made considerable progress with it, it came to the knowledge of the Society that I was very much in want of materials for "Wind and Current Charts" for the Indian Ocean. Therefore the Geographical Society of Bombay, with a spirit of liberality and a degree of friendly consideration for which I am profoundly thankful, resolved to place at my disposal all the work which has been accomplished under the auspices of the Society.

This work consists of track Charts of the Indian Ocean extending from the Cape of Good Hope to 170° E. They are on the scale of the Wind and Current Charts. These MS. Charts are six in number; they have the shore-line sketched in, and the tracks of one hundred vessels—in all colors—projected upon them.

The notes and explanations necessary to enable me to incorporate these charts with my own, however, have not yet arrived.

The following extract is from the letter of Dr. Buist, a member of the Society, and one of the most devoted friends of science to be found in any quarter of the globe.

"BOMBAY, *November* 17, 1851.

"LIEUT. MAURY, *National Observatory, Washington.*

"MY DEAR SIR: You will receive along with this, or shortly afterwards, a tin case, through Smith, Elder, & Co., containing the skeleton charts commenced by the Geographical Society, to which I have repeatedly alluded, and with which I am now authorized to present you. We shall endeavor to do our best to provide you with all the information we can collect, to enable you to extend your researches to the India seas; only you must remember that while you belong to the fastest we live in the slowest country in the world, and the time we take to conduct a preliminary official correspondence suffices you for the commencement and completion of your work. I work here not only single-handed, but with a world of obstacles actually thrown in my way, with the labor of a daily paper on my shoulders, a school of industry to attend to, and generally a severe attack of sickness three or four times a year; so if I get on slowly it is not because of my doing little, but because of my profession, by which I have exhausted four-fifths of my time and strength. * * * * * * * * * * * * * * *

"Though I have published very little on meteorology, for want of time to put the stock of information I have collected in order, I have beside me an enormous mass of facts. Three years since, I began to perceive that we had certain classes of storms that occurred periodically, not only all over India, but all over the region to which my information extended, and that these were synchronous, or nearly so; I then began a series of maps illustrative of the matter. I have sent you specimens, but for this we were too scantily provided with information. Instrumental observations are too much insisted on; when excellence is not attainable they are better dispensed with; the remarks of an observant man, recorded at the time, with due advertence to day and hour, are invaluable. Surely these might be had in abundance for the future, if not for the past. This you will observe, is intimately connected and in perfect consonance with your theories of the electric or magnetic origin of all meteorological phenomena.

"Through this means alone can the occurrence of storms simultaneously round the one half of the world be accounted for. Have you any good sets of hourly barometric observations from your southern States? If you will turn to the *London Philosophical Transactions* of 1850, you will see a paper by Colonel Sykes, on the observations made in India, which will show you the interest attaching to barometrical tides, within and beyond the tropics, and we are most anxious to discover the law they obey till they become merged, and to a great measure lost in, vast casual fluctuations." * * *

In the mean time Kupffer, the laborious meteorologist of Russia, had suggested the idea of a conference between the meteorologists of Russia and those of the United States, with a view to a more general co-operation and concert of action between them; while this subject was under advisement, a proposition was made by the British Government that that of the United States should co-operate with it in its plans for making meteorological observations at certain foreign stations, and according to instructions that had been prepared by Capt. Henry James, R. E., by direction of Major-General Sir John Burgoyne, Inspector-General of Fortifications. Here was an opportunity unexpectedly offering itself for establishing concert of

action among meteorologists on shore, and co-operation among navigators at sea everywhere, in collecting data and materials for the advancement of science and the benefit of navigation. I could not suffer such an opportunity to pass; and therefore, in reply to the British proposition, suggested that the sea should be included as well as the land; that the plan should be uniform and universal; and that in order to make it so, and to secure its success, I ventured to propose a general conference, to consist among others of meteorologists from the shore and of navigators from the sea, who should take the subject up and discuss the plans, draw up the forms, fix the standards, and prescribe the instruments to be used, the instructions to be followed; in short, a conference that shall take cognizance of everything, whether it have regard to the instruments and their errors, the subjects to be observed, the methods, forms, &c., of reduction.

This is an interesting subject; the move is an important one. The Academy of Sciences at Paris, the British Meteorological Society in London, the Royal Sardinian Society, the Royal Society of Copenhagen, with other societies and governments, have already expressed their readiness to participate in the proceedings of this conference. This proposition is one which, if it be met in the right spirit and be carried out with diligence, promises much good. I therefore quote in this place the correspondence in relation to it, especially with the view of bringing the subject to the notice of navigators, and of soliciting for it in advance their hearty good-will and cheerful co-operation.

Correspondence in Relation to a Universal System of Meteorological Observations, for the Sea as well as for the Land.

BRITISH LEGATION, *Washington, Nov.* 13, 1851.

SIR: I have been instructed by Her Majesty's Government to present to the United States Government the printed volume which I have the honor to inclose herewith, which has been drawn up by Major-General Sir John Burgoyne, Inspector-General of Fortifications, for the purpose of enabling the officers of the Royal Engineers at foreign stations to take meteorological observations upon a uniform plan; and I am directed to say, that her Majesty's Government would be glad to obtain such co-operation in regard to the objects to which those instructions relate, as the proper department of the United States Government may be willing to afford.

I avail myself of this opportunity to renew to you, Sir, the assurances of my highest consideration.

(Signed) JOHN F. CRAMPTON.

The Honorable DANIEL WEBSTER, &c., &c., &c.

DEPARTMENT OF STATE, *Washington, Nov.* 14, 1851.

SIR; I have the honor to transmit to you, herewith, the copy of a note just received from Her Britannic Majesty's Chargé d'Affaires in this city, together with the printed volume which accompanied it, relative to the co-operation of the Government of the United States with that of Her Britannic Majesty,

in carrying out a plan which it has adopted, for the taking of uniform meteorological observations at foreign stations, and to invite your attention to the subject.

I am, Sir, very respectfully,

Your obedient servant,

DANIEL WEBSTER.

Hon. WILLIAM A. GRAHAM,

Secretary of the Navy.

BUREAU OF ORDNANCE AND HYDROGRAPHY, *Nov.* 19, 1851.

SIR: With this you will receive a communication from the Chargé d'Affaires of Great Britain to the Secretary of State of the United States, covering a printed pamphlet in relation to meteorological observations, and proposing a co-operation by the officers of our Government in making similar observations.

After perusing them, you will please state whether such co-operation could be made at the Naval Observatory without interference with other duties, or making any material changes in any arrangements which may now be in use there, for similar purposes. You will also give your views whether any useful co-operation, direct or indirect, could be furnished by our vessels at sea, with the instruments usually furnished to them, or at any of our Navy Yards, either with their present instruments or by the aid of others to be furnished for that purpose; and if so, at what yards such observations would be most desirable, having regard to the observations of this kind which are known to be made at different places in connection with the Smithsonian Institution, and public observatories.

Return all the inclosures after perusal.

Respectfully, your obedient servant,

C. MORRIS,

Chief of Bureau.

Lieut. M. F. MAURY,

Supt'dt. &c. &c., Washington.

NATIONAL OBSERVATORY,

Washington, Nov. 21, 1851.

SIR: I have the honor to acknowledge the receipt of yours of the 19th inst., inclosing a communication from the Chargé d'Affaires of Great Britain to the Secretary of State of the United States, with certain other papers and documents, relative to a proposition by the British Government, to the effect that the Government of the United States will cause its officers who are engaged in making meteorological observations, to co-operate with the Royal Engineers engaged upon like duties on foreign stations, according to the plan set forth in the "Instructions for taking Meteorological Observations at the principal Foreign Stations, of the Royal Engineers," drawn up by Major-General Sir John Burgoyne, Inspector-General of Fortifications.

I am directed by you to state, "whether such co-operation could be made at the Naval Observatory without interference with other duties, or making any material changes in any arrangements which may now be in use there for similar purposes;" also, to give my "views whether any useful co-operation, direct or indirect, could be furnished by our vessels at sea, with the instruments usually furnished to them; or at any of our Navy Yards, either with their present instruments, or by the aid of others to be furnished for that purpose; and if so, at what yards such observations would be most desirable, having regard to the observations of this kind which are known to be made at different places, in connection with the Smithsonian Institution and public observatories."

In reply, it gives me pleasure to state that the desired co-operation can be made at this Observatory, and at the naval stations generally, without interference with other duties, and with very slight changes in fixtures and arrangements now in use for like purposes.

This is an important subject. Many of the great interests of state, and the well-being of the human family, are to be advanced by increase of knowledge touching the dynamical laws of the atmosphere, and the distribution through it, over the surface of our planet, of electricity, heat, and moisture.

For the fruits of his labor the husbandman is dependent upon atmospherical conditions; and commerce is controlled by the course of the winds. The subject, therefore, is one of high scientific interest, and of great national, industrial, and practical import. The step proposed by the British Government is in the right direction; wherefore, to make myself the more clearly understood, I may be excused for referring to the meteorological system of the United States, and for offering a few suggestions amendatory of the British proposition.

The Government of the United States has its own system of meteorological observations; one for the sea, another for the land.

Some of the States, as New York and Massachusetts, have, on their own account, established their system of meteorological observations also.

Also, some of the institutions of the country, as the "Smithsonian," and many of our fellow-citizens are likewise actively engaged in meteorological researches.

The meteorological observatories that are under the control of the different States, of the institutions, and of the private citizens of the United States, amount to several hundred. These extend from the shores of the Atlantic to those of the Pacific, and from the farthest northern boundary to the extreme southern limits of the United States.

Over these widely scattered observatories, and over this large corps of observers, their time for observation, their mode and means of observing, and their methods of recording the results of their labors, the Government of the United States has no control whatever; nor can it exercise any, except such as may flow from precept and example.

Nevertheless, these observatories, both national, state, and private, for the most part, act in concert. They mostly employ the same instruments, refer to the same standards; many of them observe at the same hours, use the same methods, and record by the same forms, most of which differ more or less from those

recommended by Major-General Sir John Burgoyne for the nineteen "foreign stations of the Royal Engineers."

I do not mean to draw comparisons, or to imply that, of the American and English systems, one is better than the other; far from it. Each is good; and if either be adopted, and made common to the two countries, the science of meteorology would be vastly benefited and advanced thereby.

If the Government of the United States, therefore, without proposing amendments to the English system, were to direct its officers, who are engaged in meteorological observations, to adopt the plan, modes, and methods of that system, it would create confusion among our observatories, and be as likely to retard as to advance the progress of meteorological research in the United States.

For this reason I beg leave to suggest a meteorological conference.

By authority of the Government, I have been permitted to invite the co-operation of American ship-masters in making daily, in all parts of the ocean, as they pursue their voyages to and fro, a series of meteorological observations.

By an act of Congress, authority has been given for all the vessels of the Navy to do the same.

The object of this co-operation is not only to improve, for the benefit of commerce and navigation, our knowledge with regard to the winds and currents of the sea, but to investigate the laws of atmospherical and oceanic circulation, and to advance the science of meteorology generally.

Under this invitation, more than a thousand American merchant vessels are engaged in making and recording their observations according to a prescribed form. At the end of the voyage their journals are regularly returned to this office.

They constitute the materials from which the "Wind and Current Charts" are constructed. These Charts, on account of the meteorological information they afford, have led to the developments of new and shorter routes across the seas, and to several other results of interest and value. I beg leave to send a set of them, the explanations which accompany them, &c., for the inspection of Her Majesty's officers.

About five-sevenths of our planet is covered with water.

It will be perceived, therefore, that in studying the course of the "wind in his circuits," and investigating the laws which govern the general circulation of the atmosphere, we must look to the sea for the rule—to the land for the exceptions. Therefore, no general system of meteorological observations can be considered complete unless it embrace the sea as well as the land.

The value of the researches conducted at this office with regard to the meteorology of the sea, would be greatly enhanced by co-operation from the observatories on the land.

Observers, with the requisite instruments for this purpose, are already at the principal stations. It is as convenient for them to observe in, as without, concert; for to observe in concert, and according to a uniform plan, would be attended neither by an increase of time, labor, nor expense; but, on the contrary, be a saving of all.

Hence, another reason for suggesting a conference upon the subject of a uniform system of meteorological observations on board British and American ships, as well as at British and American posts, stations,

and observatories. On board of every properly appointed ship of both nations, all, or nearly all, the observations which would probably be recommended for this universal system are already made. It is the custom to keep a log-book on board of every ship, and to enter in that log-book remarks and observations upon the winds, the weather, and the sea; and all that is requisite to impart a new and a greater value to these observations is, that they should be made all at the same time, recorded in a stated journal—the "abstract log" kept for the purpose—and then be made available by being returned to the office appointed to receive them.

The atmosphere envelops the Earth, and all nations are equally interested in the investigations of those laws by which it is governed. There is Russia, upon whose territories the Sun, except in the long night of the Polar winter, never sets—perhaps she, of all nations, has gone to the greatest expense in establishing meteorological observatories on the land, in collecting and publishing results, &c.

From what has already passed between Kupffer, the Russian meteorologist (also in charge of the mines), and myself upon the subject, I am induced to believe that he is already authorized, by the proper authorities in that country, to confer with the proper authorities in this, as to the establishment of a uniform system of meteorological observations on the land, for the two countries.

The achievements of France and Germany, in the paths of science, and the monuments they have erected in its name, do not admit us to doubt but that they too would readily and most heartily second any move which has for its object the great good of establishing, among civilized nations throughout the world, a uniform and universal system of meteorological observations.

There are other nations in Europe not a whit behind Germany and France in their devotion to science, their love of the useful.

For these reasons, I therefore respectfully suggest that, as an amendment to the British proposition, a more general system be proposed. That England, France, Russia, and other nations be invited to co-operate with their ships, by causing them to keep an abstract log, according to a form to be agreed upon, and that authority be given to confer with the most distinguished navigators and meteorologists, both at home and abroad, for the purpose of devising, adopting, and establishing a universal system of meteorological observations for the sea as well as for the land.

Respectfully, &c.,

(Signed) M. F. MAURY,

Lieut. U. S. N.

Com. CHAS. MORRIS,

Chief of Bureau of Ord. and Hyd., Present.

BUREAU OF ORDNANCE AND HYDROGRAPHY, *Dec.* 5, 1851.

SIR: I have the honor to acknowledge the receipt of your letter of the 17th ultimo, which covered a note to the Secretary of the Navy, from the Secretary of State, transmitting a communication from Her Britannic Majesty's Chargé d'Affaires in this city, and a printed volume relative to the co-operation of the

Government of the United States with that of her Britannic Majesty, in carrying out a plan which it has adopted for the taking of uniform meteorological observations at foreign stations.

To enable me to state more fully the extent to which the Navy is prepared to unite in the proposed co-operation, than my recent connection with this Bureau enabled me to do from personal knowledge, a letter was addressed to the Superintendent of the Observatory—a copy of this letter, and of Lieut. Maury's reply, are herewith inclosed.

With a set of Wind and Current Charts, and Explanations of them, which have been furnished by Lieut. Maury, I forward Professor Espy's Third Report on Meteorology, and a communication received from Professor Henry, of the Smithsonian Institution, on the same subject.

Collectively, they show the general character and extent of the meteorological observations which have been made in the United States; and the practical and useful application which has been made of these observations that have been collected under the direction of the Navy Department. The transmission of these for the inspection of the officers of Her Britannic Majesty, who are engaged or interested in similar observations, is respectfully suggested and submitted for your decision.

Although I concur in the opinion of Lieut. Maury, that it would be inexpedient to substitute, at this time, the plan for observations proposed by General Burgoyne, for that now followed in establishments and vessels under the direction of the Navy Department; changes and additions could probably be made, which could secure a nearer approach to uniformity in our shore establishments, without producing confusion, and they are respectfully recommended to that extent.

The suggestions for a more general and widely extended co-operation upon some uniform plan, promises so many advantages that hopes may be reasonably indulged for its eventual adoption.

Notwithstanding strict uniformity cannot be yet secured between the observations made by our officers and the British Sovereign's, an interchange of such observations, or of the deductions drawn from them, seems to be very desirable, and a proposal for such exchange is respectfully suggested.

With much respect, I am, your obedient servant,

CHAS. MORRIS,

Chief of Bureau.

To the Hon. WM. A. GRAHAM,

Secretary of the Navy.

NAVY DEPARTMENT, *Dec.* 6, 1851.

SIR: The communication from the State Department, of the 14th ultimo, transmitting a copy of a note from Her Britannic Majesty's Chargé d'Affaires in the city of Washington, together with the printed volume which accompanied it, relative to the co-operation of the Government of the United States with that of Her Britannic Majesty, in carrying out a plan which it has adopted for the taking of uniform meteorological observations at foreign stations, and inviting the attention of this Department to the sub-

ject, was duly received and referred to the proper Bureau for a report as to the extent to which the Navy of the United States is prepared to unite in the proposed co-operation.

This Department, appreciating the importance of co-operation in the meteorological researches between the officers of the Royal Engineers of Her Britannic Majesty's Army, and the officers of the United States, acting under the authority of the Navy Department, cordially reciprocates the spirit in which the proposition of the British Government is made.

Concurring in the opinions and approving the suggestions contained in the accompanying letters from the Chief of the Bureau of Ordnance and Hydrography, and from the Superintendent of the Naval Observatory, as to the importance of a system of meteorological observations which shall harmonize and be a guide and rule among observers generally, both at sea and on land, I beg you will assure Her Britannic Majesty's Chargé d'Affaires that it would afford not only this Department, but the institutions of our country, great satisfaction to see British and American ships, American and British meteorologists, co-operating with others in establishing a general and comprehensive system of observations, and of carrying it out in such a manner that an observation in one part of the world may be readily referred to and compared with like observations made in other parts of the world; and that, for the purpose of giving practical effect to these views, the Superintendent of the Naval Observatory is authorized to confer as to such a uniform plan, with Her Majesty's officers, and others of proper jurisdiction, at home and abroad; and, in concert with them, to agree upon a system of observations both for the sea and the land; and which, by being common, effective, and of easy execution, may be followed by meteorologists and navigators generally.

And in connection with this subject, I have the honor to transmit with this communication, a letter from the Chief of the Bureau of Ordnance and Hydrography, with one from the Superintendent of the Naval Observatory, and one from Professor Henry, of the Smithsonian Institution; also, Lieutenant Maury's Sailing Instructions, with his Wind and Current Charts, and Professor Espy's second and third Reports on Meteorology.

With very great respect, I have the honor to be,

Your obedient servant,

DANIEL WEBSTER, (Signed) WM. A. GRAHAM.

Secretary of State.

NAVY DEPARTMENT, *Dec.* 6, 1851.

SIR: Inclosed with this you will receive a copy of a letter from the Honorable Secretary of State to this Department, and the reply thereto, as well as a copy of one from the Chief of the Bureau of Ordnance and Hydrography, relative to the co-operation of the Government of the United States with that of Her Britannic Majesty, in carrying out a plan which it has adopted for the taking of uniform meteorological observations at foreign stations.

In furtherance of the views expressed in the letter from this Department to the Secretary of State, you

are hereby authorized to confer with Her Britannic Majesty's officers, and others of proper jurisdiction, at home and abroad; and, in concert with them, to agree upon a system of observations, both for the sea and the land, which may be followed by meteorologists and navigators generally.

And you will report to this Department, from time to time, the progress made and the results reached in the adoption of such uniform system of observations.

I am, very respectfully,

Your obedient servant,

WM. A. GRAHAM.

Lieut. M. F. MAURY,

Sup't. U. S. Naval Observatory, Washington, D. C.

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*Extracts from "Instructions for taking Meteorological Observations—Drawn up by Order of the Inspector-General of Fortifications, by Captain Henry James, R. E., F. R. S., &c."**

"A 'notice' of the arrangements which have been made for having Meteorological Observations taken at the principal foreign stations of the Royal Engineers, has been published in the corps papers for this year; this 'notice,' with some alterations and additions, is now printed as a separate paper, as instructions for the observers.

"Since the publication of the 'notice,' Major-General Sir J. Burgoyne has, with the sanction of the Master-General of the Ordnance, invited the co-operation of the Honorable Board of Directors of the East India Company, and the Board of Admiralty, for having similar observations taken in India, at those places where the Admiralty have officers competent for the duty, and where there are no other meteorological observatories; and, in consequence, the Board of Directors have ordered twenty sets of instruments to be sent to India, and the Admiralty have ordered four sets to be sent to Ascension, Rio de Janeiro, Callao, and Valparaiso; all the instruments are of a similar construction, and will be compared with the standards at the Royal Observatory at Greenwich. Thus, with the observations taken at different Government observatories, both at home and abroad, and by the members of the Meteorological Society of London, who have provided themselves with similar instruments, and have many zealous observers amongst their number—and with the observations taken in the different States of Europe and America, under the patronage of their respective governments—and by Her Majesty's Consuls abroad, who have been instructed by Lord Palmerston to carefully observe and accurately record atmospheric phenomena, to determine the laws, by which storms and variable winds are generated (see his Lordship's letter and inclosures in the Appendix),† a greater combination has been effected for collecting accurate data connected with the science of meteorology, than was ever before attempted. The observers, therefore, are

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* Circulated by order of Major-General Sir John Burgoyne, K. C. B., Inspector-General of Fortifications, &c. &c.

† Pp. 16–25.

earnestly requested zealously to perform their several parts, by regularly and carefully registering their observations, so as to make each set of observations as complete as possible, and thus to furnish accurate data for determining the laws of atmospheric phenomena, and the peculiarities of the climate of the different parts of the world.

"The following memorandum from the Inspector-General of Fortifications has been addressed to the commanding officers of Royal Engineers:—

"'It having been suggested to the Master-General that it might be highly useful to science if a series of meteorological observations were recorded in different parts of the world, on one uniform system, under instructions and by authority, his Lordship has consented that the object should be carried out at the nineteen stations as enumerated below, by or under the immediate directions of the Commanding Royal Engineers at each.

Names of Stations.

1. Bahama,	6. Corfu,	11. Hong-Kong,	16. New South Wales,
2. Barbadoes,	7. Demerara,	12. Jamaica,	17. St. Helena,
3. Bermuda,	8. Gibraltar,	13. Malta,	18. Toronto,
4. Cape,	9. Guernsey,	14. Mauritius,	19. Quebec.
5. Ceylon,	10. Halifax,	15. Newfoundland,	

"'Instruments, instructions, and books of reference of a uniform description will be forwarded to each station.

"'The endeavor, in the arrangements, has been to commence, upon a system that shall be compatible with the acquirements of any officer of Engineers, and that shall enable him without difficulty to take measures for a due record being kept, of every matter required; and, at the same time, not call upon any exertions or unnecessary attendance that shall interfere with the more regular necessary duties of the Department.

"'The Inspector-General of Fortifications attaches very great importance to this measure, and trusts to meet with the zealous co-operation of the several Commanding Royal Engineers, to carry it out in the most perfect manner.

"'He requests an early communication from the Commanding Royal Engineers, of the first measures taken by them in the matter, with any remarks they may have to offer; and subsequently, he would be glad of information, from time to time, of the mode and regularity of the proceedings, with any circumstances worthy of observation.'"

From the Appendix to the same.

FOREIGN OFFICE, *April* 30, 1851.

SIR: I transmit to you copies of a letter, with its inclosures, which I have received from Colonel Reid, of the Royal Engineers, who for many years has devoted his attention to the theory of storms, and whose object has been to investigate, with a view to practical use in navigation, the laws by which storms and variable winds are governed.

In order that an investigation of this nature may be practically useful, it is essential that facts connected with the atmospherical phenomena in question should be carefully observed and accurately recorded, over as large a portion as possible of the surface of the globe, by persons of education, and whose scientific attainments or professional avocations qualify them for making such observations.

Colonel Reid has suggested that such observations could be most easily made and recorded by captains of ports, masters of light-houses, harbor-masters, and others, whose professional pursuits naturally lead them to be constant observers of atmospherical phenomena.

The inclosures in Colonel Reid's letter will more fully point out the manner in which information on the subject of storms may be collected.

I have accordingly to instruct you to use your best endeavors to procure such information on this important subject; and you will transmit to me, half yearly, an abstract of the information you may have obtained, with such remarks as may suggest themselves to you. If you can add diagrams to show the tracks of any remarkable storms, it would greatly add to the value of your reports. As it is of importance to circulate as widely as possible information as to storm tracks, you should encourage the publication of such information in newspapers and periodical works.

I am, sir, your most obedient, humble servant,

(Signed) PALMERSTON.

HER MAJESTY'S CONSUL,

At————

[Inclosure—1.]

Lieutenant-Colonel Reid to Viscount Palmerston.

14 KENSINGTON GORE, *April* 15, 1851.

MY LORD: I have the honor to acknowledge the receipt of your Lordship's letter, dated 20th March, 1851, transmitting to me certain documents on the subject of storms. I have sent copies of the whole of them to Mr. Redfield, of New York, having asked the favor of the American Minister to transmit them for me. I inclose herewith a copy of a letter, which I wrote to Mr. Lawrence on transmitting the second set of documents, with the answer which I have received in return.

I have no doubt that the representations of Mr. Lawrence will have the effect of extending these combined Meteorological Observations, hitherto confined to the North Atlantic Ocean, to all other parts of the world where American and British officers meet.

I venture to suggest to your Lordship, that a copy of the letter which Mr. Lawrence has addressed to me be circulated among the British Consuls. I inclose also a copy of a circular letter, which was addressed by Lord Glenelg, in 1838, to the Governors of all the British Colonies, which circular letter describes the manner in which information on the subject of storms may be collected; and which, if your Lordship should think fit also to transmit to the Consuls, it would serve as a very useful guide to them.

I must apologize to your Lordship for proposing to give so much trouble; but I do so from a convic-

tion that further knowledge of the atmospheric laws can only be obtained by interesting very many individuals in the inquiry over extended portions of the globe.

I have, &c.

(Signed) WM. REID,

Lieut.-Colonel Royal Engineers.

[Inclosure—2.]

Lieutenant-Colonel Reid to Mr. Abbott Lawrence.

14 KENSINGTON GORE, *April* 10, 1851.

SIR: After I had sent to your Excellency, on the 3d instant, some documents on the subject of Atlantic storms, I received the inclosed papers from the Foreign Office, sent to me by the direction of Lord Palmerston. As these particularly relate to a storm which Mr. W. C. Redfield has been tracing, I beg you will do me the honor of transmitting them for that gentleman.

I take the liberty of informing your Excellency that the attention of the Governors of all British Colonies has been long ago directed to the furtherance of the study of storms, and that Lord Palmerston has directed the attention of British Consuls to the same subject. More recently, an order has been given by the Ordnance Department, to send meteorological instruments to the commanding engineers at all the British Colonial stations. The American and British people have an immense advantage in using the same language, which has enabled us to trace the storm tracks from the West Indies to Labrador, and thus to make a great step in advance in meteorological science.

My object in entering into this explanation to your Excellency, is respectfully to suggest for your consideration, whether great benefit might not result if your Government would invite your Consuls and Naval Officers, wherever stationed, to join their efforts to those of British Consuls and Officers, in investigating the laws of the winds. A notice published in India by the Governor-General, by desire of the Court of Directors, has led to the most important practical results. It is by the combined efforts of American and British, that the knowledge we now possess of Atlantic storms has become of great practical use in navigation; and the unlimited extension of similar efforts to other seas would, I trust, be of benefit to mankind generally.

I have, &c.

(Signed) WM. REID.

[Notification.]

CALCUTTA, *Wednesday, September* 11, 1839.

The importance of investigating the course and phenomena of storms, has been brought to the notice of Government by the Honorable Court of Directors; and the Honorable the President in Council, is in consequence desirous of obtaining local registers of these phenomena, taken simultaneously at as many stations of India as may be found possible. The public officers of the different settlements and stations of

India, are accordingly invited and requested, upon the occurrence of any hurricane, gale, or other storm of more violence than usual, to note accurately the time of its commencement, the direction from which the wind first blows, whether in gusts or regular, and whether accompanied with rain, thunder and lightning, or other phenomena. Also, to note, with as much accuracy as possible, the changes of direction in the wind, and the time of occurrence of each; and lastly, the duration of the gale, and in what quarter the wind is when it ceases. The variations of the thermometer and barometer at each period noticed, will also be of importance, if the means are forthcoming of making such observations.

The President of the Council refrains from making it the business of any particular officer to note the above circumstances, but relies on the known desire of all enlightened persons to promote objects of scientific and useful inquiry, that the public officers will arrange in such a manner as to insure that the observations will be taken by some one in the vicinity of each station.

Reports upon matters of the description comprehended in this order may be forwarded to the Secretary to Government in the General Department, free of postage, (superscribed "Storm Report.")

A scientific gentleman* in Calcutta has obligingly undertaken to combine all reports that may be so received, into a synopsis for exhibition of the results, in the manner adopted and recommended by Colonel Reid, R. E.

By order of the Honorable the President of the Council of India in Council.

(Signed) H. T. PRINSEP,

Secretary to the Government of India.

[Inclosure—3.]

Mr. Abbott Lawrence to Lieutenant-Colonel Reid.

LEGATION OF THE UNITED STATES,

London, April 11, 1851.

SIR: I have the honor to acknowledge the receipt of your letter of yesterday, inclosing for Mr. Redfield a report from Her Majesty's Consul at St. Michael's, of a storm in the Atlantic. I shall have great pleasure in forwarding these to Mr. Redfield, as before, through the Government at Washington; and I shall, in compliance with your suggestion, invite its continued attention to this subject, as I am fully sensible of the important results that may flow from observations vigorously prosecuted with the extended means the Mercantile and Naval Marines and the Consular force of Great Britain and the United States afford.

I have, &c.,

(Signed) ABBOTT LAWRENCE.

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* Mr. Piddington.

[Inclosure—4.]

Circular to Governors of British Colonies.

DOWNING STREET,
November 29, 1838.

SIR: I transmit to you a copy of a work lately published by Lieut.-Col. Reid of the Royal Engineers, entitled "The Law of Storms." The object of the work is to develop, with a view to practical uses in navigation, the laws by which storms and variable winds are governed. In order to make an inquiry of this nature truly useful, it is essential that the facts connected with such phenomena should be collected and arranged over an extended surface, and that accurate records of them should be kept by persons whose education and scientific or professional avocations enable them to estimate the value of such records.

It has been suggested to me that such records could be most easily obtained, and the inquiries on which Colonel Reid has entered be most advantageously followed up, by inviting the co-operation of captains of ports, masters of light-houses, harbor-masters, and others, whose professional pursuits naturally lead to the observation of atmospheric phenomena.

A perusal of the inclosed work will convince you of the interest and importance of this inquiry, and I feel assured that you will be anxious to do all in your power for its promotion.

I would, therefore, request you to communicate with such officers or private individuals in the colony under your government, as may appear to you best qualified to furnish information on the subject, pointing out to them the service which they would render to science, by keeping journals of such phenomena as may come under their respective observations.

The form in which such journals should be kept is suggested in the memorandum herewith inclosed.

If you should succeed in setting on foot a system of observations, you will have the goodness to transmit to Her Majesty's Government, half yearly, an abstract of the journals at your command; and I would suggest that you should endeavor, as much as possible, to obtain authentic information of the same nature from the foreign countries in your neighborhood.

I have, &c.,

(Signed) GLENELG.

Memorandum respecting the Records to be kept of the State of the Weather in British Colonies.

The captains of ports, harbor-masters, and keepers of light-houses, or, where those officers do not exist, some other competent public functionary, should be requested to keep journals of the weather, on the principle of the log-books of ships. A column should be specially reserved for inserting the height of the barometer.

Under the head of "Remarks," should be entered all Meteorological Observations considered worthy of particular notice.

When a keeper of a journal may hear that a vessel has encountered a storm, he will enter in it any

information on the subject which he can rely on, together with the name of the ship, of her owner, and of the port to which she may belong.

With the view of tracing the course of storms, the Trinity Board of London have given directions for the adoption of measures to obtain a more accurate record of the state of the weather than has hitherto been kept at the light-houses of Great Britain and Ireland.

The keepers of these lights having the opportunity of taking their observations by night as well as by day, great advantage may be derived from employing them in this manner. Officers in charge of colonial light-houses, should be instructed to keep similar journals. In noting the wind's force, both in the harbor-masters' journals and in the light-house reports, it is desirable that the officers should adopt the numbers for denoting the strength of the wind in use at Greenwich Observatory, and about to be introduced at the light-houses under the Trinity Board.

In the cases of St. Helena and Ascension, it is desirable that more precise information respecting the "Rollers" at those Islands should be obtained.

As the object of Her Majesty's Government, in instituting these inquiries, is the advancement of knowledge or science generally, the Governors of the several British Colonies will consider how far it may be in their power to obtain useful information bearing on the subject, from countries adjoining to their government in the possession of foreign powers, or how far it may be useful to the study of meteorology, to exchange the observations made within their governments, for those of other countries in the neighborhood.

If at any time desired, there would be no objection to the publication, in the colonial newspapers, of extracts from the journals.*

I have deemed the foregoing necessary to a proper understanding of the question herewith submitted to the seafaring, meteorological, and scientific communities of the world, and for the information of all others, upon whose co-operation and assistance the successful accomplishment of the important objects in view depends.

It will be observed that the meteorologists and Government of Great Britain have already taken steps for enlisting a large corps of laborers in the meteorological field, and that the American proposition is offered only as an amendment thereto.

To make the system complete, it appeared necessary to spread it out over the sea, as well as the land; and to secure the requisite concert of action among observers in all countries, it was thought advisable to propose a conference of meteorologists generally, at which the kind and construction of the instruments to be used, the subjects of observation, the time and method of observing, with the forms for recording and reducing the observations, &c. may be discussed and arranged; and at which, also, all the arrangements

* See pp. 24–29—Appendix to Instructions for taking Meteorological Observations at the Principal Foreign Stations of the Royal Engineers.

for a universal system of observation, including a series for the sea as well as for the land, may be made, and the plans for carrying it out recommended for the approval and adoption of those upon whose co-operation the successful prosecution of the scheme must rely. It is proposed that this conference shall be as general as is the field of research; and, therefore, it is desired that all those who have it in their power to assist, will take part in its proceedings either by personal representation or written communication, as to them may seem best.

The time and place for holding this conference, have not been agreed upon; but as soon as they are, they will be made known. In the mean time, communications have been addressed to the diplomatic functionaries of the various governments represented near Washington, requesting them to bring the subject to the notice of their governments. The replies of these gentlemen are encouraging; they give reason to expect that their governments will give the proposition a favorable consideration.

After the details of the plan shall have been agreed upon in conference, it is supposed that the parties therein represented will co-operate in giving effect to the plan, by directing the observations to be made according to it, on board public ships, at military posts, at light-houses, hospitals, and all other government establishments and institutions at which it may be convenient or desirable to institute a series of meteorological observations.

But, as important as such a co-operation on the part of governments would be, and as greatly to be desired as it is, that co-operation would by no means cover the whole ground; nor would the corps of laborers thus brought into the field, though every state in Christendom should unite in the scheme, be sufficient to gather the harvest that it is proposed to reap.

The plan, though it fully recognizes the value of the aid which governments can give, by no means overlooks the importance of that kind of co-operation and aid which is to be derived from the hearty good-will of good men, and from the voluntary co-operation of that powerful corps of meteorological observers and navigators who labor in the private walks of life.

"Man is a meteorologist by nature;" and every one who observes the wind and the weather, and who is in the habit of noting the thermometer and the barometer, is already an observer whose services it is desirable to secure, and whose labors in the field meteorological, the plan in contemplation proposes to make available. In like manner, "all who go down to the sea in ships," are invited to co-operate; for they, too, are observers. That this immense corps of laborers, who are already in the field, should act in concert and "pull together," is the object of the present plan. Therefore, the men of science, the scientific societies, the shipowners and shipmasters, the directors of corporations, and the faculties of universities, and the members of the various institutions for the promotion of science, and good men everywhere, are requested to lend this scheme their good-will, their influence, their aid, and their co-operation.

The importance of concert among meteorologists all over the world, and of co-operation between the observer on the shore and the navigator at sea, so that any meteorological phenomenon may be traced throughout its cycle both by sea and land, is too obvious for illustration, too palpable to be made plainer by argument. And therefore the proposition for a general conference, to arrange the details of such a

comprehensive system of observations, addresses itself to every friend of science and lover of the useful in all countries.

The domain of this science is the atmosphere; its boundaries embrace the land and cover the sea. To comprehend the laws which govern the movements of a machine so vast as it is, requires that its operations should be observed in all its parts, and watched from all points at the same time. Its motions are freer and less obstructed over the water than they are by the land and across the mountains. Indeed, the ocean itself may, in one sense, be regarded as a grand expression of meteorological agencies; therefore, the good-will and friendly co-operation of private ship-owners and masters, in all maritime countries, is considered of great importance to the cause in hand.

Many of these, in America, have already shown their willingness to enter this field as co-laborers. Several hundreds of them are already co-operating with me in a system of observations according to a prescribed form, and from which several highly important results, both practical and scientific, have already been obtained. It is presumed that the ship-owners and masters of other countries will be equally as willing, and equally as zealous to second and to take part in such a system of observations as those of America have shown themselves to be.

These observations at sea possess a double value; they help us, as do those on the land, to a right understanding of the meteorological machinery of the earth; and they also help us in the safe navigation of the seas and in the industrial pursuits of commerce.

By how much the commercial marine of every country is more extensive than its naval, by so much more valuable is the assistance which the former is capable of rendering. How far are the owners and masters of the private ships under the various flags, inclined to furnish their vessels with the necessary instruments—to use them—to record the observations all according to the same form—and, at the end of each voyage, to transmit them to the Repository that may be designated to receive them?

Upon the answer which the seafaring community of each nation shall give to this question, depend the importance of the aid, and the value of the co-operation which they will render in this undertaking. If they will but unite in one long pull together, the ocean, at their word, may be covered with floating observatories, each one, without interruption to owners or inconvenience to master, propounding, as he goes, the same questions to Nature; and all of them may, at the same instant, though scattered over the whole face of the earth, be extracting and recording her answers thereto.—These answers, when brought together, compared, and sifted, cannot fail to reveal truths and principles of the highest interest to mankind.

The missionaries who are stationed among the islands and in heathen lands, form also a class capable of rendering the most valuable assistance in any comprehensive system of meteorological observations. As a corps of observers they are not to be excelled—they visit parts of the world which cannot be brought under the system except through their instrumentality. While teaching savage man the principles of Christianity, and spreading around him the blessings of civilization, these devout men have also rendered most important services to the cause of science; and it is not doubted that when such a subject as this shall be brought to their notice, they will gladly lend it co-operation also.

Such are the classes and the individuals for whose consideration I now submit the proposition for a universal system of meteorological observations, for concert of action between the navigator at sea and the observer on shore, and for a general conference in which all the details connected with such a system shall be discussed and arranged.

As before stated, the subject has been brought officially before the various governments through the regularly appointed channels of communication. They have been invited to assist and co-operate.

It is proposed, therefore, before taking any definite action either as to the farther details, or as to the time and place for holding the conference, to wait for the replies to these communications. In the mean time, however, I avail myself of this means of bringing the subject to the notice of the meteorologists, navigators, and the friends of science generally, with the hope that thereby the cause will be advanced, and that all whose good-will, friendly counsels, and co-operation are concerned, will take the matter into consideration, and be prepared to lend their support to a scheme which has for its object nothing but universal good.

To prevent misconception, it is proper to state that the plan proposed is based upon the principle of voluntary co-operation, and that I have no authority to pledge the Government of the United States for any expense whatever.

All of which is respectfully submitted,

M. F. MAURY,

*Lieut. U. S. N.**

U. S. N. OBSERVATORY,

December 13, 1851.

Brazil, Chili, Peru, New Granada, Sardinia, the King of the Sandwich Islands, the Holy See, and Denmark, with many Scientific Societies and learned philosophers, readily responded to the proposition, and appointed representatives with whom I might consult as to details.

But when the original proposition, as amended by the American Government to include the sea also in the system of research, went back to the British Government, it was by that Government referred to the President and Council of the Royal Society for a report.

This gave the subject a new aspect, as will appear from the following.

April 29, 1852. At a Council of the Royal Society:—

Present—The EARL OF ROSSE, President, in the Chair. Mr. Bell; Mr. Bowman; Mr. Brooke; Prof. Challis; Mr. Christie; Dr. Clark; Sir Philip Edgerton, Bart.; the Dean of Ely; Mr. Gassiot; Sir John F. Herschel, Bart.; Professor Miller; Lieut.-Col. Portlock, R. E.; Colonel Sabine, R. A.; Mr. Solly; Mr. Spence; Captain Smyth, R. N.

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* *Vide* the pamphlet "On the Establishment of a Universal System of Meteorological Observations, by Sea and Land," published at the National Observatory, 1851.

The Minutes of the last meeting were read and confirmed.

Colonel Sabine reported that the Committee to which Mr. Addington's letter and the accompanying documents were referred, had agreed upon the following draft of a letter to be addressed to Mr. Addington by the Secretary.

"SOMERSET HOUSE, *May*, 1852.

"Sir: I have the honor to acknowledge the receipt of your letter of March the 4th, transmitting, by direction of the Earl of Malmesbury, several documents received from foreign governments in reply to a proposal made to them by Her Majesty's Government, for their co-operation in establishing a uniform system of recording meteorological observations, and requesting the opinion of the President and Council of the Royal Society in reference to a proposition which has been made by the Government of the United States, respecting the manner in which the proposed co-operation should be carried out.

"Having submitted your letter with its inclosures to the President and Council of the Royal Society, I am directed to convey to you the following reply.

"With reference to the subject of well-directed and systematically conducted meteorological observations generally, and to the encouragement and support to be given to them by the governments of different countries, the President and Council are of opinion that they are highly deserving of such consideration, not only for their scientific value, but also on account of the important bearing which correct climatological knowledge has on the welfare and material interests of the people of every country.

"With reference to the proposal for the establishment of a uniform plan in respect to the instruments and modes of observation, the President and Council are not of opinion that any practical advantage is likely to be obtained by pressing such a proposition in the present state of meteorological science. Most of the principal governments of the European Continent, as Russia, Prussia, Austria, Bavaria, and Belgium, have already organized establishments for climatological researches in their respective States, and have placed them under the superintendence of men eminently qualified by theoretical and practical knowledge, and whose previous publications had obtained for them a general European reputation. Such men are Kupffer, Dové, Kriel, Lamont, and Quételet; under whose directions the meteorological observations in the above-named countries are proceeding; the instruments have been constructed under their care, and the instructions drawn up and published by them under the sanction of their respective governments. The observations as they are made are sent to them, are reduced and co-ordinated under their superintendence, and are published at the expense of the governments. Every year is now producing publications of this nature in the countries referred to, and by the rapid intercommunication of these, the results of the experience of one country, and the modifications and improvements which experience may suggest, become quickly known to all. To call on countries already so advanced in systematically conducted meteorological observations to remodel their instructions and instruments, with a view of establishing uniformity in these respects, would probably, if pressed, elicit from other governments also the reply which Her Majesty's Government have received from Prince Schwarzenberg, conveyed in the Earl of Westmoreland's letter to

Viscount Palmerston, viz: the transmission of a copy of the instructions which have been given to the Meteorological Observatories, forty-five in number, in the Austrian dominions, and a reference to the results obtained at those observatories, which are stated to be in regular course of publication.

"In an earlier stage, when these establishments were either forming or were only in contemplation, it was considered that advantage might arise from a discussion of the objects to be principally kept in view, and of the instruments and methods by which these might be most successfully prosecuted. For this purpose, a conference was held at Cambridge, in England, in 1845, which was attended by many of the most distinguished meteorologists in Europe, and amongst them by all the gentlemen whose names are above stated, and who were expressly sent by their respective governments. The impulse communicated by this assemblage was without doubt highly beneficial, and the influence of the discussions which took place may perhaps be traced in some of the arrangements under which the researches in different countries are now proceeding; but in the stage to which they have advanced, it may be doubted whether any measures are likely to be more beneficial than those which would increase the facilities of a cheap and rapid intercommunication of the results of the researches which are in progress.

"With reference 'to the suggestions made by the scientific men of the United States,' the proposition of Lieutenant Maury, to give a greater extension and a more systematic direction to the meteorological observations to be made at sea, appears to be deserving of the most serious attention of the Board of Admiralty. In order to understand the importance of this proposition, it will be proper to refer to the system of observations which has been adopted of late years in the Navy and Merchant service of the United States, and to some few of the results to which it has already led. Instructions are given to naval captains and masters of ships, to note in their logs the points of the compass from which the wind blows, at least once in every eight hours; to record the temperature of the air, and of the water at the surface, and when practicable, at considerable depths of the sea; to notice all remarkable phenomena which may serve to characterize particular regions of the ocean, more especially the direction, the velocity, the depths, and the limits of the currents. Special instructions also are given to whalers, to note down the regions where whales are found, and the limits of the range of their different species. A scheme for taking these observations regularly and systematically, was submitted by Lieut. Maury to the Chief of the Bureau of Ordnance and Hydrography, in 1842, and instantly adopted; detailed instructions were given to every American shipmaster, upon his clearing from the Custom-house, accompanied by a request that they would transmit to the proper office, after their return from their voyage, copies of their logs, as far at least as they related to these observations, with a view to their being examined, discussed, and embodied in Charts of the Winds and Currents, and in the compilation of Sailing Directions to every port of the globe. For some years the instructions thus furnished received very little attention, and very few observations were made or communicated; the publication, however, in 1848, of some charts, founded upon the discussion of the scanty materials which had come to hand, or which could be collected from other sources, and which indicated much shorter routes than had hitherto been followed to Rio and other ports of South America, was sufficient to satisfy some of the more intelligent shipmasters of the object and real import-

ance of the scheme, and in less than two years from that time it had received the cordial co-operation of the masters of nearly every ship that sailed. At the present time there are nearly 1,000 masters of ships who are engaged in making these observations; they receive freely in return the Charts of the Winds and Currents, and the Sailing Directions which are formed upon them, corrected up to the latest period.

"Short as is the time that this system has been in operation, the results to which it has led have proved of very great importance to the interests of navigation and commerce. The routes to many of the most frequented ports in different parts of the globe have been materially shortened; that to St. Francisco, in California, by nearly one-third; a system of southwardly monsoons in the equatorial regions of the Atlantic and on the west coast of America has been discovered; a vibratory motion of the trade-wind zones, and with their belts of calms and their limits for every month of the year, has been determined; the course, bifurcations, limits, and other phenomena of the great Gulf Stream have been more accurately defined, and the existence of almost equally remarkable systems of currents in the Indian Ocean, on the coast of China, and on the North-western coast of America and elsewhere has been ascertained; there are, in fact, very few departments of the science of meteorology and hydrography which have not received very valuable additions; whilst the most accurate determination of the parts of the Pacific Ocean (which are very limited in extent) where the sperm-whale is found, as well as the limits of the range of those of other species, has contributed very materially to the success of the American whale fishery, one of the most extensive and productive of all the fields of enterprise and industry.

"The success of this system of co-operative observations has already led to the establishment of societies at Bombay and Calcutta, for obtaining, by similar means, a better knowledge of the winds, currents, and the course of the streams of the Indian seas.

"But it is to the Government of this country that the demand for co-operation, and for the interchange of observations, is most earnestly addressed by the Government of the United States; and the President and Council of the Royal Society express their hope that it will not be addressed in vain. We possess in our ships of war, in our packet service, and in our vast commercial navy, better means of making such observations, and a greater interest in the results to which they lead, than any other nation; for this purpose, every ship which is under the control of the Admiralty should be furnished with instruments properly constructed and compared, and with proper instructions for using them. Similar instructions for making and recording observations, as far as their means will allow, should be given to every ship that sails, with a request that they will transmit the results of them to the Hydrographer's Office of the Admiralty, where an adequate staff of officers or others should be provided for their prompt examination, and the publication of the improved Charts and Sailing Directions to which they would lead; above all, it seems desirable to establish a prompt communication with the Hydrographer's Office of the United States, so that the united labors of the two greatest naval and commercial nations of the world may be combined, with the least practicable delay, in promoting the interests of navigation.

"The President and Council refer to the documents which have been submitted to them, and more especially to the 'Explanations and Sailing Directions to accompany Wind and Current Charts,' prepared

by Lieutenant Maury, for a more detailed account of this system of co-operative observations, and of the grounds upon which they have ventured to make the preceding recommendations."

(Signed) "S. HUNTER CHRISTIE, Sec. R. S."

"H. U. ADDINGTON, ESQ."

"Resolved—that this report be adopted, and that the Secretary be requested to write a letter to this effect, approved by the Committee."

Report of Lieutenant Maury to the Secretary of the Navy.

NATIONAL OBSERVATORY, *Washington, November* 6, 1852.

SIR: By a communication of December 6, 1851, from the Navy Department, I was instructed to confer with Her Britannic Majesty's officers and others, with regard to the establishment of a universal system of meteorological observations. I was directed also to report progress from time to time to the Navy Department. This I now have the honor to do.

That no time might be lost with regard to a measure that gives promise of such universal benefits, I immediately published a pamphlet in explanation of the proposition, and of the steps which had been taken with regard to it.

A copy of this pamphlet, entitled "On the Establishment of a Universal System of Meteorological Observations by Sea and Land," I have the honor herewith to forward.

Steps were taken to bring the subject to the notice of the various governments with which the United States were in friendly and diplomatic intercourse. To this end, Ministers and Diplomatic Agents were addressed, requesting them to bring the subject to the notice of the proper functionaries abroad, and to convey an invitation for co-operation.

The main object of this plan of meteorological observations, so far as the aim which the United States had especially in view is concerned, was to bring the sea regularly within the domain of active and systematic meteorological research, and make it a field in which maritime nations might all act together and in concert for the common good of mankind.

This proposition was offered as an amendment to one from Great Britain, inviting the co-operation of the United States in an arrangement "for the purpose of enabling the officers of the Royal Engineers at foreign stations to take meteorological observations upon a uniform plan."

At the time that this amendment was offered, it was not known here that the Government of Great Britain had invited the co-operation of other governments generally in the plan which she had proposed for the "nineteen stations" of her Royal Engineers.

Moreover, as the proposition to establish a uniform plan of making and recording meteorological observations on shore, seems to meet with more or less opposition among meteorologists, I would recommend that the United States should afford, as far as practicable, the co-operation asked for by Great Britain in the first place; abandon, for the present, at least, that part of the "universal system"

which relates to the *land*, and direct our efforts mainly to the sea, where there is such a rich harvest to be gathered for commerce and navigation, as well as for the increase of knowledge, the advancement of science, and the benefit of man.

I am farther induced to make this recommendation in consequence of the evident reluctance with which Russia, Austria, Bavaria, Belgium, and other powers, seem to regard any change in their system of meteorological observations on shore, and under which some of their *savans*, as Dové, Kriel, Lamont, Quételet, *et al.*, have obtained a world-wide reputation.

On the land, the field is already well filled with laborers; it has been occupied for a long time, and each country seems to have adopted a system of its own, according to which its laborers have been accustomed to work, and to which its meteorologists are more or less partial.

Any proposition having in view, for these systems, a change so radical as to bring them to uniformity, and reduce them to one for all the world, would, I have reason to believe, be regarded with more or less jealousy by many; and though there be not a few societies and individuals of great eminence and worth, such as the Academy of Sciences of France, the Meteorological Society of Great Britain, and the Royal Danish Society of Sciences, that have manifested a readiness to entertain propositions to such an effect; yet meteorology is a science, which depends so much for progress upon harmony, co-operation, and mutual accord of observers, that I have deemed it expedient not to press observers on the land for any co-operation with observers at sea, except such as they will willingly give in their own way, and according to their own plan.

Independent of these considerations, there is another, which should be paramount in inducing us not to press the proposition for a universal system of Meteorological Observations on the land, and a general co-operation of meteorologists therein:—

The British Government, which had taken the lead in that feature of the plan, upon the receipt of the American proposition to include the sea also, and make the plan universal, referred the subject to the President and Council of the Royal Society for a report.

That Society, at its sitting of the 29th of April last, adopted a report upon the subject which had been brought before it by command of the Earl of Malmesbury, in which, "with reference to the proposal for the establishment of a universal plan, in respect to instruments and modes of observations" *on the land*, the opinion is expressed, that no "practical advantage is likely to be obtained by pressing such a proposition, in the present state of meteorological science."

Bowing to the authority and weight of this opinion—respect for the source whence it emanates, and a proper regard for the circumstances under which it was called forth, seem to render any farther action, with regard to the land feature of the plan, highly inexpedient, not to say indelicate, and therefore improper, on our part.

Not so, however, with regard to the sea; that meets with decided favor and earnest support.

In the report already alluded to, the President and Council of the Royal Society hold the following language with reference to the suggestions made by the scientific men of the United States: "The propo-

sition of Lieut. Maury, to give a greater extension and a more systematic direction to the meteorological observations to be made at sea, appears to be deserving of the most serious attention of the Board of Admiralty. In order to understand the importance of this proposition, it will be proper to refer to the system of observations which has been adopted of late years in the Navy and Merchant service of the United States, and to some few of the results to which it has already led. Instructions are given to naval captains and masters of ships, to note in their logs the points of the compass from which the wind blows, at least once in every eight hours; to record the temperature of the air, and of the water at the surface, and when practicable, at considerable depths of the sea; to notice all remarkable phenomena which may serve to characterize particular regions of the ocean, more especially the direction, the velocity, the depth, and the limits of the currents. Special instructions also are given to whalers to note down the regions where whales are found, and the limits of the range of their different species. A scheme for taking these observations regularly and systematically was submitted by Lieut. Maury to the Chief of the Bureau of Ordnance and Hydrography, in 1842, and instantly adopted. Detailed instructions were given to every American shipmaster, upon his clearing from the Custom-house, accompanied by a request that they would transmit to the proper office, after their return from their voyage, copies of their logs, as far at least as they related to these observations, with a view to their being examined, discussed, and embodied in Charts of the Winds and Currents, and in the compilation of Sailing Directions to every port of the globe. For some years the instructions thus furnished received very little attention, and very few observations were made or communicated; the publication, however, in 1848, of some charts, founded upon the discussion of the scanty materials which had come to hand, or which could be collected from other sources, and which indicated much shorter routes than had hitherto been followed to Rio, and other parts of South America, was sufficient to satisfy some of the more intelligent shipmasters of the object and real importance of the scheme, and in less than two years from that time it had received the cordial co-operation of the masters of nearly every ship that sailed. At the present time, there are nearly 1,000 masters of ships who are engaged in making these observations; they receive freely in return the Charts of the Winds and Currents, and the Sailing Directions which are formed upon them, corrected up to the latest period.

"Short as is the time that this system has been in operation, the results to which it has led have proved of very great importance to the interests of navigation and commerce. The routes to many of the most frequented ports in different parts of the globe have been materially shortened; that to San Francisco, in California, by nearly one-third. A system of southwardly monsoons in the equatorial regions of the Atlantic and on the west coast of America has been discovered; a vibratory motion of the trade-wind zones, and with their belts of calms and their limits for every month of the year has been determined; the course, bifurcations, limits, and other phenomena of the great Gulf Stream have been more accurately defined, and the existence of almost equally remarkable systems of currents in the Indian Ocean, on the coast of China, and on the North-western coast of America and elsewhere has been ascertained. There are, in fact, very few departments of the science of meteorology and hydrography which have not received very valuable additions; whilst the most accurate determination of the parts of the Pacific Ocean (which are very limited

in extent) where the sperm-whale is found, as well as the limits of the range of those of other species, has contributed very materially to the success of the American whale fishery, one of the most extensive and productive of all the fields of enterprise and industry.

"The success of this system of co-operative observations has already led to the establishment of societies at Bombay and Calcutta, for obtaining, by similar means, a better knowledge of the winds, currents, and the course of the streams of the Indian seas.

"But it is to the Government of this country that the demand for co-operation, and for the interchange of observations, is most earnestly addressed by the Government of the United States; and the President and Council of the Royal Society express their hope that it will not be addressed in vain.

"We possess in our ships of war, in our packet service, and in our vast commercial navy, better means of making such observations, and a greater interest in the results to which they lead, than any other nation; for this purpose, every ship which is under the control of the Admiralty should be furnished with instruments properly constructed and compared, and with proper instructions for using them. Similar instructions for making and recording observations, as far as their means will allow, should be given to every ship that sails, with a request that they will transmit the results of them to the Hydrographer's Office of the Admiralty, where an adequate staff of officers or others should be provided for their prompt examination, and the publication of the improved Charts and Sailing Directions, to which they would lead; above all, it seems desirable to establish a prompt communication with the Hydrographer's Office of the United States, so that the united labors of the two greatest naval and commercial nations of the world may be combined, with the least practicable delay, in promoting the interests of navigation.

"The President and Council refer to the documents which have been submitted to them, and more especially to the 'Explanations and Sailing Directions to accompany Wind and Current Charts,' prepared by Lieutenant Maury, for a more detailed account of this system of co-operative observations, and of the grounds upon which they have ventured to make the preceding recommendations."

Moreover, at the last meeting of the British Association, held a few weeks ago, its President, in his address remarked: "The activity which has prevailed so greatly of late, in the collection of meteorological data, has been almost exclusively confined to that portion of the surface of the globe which is occupied by land, although the portion covered by the ocean is not only much greater in extent, but is also better suited for the solution of several meteorological problems.

"Many striking examples might be adduced to show that it is systematic direction, and not individual zeal, in naval men, which has been wanting; *and it has been, therefore, with great satisfaction, that meteorologists have learned that a proposition has been made, from the United States Government, conjointly, and in co-operation, for a system of meteorological observations to be made at sea,* in all ships belonging to the naval service of the two countries, and sufficiently simple to be participated in by the merchant service also.

"In a partial trial which has already been made in the United States, it has been found to produce results which, exclusive of their scientific bearing, *are of great importance to the interests of navigation and*

commerce in materially shortening passages, by the knowledge of prevailing winds and currents, at particular seasons." "The practical advantage arising from the co-ordination of the observations in the Hydrographic Office of the United States, and the circulation of the Charts of the Winds and Currents, and the Sailing Directions formed on them, have been such, and so appreciated, that there are now, as is stated, more than 1,000 American ships engaged in making them. The request for British co-operation in an undertaking so honorable to the country in which it originated, was referred in the Spring of this year by the Earl of Malmesbury to the President and Council of the Royal Society for a report. * * * * * Doubtless, we can now estimate only a small part of the advantages which terrestrial physics, as well as hydrography and navigation would derive from the concurrent exertions of the two great maritime nations, in the way which has been pointed out."

Such are the reasons and the circumstances which induce me to recommend an abandonment, for the present, of the land portion, and to urge farther action with regard to that which includes the sea. This meets the approval of all who have expressed opinions with regard to it; many, great, and obvious are the advantages which it promises to navigation and commerce, and all that seems wanting now to get it fairly under way is the adoption of the necessary preliminary arrangements.

These relate chiefly to the subjects of observations, the instruments to be used, and the modes and methods of making the observations and of treating them. The abstract logs, as the forms used by the American shipmasters for making and recording observations at sea, for this office, are called, were intended principally for the commercial marine; and therefore they only embrace such objects, and require only such instruments as the masters of American merchant vessels generally are accustomed to use and to make.

These observations have been carried far enough to show the great need there is for nicer instruments, for more accurate observations, and for including among the objects to be observed, certain things which are generally passed over unobserved by navigators.

As it is desired, therefore, 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 may 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 whatever part of the world; and moreover, as it is desirable to enlist the voluntary co-operation of the commercial, as well as the military marine of all nations, in this system of research, it becomes not only proper, but politic, that the forms of the abstract logs to be used, the description of the instruments to be employed, the things to be observed, with the manipulation of the instruments, and the methods and modes of observation, should be the joint work of the principal parties concerned.

Wherefore, in discussing the requisite forms and instructions for this purpose, I should be glad to have the assistance in counsel and advice of the most eminent navigators.

For these reasons, I request that the Board of Admiralty, and the Ministers of Marine of France,

Russia, Holland, Denmark, Sweden, and Prussia, be invited, each, to appoint for this purpose an officer, to meet me at such time and place as shall be agreed upon.

Respectfully, &c.,

M. F. MAURY,

Lieut. U. S. Navy.

Hon. JOHN P. KENNEDY,

Secretary of the Navy, Washington.

Invitations were thereupon issued by Mr. Everett, the Secretary of State; and accordingly a maritime conference, for the purpose of devising a uniform plan of observations at sea, met in Brussels, Tuesday the 23d of August, 1853.

It consisted of representatives from Portugal, France, England and Belgium, Denmark, Sweden and Norway, and from Russia, Holland, and the United States.

My letter of appointment, which bears date, U. S. Navy Department, 8th July, 1853, under the signature of the Hon. J. C. Dobbin, Secretary of the Navy, says:—

"By your letter, addressed to this Department under date of the 18th ultimo, I am informed that the Emperor of Russia, and the kings of Sweden, Norway, Holland, and Denmark, have each signified their acceptance of the invitation to appoint an officer to confer as to the details of a uniform system of observations at sea, or that they manifested a disposition to accede to the proposition, so soon as the time and place for the conference should be named.

"The Department having approved of your suggestion as to the place and time of meeting, viz: Brussels, and Tuesday the 23d of August next, you are hereby appointed, on the part of the Navy Department of the United States, to meet the representatives of other navies in conference upon the subject of a uniform system of observations on board of vessels of war at sea; and, for this purpose, you will proceed to Brussels, where you will endeavor to arrive by the day named for the meeting."

The Belgian Government, acting up to the enlightened views for which it is deservedly celebrated, admitted this conference to its capital with marks of the most friendly consideration.

A place of meeting in the Hotel of the Minister of the Interior was kindly offered, and every facility for conducting deliberations and for publishing accounts of proceedings was afforded by command of his Majesty, the King of the Belgians.

It will be observed from my letter of instructions, quoted above, that the object of this conference was to devise "a uniform system of observations on board VESSELS OF WAR at sea;" that it did not refer to the land, nor was it intended to *prescribe* a form for merchantmen, though it had for its object their co-operation.

I had, after arriving at Brussels, reason to regret that the proposition to include the land also, and make the plan universal, had been withdrawn, or rather, *temporarily* abandoned.

In my letter of November 6, 1852, to the Secretary of the Navy (p. 36), I had, in deference to the views expressed by the President and Council of the Royal Society of London, in their report of May,

1852 (p. 33), to Mr. Addington, recommended (p. 40), "an abandonment, for the present, of the land portion" of the plan.

But when I arrived at Brussels, and came to compare notes, I found reason to believe that the President and Council of the Royal Society, in their report to the British Government, were mistaken in their opinion as to the light in which some of the most distinguished European meteorologists at least would regard the proposition for the establishment of a universal system of meteorological observations.

M. Quetelet exceedingly regretted that he had been quoted on that occasion, as one opposed to such a system. On the contrary, he thought that much good would come of a system of observations which should secure the co-operation of meteorologists both by sea and land. So far from being opposed to it, he avowed himself as an ardent friend of the measure, and thought if the land feature had not been temporarily abandoned that it would have met with decided success.

He was of opinion, moreover, that Dové also, and Kriel too, would both favor so grand and beneficent a proposition as was that to bring both the land and the sea regularly within the domains of systematic meteorological research.

I had the pleasure to receive, also, while at Brussels, a letter from the eminent Russian meteorologist, Kupffer, expressing the opinion that his Government stood ready to co-operate, throughout her extensive system of meteorological observatories, with the plan proposed by the conference for the sea, should the conference think proper to invite such a co-operation.

This communication was received with much satisfaction by the Conference. But the co-operation was not invited, simply because the members thought they had no authority to include the land, and that, to invite co-operation there, would be travelling out of the record.

I also received, while in Brussels, official information that the Government of Her Majesty, the Queen of Portugal, had appointed Doctor Guilherme J. A. D. Pegado, Professor of Physics in the Polytechnic School of Portugal, to confer with me upon the subject of "a universal system of meteorological observations."*

Captain James, R.E., one of the British representatives at the Brussels Conference, informed me that Spain had actually sent to England for the standard instruments, &c., requisite for such a system of observations. She expressed herself in favor of it.

Also M. Ballot, the enterprising meteorologist of Holland, declared himself, both by letter and afterwards in person, when I had the pleasure of making his acquaintance in Amsterdam, earnestly in favor of such a system. The Meteorological Society of Great Britain has, through its officers, also declared in favor of the proposition.

The French Academy of Sciences entertained in the most favorable manner the proposition, as it

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* Extract from Dr. Pegado's letter, received at Brussels: "Le Gouvernement de S. M. la Reine du Portugal, a bien voulu me faire la grâce de me charger de l'honorable mission de recevoir vos ordres en tout ce qui concerne le haut sujet du système universel des observations météorologiques, et son application aux—*Wind and Current Charts*—sujet, auquel vous avez, Monsieur, je le dis avec le plus grand plaisir, une si grande part de gloire."

originally came from this office, in 1851, viz: to include the sea, and make the plan universal. In proof of this, I quote two letters from M. Jomard, the distinguished French *savant*, to Robert Walsh, my esteemed friend and fellow-citizen:—

PARIS, *February* 1, 1852.

ESTEEMED AND SCIENTIFIC FRIEND: I have read with lively interest the project of having meteorological observations made simultaneously, and in a uniform plan, by all enlightened nations. Far from having objections to put forth, I have only praises to offer for the advances which your compatriots have made towards uniting in one combination the partial results, which, scattered about, and from want of a cordial and common understanding, would never bear much fruit. The reason is evident; it is, that meteorological phenomena commonly embrace large extents of country, covering the territories of several nations. The adoption of such a plan has, moreover, the great advantage of drawing closer the bonds of union among the peoples. In fine, it would be opening the way to the establishment of a periodical scientific congress, which I have long desired, in order to regulate the scientific inquiries which interest all civilized people. You are perhaps aware of what I have written on the uniformity to be introduced in the units of measure, in nomenclature, in the expression of altitudes, &c. No one, therefore, can rejoice more than I at seeing the commencement of operations of a system of meteorological labors.

But as I have expressed the wish that Baron Von Humboldt were put at the head of the reform, he it is again to whom we must look to take in hand the meteorological work. And there is another reason yet more urgent; the Baron Humboldt is the very man who has caused, by the weight of his name, the establishment of magnetic observatories in twenty different regions among all kinds of people; his enterprise has continued for twenty or thirty years; I had myself the pleasure of seeing one established at Cairo; at the other extremity of Africa there is another of these stations; there is even one in Australia.

It is, then, under his patronage you should place the matter which now occupies your scientific compatriots and the learned of England. His name, and that of M. Arago, will cause success to the proposed institution. It is sufficient to say that my name ought *not to appear* in the *confidential* letter of M. Maury, to whom I am for the rest well known.

You can say to him that no one appreciates more than I do the merits of his *Charts of Winds and Currents*, and the immense service he renders to navigation and the commerce of all people—what do I say?—to humanity and to civilization.

In the magnetic stations of Baron Humboldt, they make all the meteorological observations. They note at all times the pressure of the atmosphere; the temperature and hygrometrical state of the air; the quantity of rain; the force, intensity, and direction of the wind; the declination and intensity of the magnetic needle. All this is well known in England. They are also there occupied with electrical phenomena, which play so great a part in the constitution of the atmosphere. It is by the combined study of all these elements that we are to discover laws, if this be possible. An engineer of roads and bridges, M. Morin, has established for this object an extensive correspondence these twenty-five or thirty years, and has published successively this meteorological correspondence.

I see by the letters of MM. Webster and Graham that they do not *say a word* of the European conference, an idea suggested in the report of M. Maury; but this should not hinder our progress. It is not probable that your Government will disavow a thought *as wise as useful.*

I hope, Monsieur and friend, that all the above may meet with your approval, and that you will not blame me for answering so much at length, and not limiting myself to a "cast mine eye over the inclosed letter."

Thousand thanks for your indefatigable and effectual kindness.

JOMARD.

Monday Evening, February 9, 1852.

MONSIEUR AND FRIEND: I hasten to inform you that the Academy of Sciences, in its session of to-day, and upon motion of M. Arago, has appointed a committee to make a report upon the project of establishing a uniform method of *meteorological observations upon both land and sea*, embracing the question of an international conference, so admirably suggested by your scientific compatriot M. Maury. M. Arago has entered into the interesting details, and rendered a deserved tribute to the American observers.

(To Mr. Walsh.) JOMARD.

"My friend Mr. Maury," says Walsh, in his superscription to the note, "will see by the above that the affair is launched. I put his letter to me into the hands of Arago, after having submitted it to M. Jomard."

That great and wise man cherished, until his death, the project for a universal system of observations. The wish was dear to his heart.

Indeed, but a few weeks before his death, he is said to have intimated disappointment and regret that the Brussels Conference was not upon a more comprehensive plan.

The members of the Maritime Conference, at Brussels, without exception, each expressed himself in favor of a system of meteorological observations more comprehensive than that which they were devising for the sea. They saw the necessity and admitted the importance of a plan which, including both sea and land, should become universal. They seemed one and all to be of opinion that it would not be difficult to devise a plan which would secure the co-operation of meteorologists on shore and afloat, and thus cause to be occupied the whole field of meteorology, with a corps of observers acting in concert and working together, for the promotion of science and the good of the world.

In virtue of the authority given to me by the Secretary of the Navy, in his letter of December 6, 1851 (p. 22), I hastened, in December of that year, to address notes to the proper functionaries of or in Great Britain, France, Prussia, Russia, Spain, Denmark, the Pontifical States, Turkey, Belgium, Austria, The Netherlands, Sweden and Norway, Two Sicilies, and Parma, Portugal, Sardinia, Guatemala, Brazil, Argentine Republic, Chili, Mexico, Nicaragua, Venezuela, Peru, New Granada, Bavaria, Sandwich Islands, China, Ecuador, and the East Indies, requesting that some one should be appointed by the Government of

each of the above-named countries, with whom I might correspond and confer touching a universal system of meteorological observations.

The East Indian Company replied to the effect that its co-operation had already been pledged to the British Government, in the plan proposed by Captain James to the Inspector-General of Fortifications. But Piddington, of Calcutta, is in favor of the more comprehensive system. So too is Buist, of Bombay.

And as farther evidence as to the interest which meteorologists and navigators in that important part of the world feel with regard to this subject, I may mention the fact that, at the Mauritius, a meteorological society has been organized under the most favorable auspices, and that it has set most enthusiastically and actively to work, with the avowed intention of co-operating with us here, in the system which relates to the sea. Meldrum is zealously lending his valuable assistance to this plan, and he has, in the persons of two gallant young officers, noble seconds, who are pledged to devote their energies, which are most promising, to the cause.

The merchants and others, of Bombay, also, backed by the Geographical Society of that place, have raised money, and have now in process of construction, a set of charts for the Indian Ocean, *à la* "The Wind and Current Charts" of this Office.

But for the casualty of disease by the way, India would have been represented in the Maritime Conference of Brussels, thus assuring us of the interest she feels in the matter.

Dr. Buist attended the last meeting of the British Association, at Hull. In a letter, which I had the pleasure to receive from him, dated October 3, 1853, he says:—

* * * * "I pointed out to the good folks at Hull, that we had estimated in India that charts such as yours, for the Eastern seas, would save us from a quarter to half a million annually, and that the entire charge proposed to be imposed on the Treasury of England, would probably be covered by the saving effected to commerce in a single week or day." * * * * * * * *

This is but one-half of the system; it relates only to the sea. Include the land, and you greatly increase the value of the results.

No reply, as might have been expected, came either from the Sultan of Turkey or the Emperor of China, with regard to this national invitation. But the American Board of Foreign Missions stand ready, I feel assured, with its able, faithful, and diligent corps of missionaries, not only in Turkey and China, but in all other heathen or pagan lands, to lend us a most powerful co-operation. So too, I suppose, would the missionaries from all the States of Christendom be found willing and ready co-operators in an enterprise which, like their own sacred calling, has so many benign influences to recommend it to the friendly notice of good and wise men.

The Holy See, with that enlightened regard for the advancement of science which marks his reign, at once accepted the invitation, and appointed my excellent friend Secchi, the distinguished Director of the Observatory at Rome, to confer with me upon the subject.

Secchi is decidedly in favor of the most comprehensive system of meteorological research. He takes the same view that other friends of the measure take with regard to the advantages to be derived from a general congress of meteorologists.

Enlist His Holiness in this cause, and we have one of the most powerful—if not the most powerful—meteorological allies that the world affords.

Roman Catholic missionaries, Roman Catholic colleges, institutions of learning, charity, and religion, dot the islands of the sea, and embellish the savage face of the earth. The intimation of a wish, the holding up of an example from Rome, would convert all these institutions and stations into so many centres of observation, and these people into a most able corps of observers, a most efficient body of co-operators.

Sardinia, in response to the invitation, appointed the Royal Academy of Sciences at Turin, and Professor Bancalari, of the University at Genoa, to confer farther as to the matter.

Brazil named the Director of the Observatory of Rio de Janeiro, and Dr. A Manoel de Mello. Chili appointed the President of the University of Santiago. Peru was willing to join in, and New Granada actually sent Senor Justo Arosemena to Washington, to confer with me the more fully upon this interesting subject.

Indeed, the two Americas, both North and South, may be set down as decidedly in favor of the universal system.

As I write, I receive communications from the Chilian Minister and the Dutch Consul-General, informing me what Chili and Holland have done, and are disposed to do, towards carrying out the measures in hand.

Extract of a Letter from Senor Carvallo, Envoy Extraordinary and Minister Plenipotentiary of Chili, &c. to Lieut. Maury.

"CHILIAN LEGATION, *Washington, November* 12, 1853.

"I have been especially requested by Mr. Vidal, the Secretary of War and Navy in Chili, to return you his sincere thanks for the valuable present that you addressed through me to his Department, of a set of trade-wind charts, which he did not receive but a few months since, in consequence of the long delay in Peru of the vessel that conveyed it.

"Mr. Vidal, or any other Secretary who may succeed him, will be always ready to second your wishes in relation to the observations you have suggested to our Navy, or in any other way that might promote the advancement of the important sciences to which you have devoted so successfully your talents and efforts."

Letter from J. C. Zimmerman, Esq., Consul-General of the Netherlands, to Lieut. Maury.

"NEW YORK, *November* 17, 1853.

"I have been requested by His Excellency, the Minister of Marine at the Hague, in a letter dated 31st October, to communicate to you, that, conjointly with H. E., the Minister of the Interior, they have in contemplation to establish a Meteorological Institute, and that they indulge in the expectation that it will soon go into operation.

"In consequence thereof, the College Zeemans hoop of Amsterdam, and the Society for the Promotion of Navigation at Rotterdam, have been invited to urge the owners or agents of Netherland vessels to send

the journals (log-books) of their vessels to the Department of the Interior, where Lieut. M. H. Jansen, of H. M. Navy, will be directed by me to extract therefrom whatever may appear to be useful for the service of meteorology."

Also the Baron Von Grabow, of the Prussian Legation, has called to explain why Prussia was not represented at the Brussels Conference. It was owing to the circumstance that notice of the Conference was not, through some miscarriage, received in time. He, however, was authorized to pledge the co-operation of Prussia in giving effect to the recommendation of that body, and asked to be supplied with the Charts, Sailing Directions, and other necessary documents. The missionaries would bring in Africa with the East, and many a savage isle of the sea.

The only unfavorable—if that can be called unfavorable—reply received, to these first invitations, was from Lamont, of Bavaria. That no injustice may be done him, I quote his letter, and I think that the friends of the move will see with me no determined hostility, or even any very decided opposition there to the plan. He thinks his own plan and his own forms are very good, and there is none to dispute that they are so. He would be pleased to see all other meteorologists adopting them, and so far as that would make the plan universal, he is certainly in favor of the universal system. The objections which he raises are founded chiefly upon the difficulties which, in his opinion, we should find in getting a universal system of meteorological observations under way. But he did not know the extent to which these apprehended difficulties seem to have disappeared.

MUNICH, *February* 8, 1852.

DEAR SIR: I have just received your communication of December 29, 1851, and will answer it immediately. In the first place, I have to inform you that the documents relative to a universal system of meteorological observations had been communicated to our Government about three months ago, by the British Minister residing at Munich. The course followed by our Government in all similar matters was followed on this occasion also, and the documents were sent to the Academy. As I have the superintendence of the meteorological observations made in Bavaria, and am the only member of the Academy who is directly concerned in this matter, I had to report on the subject.

Now my opinion concerning this "universal system of meteorological observations," as far as regards Bavaria, is:—

1. That a change in our system of observations, the addition of new instruments, &c. is in no way necessary; since the observations, carried on in the present form, will answer the different purposes to be attained by the "universal system."

2. That although the number of stations in Bavaria is, in proportion to the extent of the country, greater than in most other countries, yet it seems expedient to extend the system as much as possible, and especially to have observations made at certain railway and telegraph stations, particularly as such observations may be made without inconvenience or additional expense.

3. That it is necessary to publish the whole of our observations at the end of each year, and that a sufficient fund must be provided for this purpose.

This in general is the substance of my report, which has been laid before the Government by the Academy.

I have communicated the contents of your letter, and the "correspondence" inclosed in it to the Academy, stating it at the same time as my opinion that, since the subject has already been fully discussed, it does not seem expedient to take any further steps till the resolution of Government with regard to the former report is known. For this reason, I am also persuaded that a direct application to the Bavarian Government on your part would, at present, be of no avail; if, however, you have any communication to make, the only proper way will be to have it sent, by the Secretary of Foreign Affairs, to some one of the American Consuls in Bavaria, who will deliver it to our Foreign Minister.

Believe me, dear sir, yours very sincerely,

LAMONT.

P. S. After having finished my letter, it occurred to me that it might be expedient to add a few words with regard to the arrangement and superintendence of meteorological stations. The first, and most extensive plan, was formed by the "Societas Palatina," in 1780 (*vide* Introduction to the first vol. of the *Ephemerides Societatis Palatinæ*), but it never could be put fully into execution, owing to the reluctance, both of meteorologists, properly so called, and amateur meteorologists, to place themselves under the command, either of an individual, or of a society. In Germany and in France, numerous plans have been brought out since 1780, all to very little purpose. About twelve years ago, I myself entered upon the same career, and the result, upon the whole, was equally unsatisfactory. I am fully persuaded that it is impossible to form anything like a "well-disciplined corps" of observers except in Russia. My own plan now is to give only very few and very general directions, and then, by private correspondence, and by visiting personally the different stations, to attain uniformity as far as possible; in this manner I am getting on very well. What the effect of a "conference" would be, may be seen by the "Magnetic Conference" at Cambridge (England) in 1845; when the members of the conference returned home, every one followed his own plan, and did what he pleased. I hope to send you in some months a "Report" on the state of our Observatory (containing at the same time a full detail of our system of observations), where you will find a number of facts relating to meteorological affairs. The observations made at the Meteorological Observatory of Hohenpersenberg, from 1792 till 1850, are just published; you shall receive a copy by Mr. Flügel, together with a memoir that I have lately published, containing a description of the new instruments employed at the Munich Observatory. L.

The course which the Governments of Great Britain, France, Russia, Holland, and the United States, Belgium, Denmark, Sweden, Portugal, Norway, and Prussia, adopted with regard to the Maritime Conference at Brussels, affords grounds for the belief that these powers, at least, would favor any reasonable plan by which a universal system of meteorological observations may be brought about.

Suffice it to say, that no system can become universal unless it be backed by the influence and the power of such governments.

Since the above was written, I have had the honor to receive the following note, which encourages the belief that the good offices and friendly co-operation of Spain will not be wanting.

SPANISH LEGATION, WASHINGTON.

SIR: In compliance with instructions from His Excellency Don Angel Calderon de la Barca, Her Majesty's first Secretary of State, under date of the 11th ultimo, I have the honor to communicate to you, in the Queen's Royal name, Her Majesty's thanks for the invitation to detail an officer of Her Navy, to be present at the scientific conference recently held at Brussels; and at the same time to express the desire which Her Majesty feels to be informed of the result of the deliberations of that body, in which, owing to accidental circumstances, the Spanish Marine was not represented.

I am, sir, with high respect, your obedient servant,

JOSÉ Ma. MAGALLON.

The Brussels Conference did not pretend to prescribe any series of observations for merchantmen. They are the amateur meteorologists of the sea; their assistance is valuable, and their hearty co-operation greatly to be desired. But inasmuch as the power to compel merchant captains to keep an abstract log, according to the form prescribed, and with proper instruments, is not the same in all countries; and inasmuch as the relations between the merchant captain and his government are both special and peculiar according to the flag under which he sails, it was deemed wisest and best to leave it to each government to select the columns from the abstract log proposed, which its merchantmen should be required to fill.

Not so with the men-of-war. Here the government has but to command, and it is done.

So, too, with the meteorologists on the land. The great body of them also is made up of amateurs. But governments have their military posts, their light-houses, hospitals, institutions of learning, observatories, and other public establishments answering to men-of-war, where meteorological observations have already been instituted, or where they may be instituted almost without cost.

Meteorological observations, whether made by sea or land, unless they be discussed, properly co-ordinated, and published, are possessed of very little value to the world.

Now, in most governments, there is provision already made for discussing and publishing such observations as are made at the government establishments, and it is to governments that we must look chiefly for preliminary discussions and early publications.

The most liberal and enlightened offer on the part of the Secretary of the Navy, to furnish with a set of Wind and Current Charts, every merchant captain, whatever be his flag, who will assist in collecting materials for them, secures the co-operation of this most able and efficient class of observers in carrying out the system of observations at sea, as recommended by the Brussels Conference.

A similar offer on the part of each government to its own amateur meteorologists, with regard to the observations on the land, would not fail to secure for the proposed universal system the hearty co-operation of this class also.

Meteorological observations which, after being made, remain in pigeon-holes without being published, had almost as well, all will admit, so far as the world is concerned, not have been made. And meteorological observations, though never so well made at an isolated station, and though they be ably discussed and duly published, yet even they are possessed of comparatively little value, unless they be compared and grouped with others made under like circumstances in other parts of the world. When this is done, then their true value begins to appear.

The whole earth is surrounded with meteorological agencies, which have a direct bearing upon its productions, its climates, and the well-being of all its inhabitants.

All of its people are equally interested in the interpretation of the laws which govern those subtile agencies, and therefore it is meet and proper that all nations should unite in one general effort rightly to read them.

So far as the sea is concerned, this has been done. A joint national and individual co-operation has been established, and, in consequence of its establishment, legislatures have not been called on for additional and heavy appropriations, or for any grievous or new imposition of taxes; neither have citizens or subjects been subjected to any new system of taxation to carry on a work which all are willing to support.

Now, so far as the land is concerned, each government may obtain the ready and willing co-operation of its own citizens or subjects who are engaged observing as amateur meteorologists, and that too at a cost still more trifling than that by which the ocean has been brought regularly within the domains of meteorological investigation.

Every State in Christendom already has one or more meteorological observatories, from which published observations are issued to the world at occasional or stated intervals.

Now, should a universal system be adopted by these States, every government may procure amateur co-operation within its own borders to any extent, and at no greater cost than that of a printed copy of its observations to each one of its own citizens, who would provide himself, at his own expense, with the requisite instruments, and who would make the observations according to the prescribed form, and return them to the proper office for discussion and publication.

This is what the United States have done with regard to the observations at sea—two-thirds of the whole meteorological field of the earth.—There, the merchantmen are the amateurs; and by offering them, for their co-operation, a copy of the nautical works which their observations help to make, the ocean has become literally dotted with floating observatories, already fitted with instruments, and furnished with observers at private charge.

So, too, any required number of free volunteer co-laborers on the land, may be enlisted in this general field of research, merely by the offer, on the part of their government, to give them a copy of the published works which their observations may help to make.

These amateurs would not in many cases probably be able to furnish their observatories with complete sets of self-registering instruments; but as to the ordinary instruments there can be no doubt, and would be no difficulty.

Who shall take up this subject and become its champion?

My field is the sea; and though many of the observations that are made there suggest, in urgent terms, the importance which corresponding observations on shore, and concert among observers on the land, would be to us in our system of research, yet I am not clear as to the propriety of my taking any very active initiatory part with reference to the assembling of a general meteorological congress, for the purpose of devising a system of observations which, embracing both sea and land, shall be universal. I hope the matter will be taken up by abler and stronger hands by far than mine.

Returning from this review as to a general conference among meteorologists, to the proceedings of the Brussels Conference, with regard to the form of an abstract log for merchantmen, it was understood that the powers of the Conference did not extend beyond men-of-war, and that the officers of the various navies therein represented were better judges than the Conference could be, as to what observations, and what part of the man-of-war log, the merchantmen of his country could or would undertake.

These principles and data were, however, laid down as indispensable, viz: 1. Every log of every co-operating merchantman, whatever be his flag, must give at the least the longitude and latitude of the ship daily; the height of the barometer, and the readings of both the air and the water thermometer, *at least* once a day; the direction and force of the wind three times a day, first, middle, and latter part; the variation of the compass occasionally; and the set of the current whenever encountered. 2. That these observations, to be worth having, must be accurately made, and that as every thermometer and every barometer has its sources of error, consequently every shipmaster, who undertakes hereafter to co-operate with us, and keep an abstract log, should have his barometer and thermometer accurately compared with standard instruments, the errors of which have been accurately determined.

These errors the master should enter in the log; the instruments should be numbered, and he should so keep the log as to show what instrument is in use. For instance, a master goes to sea with thermometers Nos. 4719, 1, 12, &c., their errors having been ascertained and entered on the blank page for the purpose in the abstract log. He first uses No. 12. Let it be so stated in the column of Remarks, when the first observation is recorded, thus: thermometer No. 12. During the voyage, No. 12 gets broken, or for some reason is laid aside, and another, say 4719, is brought into use. So state, when the first observation with it is recorded, and quote in the column of Remarks the errors both of Nos. 12 and 4719. Now, with such a statement of errors given in the log, for each of these instruments, according to its number, the observations may be properly corrected when they come up here for discussion.

It is as rare to find a barometer or a thermometer that has no error, as it is to find a chronometer without error. A good thermometer, the error of which the maker should guarantee not to exceed in any part of the scale 1°, will cost in the United States not less than $2, perhaps $2 50.

The errors of thermometers sometimes are owing to inequalities in the bore of the tube, sometimes to errors of division on the scale, &c. Therefore, in comparing thermometers with a standard, they should be compared at least for every degree between melting ice and blood heat.

The hours at which observations are most important are denoted by large figures; and the columns

which it is most important for merchantmen to fill up are marked in the Brussels form, given in the abstract log; (*a*) for those which are indispensable; (*b*) for the next most important; (*c*) for the next, and so on.

We are now about to turn over a new leaf in navigation, on which we may confidently expect to see recorded much information that will tend to lessen the dangers of the sea, and to shorten the passage of vessels trading upon it.

We are about to open in the volume of Nature, a new chapter, under the head of MARINE METEOROLOGY. In it are written the laws that govern those agents which "the winds and the sea obey." In the true interpretation of these laws, and the correct reading of this chapter, the planter as well as the merchant, the husbandman as well as the mariner, and States as well as individuals, are concerned. They have a deep interest in these laws. For with the hygrometrical conditions of the atmosphere, the well-being of plants and animals is involved. The health of the invalid is often dependent upon a dry or a damp atmosphere, a cold blast or a warm wind.

The atmosphere pumps up our rivers from the sea, and transports them through the clouds to their sources among the hills; and upon the regularity with which this machine, whose motions, parts, and offices we now wish to study, lets down that moisture, and the seasonable supply of rain which it furnishes to each region of country, to every planter, and upon all cultivated fields, depend the fruitfulness of this country, the sterility of that.

The principal maritime nations, therefore, have done well by agreeing to unite upon one plan of observation, and to co-operate with their ships upon the high seas with the view of finding out all that patient research, systematic, laborious investigation may reveal to us concerning the winds and the waves.

Accordingly, every one who uses the sea is commanded or invited to make certain observations; or, in other words, to propound certain queries to Nature, and to give us a faithful statement of the replies she may make.

Now, unless we have accurate instruments, instruments that will themselves tell the truth, it is evident that we cannot get at the real meaning of the answers that Nature may give us.

An incorrect observation is not only useless of itself, but when it passes undetected among others that are correct, it becomes worse than useless; nay, it is mischievous there, for it vitiates results that are accurate, places before us wrong premises, and thus renders the good of no value.

With this explanation to that gallant corps of American shipmasters who are co-operating with me, the results of whose labors are seen in the works of this office, I appeal to their spirit and their pride, and leave it for each one to decide what additional instruments he will take with him to sea; what columns of the new log he will undertake to fill, and at what other than the usual hours he will observe.

I leave this to their intelligence and their judgment, in the full confidence that, when the next maritime conference meets to compare notes, and discuss new points, he who has the honor to represent our country there, will not be ashamed to lay the contributions of the American merchant marine before the meeting, or to see them compared with the most choice of the best from other flags.

And that each one may have it in his power to contribute according to his inclination and ability, I give, in a subsequent part of this work, the form of the man-of-war log; and under it, on the same page, the form of the abstract log, for the merchant service. I call this the log for the merchant service, because the observations called for in it are a *minimum*. Every merchant captain who wishes to co-operate with us, must furnish at least what the blanks of that form call for, in order that he may be entitled to the Charts, and these Sailing Directions.

There are many clever men in the merchant service who have been co-operating with me from the beginning; and there are many more who are ready, willing, and competent to give all the information that the most complete man-of-war abstract calls for. To all such, I shall be most happy to furnish man-of-war blanks.

Abstracts according to this form are wanted for all parts of the ocean, and for every sea, and particularly for the China Seas, the Indian and Pacific Oceans.

There is a promise of much activity among friends in the East Indies, and of many valuable materials thence for the construction of charts.

In 1851, a meteorological society was established at the Mauritius, under the especial patronage of the enlightened Governor, Mr. Higginson, and with the indefatigable Meldrum for secretary. This Society is rendering most important services to the cause; it is avowedly co-operating with us, and it makes it a regular part of its duties to collect the abstract logs of vessels arriving at that important meteorological station.

Since 1839, Piddington has been at work in Calcutta, almost solitary and alone, till now. He has, however, collected a vast amount of information concerning storms, from which his cyclonology has sprung.

At Madras, there is a well-founded meteorological observatory under the charge of Major Jacob, an officer of distinguished merit and high attainments.

Sir Henry Pottinger, and Dr. Ford, the meteorologist, are also in India. Their previous history is a guarantee of sympathy and support from them, in any undertaking that has for its object the advancement of science and the good of mankind.

Mr. Fergusson, an officer of the Indian Navy, in charge of the Bombay Observatory, is at present engaged in collecting materials for, and in the construction of, a set of wind and current charts for the Indian Ocean.

And I had the pleasure, on my return from Europe, to find on my table a package containing a number of abstract logs relating to the ocean; and for which, I suppose, I am indebted to the kindness of Buist, Meldrum, or Fergusson.

This most acceptable contribution, however, only serves to whet the appetite for more; for materials sufficient to justify an attempt to investigate the winds and currents of that ocean are still wanting.

A rich harvest is to be gathered there.

MARITIME CONFERENCE HELD AT BRUSSELS,

FOR

DEVISING A UNIFORM SYSTEM OF METEOROLOGICAL OBSERVATIONS AT SEA.

AUGUST AND SEPTEMBER, 1853.

THE GOVERNMENTS REPRESENTED AT THE CONFERENCE, AND THE NAMES OF THE OFFICERS WHO ATTENDED.

BELGIUM—by A. QUETELET, directeur de l'Observatoire royal, secrétaire perpétuel de l'Académie royale des sciences, des lettres, et des beaux-arts de Belgique;—and VICTOR LAHURE, capitaine de vaisseau, directeur général de la marine;

DENMARK—by P. ROTHE, Captain-Lieutenant Royal Navy, Director of the Depot of Marine Charts;

FRANCE—by A. DELAMARCHE, Ingénieur hydrographe de la marine impériale;

GREAT BRITAIN—by F. W. BEECHEY, Captain Royal Navy, F.R.S., etc., Member of the Naval Department of the Board of Trade;—and HENRY JAMES, Captain Royal Engineers, F.R.S., M.R.I.A., F.G.S., etc;

NETHERLANDS—by M. H. JANSEN, Lieutenant Royal Navy;

NORWAY—by NILS IHLEN, Lieutenant Royal Navy;

PORTUGAL—by J. DE MATTOS CORRÊA, Captain-Lieutenant Royal Navy;

RUSSIA—by ALEXIS GORKOVENKO, Captain-Lieutenant Imperial Navy;

SWEDEN—by CARL ANTON PETTERSSON, first Lieutenant Royal Navy;

UNITED STATES—by M. F. MAURY, LL.D., Lieutenant United States Navy.

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 meteorological 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

* See Parliamentary Papers, No. 115.

† See Sailing Directions, by Maury.

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 whatever 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 instruments to be employed, the things to be observed, with the manipulation of the instruments, and the methods and modes of observation should be the joint work of the principal parties concerned."

These sentiments being concurred in by the Government of the United States, the correspondence between the governments was continued, and finally each nation was invited to send an officer to hold a conference at Brussels, on a given day.

And that the system of proposed observation and of combined action might become immediately available, and be extended to its widest possible field of operation, it was determined to adapt the standard of the observations to be made to the capabilities of the instruments now in general use in the respective naval services, but with the precaution of having all these instruments brought under the surveillance of parties duly appointed to examine them and determine their errors; as this alone would render the observations comparable with each other through the medium of their respective standards.

The Conference opened its proceedings at Brussels, on the 23d August, 1853, at the residence of M. Piercot, the Minister of the Interior, to whom the thanks of the Conference are especially due.

M. Quetelet was unanimously elected President.

Before entering upon any discussion, it was the desire of all the members of the Conference that it should be clearly understood that, in taking part in the proceedings of the meeting, they did not in any degree consider themselves as committing their respective governments to any particular course of action, having no authority whatever to pledge their country in any way to these proceedings.

The objects of the meeting having been explained by Lieutenant Maury, of which the substance has been already given,* the Conference expressed its thanks to that officer, for the enlightened zeal and earnestness he had displayed in the important and useful work which forms the subject of the deliberations of the Conference.

In concerting a plan of uniform observation, in which all nations might be engaged, the most obvious difficulty which arose, was from the variety of scales in use in different countries. It is much to be desired that this inconvenience should be removed; but it was a subject upon which the Conference, after mature deliberation, determined not to recommend any modification, but to leave to each nation to continue its scales and standards as heretofore; except with regard to the thermometers, which it was agreed should, in addition to the scale in use in any particular service, have that of the centigrade placed upon it, in order to accustom observers in all services to its use, with a view to its final and general adoption.

* See the Minutes of the Proceedings of the Conference.

The advantages of concert of action between the meteorologist on land and the navigator at sea, were so obvious, that, looking forward to the establishment of a universal system of meteorological observation upon both elements, it was thought that the consideration of scales would with greater propriety be left for that or some such occasion.

As to the instruments to be recommended, the Conference determined to add as few as possible to such as were in common use in vessels of war; but regarding accuracy of observation as of paramount importance, the Conference felt it to be a matter of duty, to recommend the adoption of *accurate* instruments, of barometers and thermometers especially that have been carefully compared with recognized standards, and have had their errors accurately determined; and that such instruments only should be used on board every man-of-war co-operating in this system, as well as on board any merchant-man, as far as it may be practicable.

The imperfection of instruments in use at sea is notorious. The barometer having hitherto been used principally as a monitor to the mariner, to warn him by its fluctuations of the changes in prospect, its absolute indication of pressure has been but little regarded; and makers seldom if ever determine the real errors of these instruments, or, if known, still more rarely ever furnish the corrections with the instruments themselves.

That an instrument so rude and so abundant in error, as is the marine barometer generally in use, should in this age of invention and improvement be found on board any ship, will doubtless be regarded hereafter with surprise; and it will be wondered how an instrument so important to meteorology and so useful to navigation, should be permitted to remain so defective that meteorologists, in their investigations concerning the laws of atmospheric pressure, are compelled, in great measure, to omit all reference to the observations which have been taken with them at sea. The fact will, it is believed, afford a commentary upon the marine barometers now in use, which no reasoning or explanation can render more striking.

It was the opinion of the Conference that it would not be impossible, considering the spirit of invention and improvement that is now abroad in the world, to contrive a marine barometer which might be sold at a moderate price, that would fulfil all the conditions necessary to make it a good and reliable instrument; and a resolution was passed to that effect, in order to call the attention of the public to the importance of an invention, which would furnish the navigator with a marine barometer, that at all times, and in all weathers at sea, would afford the means of absolute and accurate determinations.

The Conference was also of opinion that an anemometer, or an instrument that would enable the navigator to measure the force, velocity, and direction of the wind at sea, was another desideratum.

The Conference was of opinion that the mercurial barometer was the most proper instrument to be used at sea for meteorological purposes, and that the aneroid should not be substituted for it.

With regard to thermometers, the Conference does not hesitate to say that observations made with those instruments, the errors of which are not known, are of little value; and it is therefore recommended, as a matter well worth the attention of co-operators in this system of research, whether some plan may not be adopted in different countries, for supplying navigators, as well in merchant-men as in men-of-war, with thermometers, the errors of which have been accurately determined.

For the purposes of meteorology, various adaptations of the thermometer have been recommended, such as those which refer to hygrometry and solar radiation; and accordingly a space will be found in the columns for temperature by thermometers, with dry, wet, and colored bulbs. With these exceptions, the only instrument, in addition to those generally used at sea, for which the Conference has thought proper to recommend a column, is that for specific gravity; the cost of this instrument is too insignificant to be mentioned.

The reasons for recommending the use at sea of the wet, the white and black bulb thermometers are obvious; but with regard to the thermometer with a bulb the color of sea-water, and the introduction on board ship of a regular series of observations upon the specific gravity of sea-water, it may be proper to remark that, as the whole system of ocean currents and of the circulation of sea-water depends in some degree upon the relative specific gravities of the water in various parts of the ocean, it was judged desirable to introduce columns for this element, and to recommend that observations should be carefully made with regard to it, both at and below the surface.

With respect to the thermometer having a bulb of the color of sea-water, it is unnecessary to say more in favor of its use on board ship, than that the object is to ascertain, whether or not such observations will throw any light upon the psychrometry of the sea, or upon any of the various interesting phenomena connected with the radiation from the surface of the ocean.

In bringing to a conclusion the remarks upon instruments, the Conference considered it desirable, in order the better to establish uniformity, and to secure comparability among the observations, to suggest, as a measure conducive thereto, that a set of the standard instruments used by each of the co-operating governments, together with the instructions which might be given by such government for their use, should be interchanged.

The object of the Conference being to secure as far as possible uniformity of record, and such a disposition of the observations that they would admit of ready comparison, the annexed form of register was concerted and agreed upon. The first columns of this form will receive the data which the Government of the United States requires merchant vessels to supply in order to entitle them to the privileges of co-operators in this system of research, and may therefore be considered as the *minimum* of what is expected of them. This condition, it may be as well to state here, requires that at least the position of the vessel and the set of the current, the height of the barometer, the temperature of the air and water should each be determined once a day, the force and direction of the wind three times a day, and the observed variation of the needle occasionally.

Every abstract log kept by a merchant vessel should contain *at least* what is here recommended. Anything more would enhance its value, and make it more acceptable.

The remaining columns are intended principally for men-of-war to fill up, *in addition* to those above mentioned; but it is believed that there are many officers in the mercantile navy also who are competent to this undertaking, and who will, it is hoped, be found willing to distinguish themselves in this joint action for the mutual benefit of the services.

In the compilation of this form, the Conference has had carefully in view the customs of the service, and the additional amount of attention which these duties will require; and it is believed that the labor necessary for the purpose, at least to the extent specified in the instructions for filling up the columns, is only such as can be well performed under ordinary circumstances, and it has considered it a *minimum*, and looks with confidence to occasional enlarged contributions from zealous and intelligent laborers in the great cause of science.

The directions for filling up the columns and for making certain observations, it will be seen by the Minutes, were limited to such only as seemed necessary to the Conference to insure uniformity of observation. This subject received the benefit of much discussion before the meeting, and it was considered most advisable to confine the matter to *hints;* which, it is hoped, will be found sufficient, when embodied in the instructions which each nation will probably issue with the forms, to insure that most desirable end, uniformity.

The Conference, having brought to a close its labors with respect to the facts to be collected, and the means to be employed for that purpose, has now only to express a hope that whatever observations may be made will be turned to useful account when received, and not be suffered to lie dormant for the want of a department to discuss them; and that, should any government, from its limited means, or from the paucity of the observations transmitted, not feel itself justified in providing for their separate discussion, it is hoped that it will transfer the documents or copies of them to some neighboring power, which may be more abundantly provided, and willing to receive them.

It is with pleasure that the Conference has learned that the Government of Sweden and Norway has notified its intention of co-operating in the work, and that the king has commanded the logs kept by his Swedish subjects to be transmitted to the Royal Academy of Science at Stockholm; and also that, in the Netherlands, Belgium, and Portugal, measures have been taken to establish a department for the same purpose, and that the Admiralty of Great Britain has expressed its intention of giving instructions for meteorological observations to be made throughout the Royal Navy.

The Conference has avoided the expression of any opinion as to the places or countries in which it would be desirable to establish offices for the discussion of the logs; but it is confidently hoped that, whatever may be done in this respect, there will always be a full and free interchange of materials, and a frequent and friendly intercourse between the departments; for it is evident that much of the success of the

plan proposed will depend upon this interchange, and upon the frankness of the officers who, in the several countries, may conduct these establishments.

Lastly, the Conference feels that it would but inadequately discharge its duties, did it close this report without endeavoring to procure for these observations a consideration which would secure them from damage or loss in time of war, and invites that inviolate protection which science claims at the hands of every enlightened nation; and that, as vessels on discovery or scientific research are, by consent, suffered to pass unmolested in time of war, we may claim for these documents a like exemption; and hope that observers, amidst the excitement of war, and perhaps enemies in other respects, may in this continue their friendly assistance, and pursue their occupation, until at length every part of the ocean shall be brought within the domain of philosophic research, and a system of investigation shall be spread as a net over its surface, and it become rich in its benefit to commerce, navigation, and science, and productive of good to mankind.

The members of the Conference are unwilling to separate without calling the attention of their respective governments to the important and valuable assistance which it has received from the Belgian Government. That the Conference has been enabled to draw its labors to so speedy and satisfactory a close, is in a great measure owing to the facilities and conveniences for meeting and deliberating, which have been afforded by His Majesty's Government.

Signed at Brussels, this 8th day of September, 1853.

BELGIUM—MM. Quetelet, *President;* Lahure. DENMARK—P. Rothe. FRANCE—Delamarche. GREAT BRITAIN—F. W. Beechey, H. James. NETHERLANDS—Jansen. NORWAY—Ihlen. PORTUGAL—De Mattos Corrêa. RUSSIA—Gorkovenko. SWEDEN—Pettersson. UNITED STATES—Maury.

MINUTES OF THE SITTINGS.

MINUTES OF THE FIRST MEETING HELD AT THE RESIDENCE OF THE MINISTER OF THE INTERIOR, ON THE 23D OF AUGUST, 1853.

The proceedings of the meeting commenced at half-past eleven in the morning. Present: MM. Delamarche, Hydrographical Engineer of the Imperial French Navy; De Mattos Corrêa, J., Captain-Lieutenant of the Royal Portuguese Navy; Gorkovenko, Captain-Lieutenant of the Imperial Russian Navy; Ihlen, Lieutenant of the Royal Norwegian Navy; Jansen, Lieutenant (of first class) of the Royal Dutch Navy; Lahure, Captain and Director-General of the Belgian Navy; Maury, Lieutenant of the Navy of the United States and Director of the Observatory at Washington; Pettersson (C. A.), Lieutenant of the Royal Swedish Navy; Quetelet, Director of the Observatory at Brussels.

The attention of the meeting was first directed to the choice of a president. Lieutenant Maury was requested to direct the proceedings, but he declined the honor; and, at his suggestion, in which other members of the meeting concurred, Mr. Quetelet took the chair.

The President submitted to the meeting the propriety of publishing the discussions of the Conference; expressing, as his own opinion, that publicity was one of the best methods of insuring the success of their undertaking; remarking, at the same time, that, independently of the information which would be conveyed to the public through the medium of the press, the minutes of each sitting and the scientific report of the Conference would thus be preserved.

Lieutenants Jansen and Maury seconded this motion.

Captain-Lieutenant Gorkovenko also expressed himself in favor of publicity. He announced to the meeting that he had just been informed that Captain Beechey, appointed by the English Government to take part in the proceedings of the Conference, would arrive at Brussels in the course of the evening.

The President next called on Lieutenant Maury to explain to the meeting the object of his mission.

Mr. Maury spoke as follows:—

"GENTLEMEN: The proposal which induced the American Government to invite the present meeting, originated with the English Government, and arose from the communication of a project prepared by Captain Henry James, of the corps of Royal Engineers, by order of General Sir John Burgoyne, Inspector-General of Fortifications, in which the United States Government was invited to co-operate.

"Nineteen stations had been formed by the English authorities upon a uniform system, and the direction of the observations confided to the immediate supervision of the officers in command of the respective stations.

"In the United States, meteorological observations had been made since the year 1816.

"The American Government sympathized with the proposal of the English Government, but said: Include the sea, and make the plan universal, and we will go for it. I was then directed to place myself in communication with the ship-owners and commanders of the navy and mercantile marine, in furtherance of the plan.

"It is from the information extracted from more than a thousand logs that I have been able to prepare the Charts which have been published up to this time, showing the sailing-routes and the direction of the winds and currents.

"With a view, however, of extending still farther these nautical observations, the Government of the United States decided upon bringing the subject under the consideration of every maritime nation, with the hope of inducing all to adopt a uniform model of log-book.

"In order to place the captains navigating under a foreign flag in a position to co-operate in this undertaking, Mr. Dobbin, Secretary of the Marine Department at Washington, has instructed me to make known that the mercantile marine of all friendly powers may, with respect to the Charts of the Winds and Currents, be placed on the same footing as those of the American Marine; that is to say, that every captain, without distinction of flag, who will engage to keep his log during the voyage upon a plan laid down, and afterwards communicate the same to the American Government, shall receive, gratis, the Sailing Directions and the Charts published.

"It has consequently been suggested to the captains, that they should provide themselves with, *at least*, one good chronometer, one good sextant, two good compasses, one marine barometer, and three thermometers for air and water. I make use of the expression *at least*, because the above is the smallest number of instruments with which a captain can fulfil the engagements he contracts upon receiving the Charts.

"Foreign flags will thus enjoy the advantage of profiting at once by all the information collected up to this time.

"You will not fail to observe, gentlemen, that the observations made on board of merchant vessels, with instruments frequently inexact, are not to be relied upon in the same degree as those made where the instruments are more numerous and more delicate, and the observers more in the habit of observing.

"The former, however, from the fact of their being more numerous, give an average result, which may be consulted with advantage; but the observations made on board the ships of the Navy, although fewer in number, are evidently superior in point of precision.

"The object of our meeting, then, gentlemen, is to agree upon a uniform mode of making nautical and meteorological observations on board vessels of war. I am already indebted to the kindness of one of the members present, Lieutenant Jansen, of the Dutch Navy, for the extract of a log kept on board a Dutch ship of war, and which may be quoted as an example of what may be expected from skilful and carefully conducted observations. In order to regulate the distribution of the Charts, which the American Government offers gratuitously to captains, it would in my opinion be desirable that, in each country, a person should be appointed by the government, to collect and classify the abstracts of the logs, of which I have spoken, through whom also the Charts should be supplied to the parties desirous of obtaining them."

The President:—

"GENTLEMEN: I think I shall be anticipating the wishes of the members of this meeting, by proposing to them to pass, in the first place, a vote of thanks to Mr. Maury, and to record our gratitude for the enlightened zeal and earnestness he has displayed in the important and useful work which forms the subject of our deliberations."

All the members in turn intimated their entire concurrence in the proposal made by the President, to express to Mr. Maury their admiration and their gratitude for the eminent services which he has already rendered, and is still endeavoring to render to the science of navigation.

Thanks are, therefore, unanimously voted to Mr. Maury.

Mr. Maury:—

"GENTLEMEN: I am extremely grateful for the sympathy you have expressed, and the praise you have been pleased to bestow on my humble efforts. On my part, I beg to thank you for the kind assistance

that you have afforded me. Allow me to add, that we are taking part in a proceeding to which we should vainly seek for a parallel in history. Heretofore, when naval officers of different nations met in such numbers, it was to deliberate, at the cannon's mouth, upon the most efficacious means of destroying the human species. To-day, on the contrary, we see assembled the delegates of almost every maritime nation, for the noble purpose of serving humanity, by seeking to render navigation more and more secure. I think, gentlemen, we may congratulate ourselves with pride upon the opening of this new era."

Upon the motion of the President, the meeting proceeded to nominate a sub-committee, instructed to prepare, for the next sitting, a model of a log to be kept on board ships of war.

The members appointed to form this sub-committee, are MM. Maury, Jansen, and Gorkovenko.

President:—

"GENTLEMEN: Some members of the meeting have expressed a desire for some further explanation. There appears to exist two opinions as to the plan to be pursued: some members being of opinion that the subject should be considered with reference to the navy only; others, that the mercantile marine should be comprehended in the scheme."

Mr. Maury declared that he had no instructions to discuss the question as regards the mercantile marine. He observed that the Government of the United States did not take upon itself to prescribe the use of this or that instrument on board merchant vessels, any more than it would think of interfering with the interior economy of private establishments. It simply wished to confine itself to laying down the plan of a log-book, to be adopted by those who may desire to participate in the advantages to be derived from the possession of the Charts. Nevertheless, he would gratefully receive any observations which the mercantile marine of other countries might be able to furnish on any subject which concerns navigation.

The President concurred in the views taken by Mr. Maury, for the reason that in Belgium, and in most other States, the government has no direct action upon the mercantile marine, and can only influence it by persuasion. He then proposed to the meeting to appoint a member to draw up the scientific report of the Commission.

Mr. Maury informed the meeting that Mr. Wells, an officer of the American Navy now residing in Brussels, would willingly perform the duties of Secretary to the Conference. He described Mr. Wells as a distinguished officer, perfectly acquainted with the subject under discussion, and possessing a knowledge of the French language. Mr. Maury would undertake, providing it were the wish of the meeting, to introduce Mr. Wells at the next sitting.

This proposal was readily accepted, and Mr. Maury was requested to make known to Mr. Wells, that the Conference accepted, with gratitude, his obliging offer, and to convey to him the thanks of the meeting for the same.

The meeting separated at one o'clock, and the next sitting was fixed for Thursday, the 25th, at eleven o'clock A. M.

QUETELET.

MINUTES OF THE MEETING OF THE 25TH OF AUGUST, 1853.

The proceedings commenced at half-past eleven. Present: MM. Captain Beechey, R. N.; Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; Captain James, R. E.; Jansen; Lahure; Maury; Pettersson; Quetelet, President.

The minutes of the proceedings of the previous day were read. MM. Jansen and Quetelet made some remarks upon the wording of the "Minutes," which were corrected accordingly, and immediately approved.

The President informed Captain Beechey and Captain James that, at the previous sitting, the assembly had passed a vote of thanks to Mr. Maury, for the enlightened zeal and earnestness he had displayed in the important and useful work which forms the subject of the deliberations of the Conference.

Captain Beechey and Captain James entirely concurred in that vote.

Mr. Wells having consented to act as Secretary, was introduced by Lieutenant Maury, and entered upon his duties.

The President, in the name of the assembly, thanked Mr. Wells for his kindness.

Captain Beechey took this opportunity to observe to the meeting, as had been done by the other members at the previous sitting, that, by taking part in its deliberations, he did not consider that he was in any way binding his government.

In the order of the day, the first subject standing for discussion was the plan of the journal prepared by the sub-committee, composed of MM. Maury, Gorkovenko, and Jansen.

Mr. Jansen gave a rapid sketch of the plan of the journal prepared by the sub-committee. The meeting decided that it should first discuss the utility of each column, and postpone the discussion of the other questions.

Lieutenant Maury having stated that his instructions from his Government were to propose a form of meteorological register for the use of *vessels of war* only, Captain Beechey stated that he had understood Mr. Maury to say, at the meeting of the ship-owners in London and Liverpool, that his object was to endeavor to induce the *merchant service* to engage in this undertaking as well as the Royal Navy; and that this idea was, he thought, confirmed by the offer that had been made of a set of Charts to the masters of such merchant vessels as would fill up certain columns of the register. And that he, Captain Beechey, certainly left England under the impression that the merchant service was to be included; and, therefore, he considered it would be proper so to frame the form of register, that it could be used by the officers of either service, and to leave to each person to fill up as many of the columns as their time and ability might enable them to do.

The meeting referred to the resolution it had already taken, to confine themselves exclusively to the ships of war.

Discussion upon the Columns of the Plan of the proposed Journal.

Column 1.—DATE. After a short debate, upon whether the day commenced at noon or at midnight, it was decided that this question should be referred to a committee, who, at the same time, would be intrusted with the examination of several other questions.—The column was adopted.

Column 2.—THE HOUR. Adopted.

Column 3.—THE LATITUDE.

Captain Beechey proposed that there should be two columns for this purpose; one for the latitude observed, and one for the dead reckoning.

This proposal was adopted, and a column added under No. 3′.

Column 4.—THE LONGITUDE. Same proposal from Captain Beechey, and the same decision. A column was added under No. 4′.

Column 5.—CURRENTS. After a short discussion, two columns were judged necessary for this object; one for the direction of the current, the other for the velocity. A column was added under No. 5′.

Column 6.—MAGNETIC VARIATION OBSERVED. Adopted.

Column 7.—MAGNETIC VARIATION EMPLOYED OR USED. After rather a long discussion, in which MM. Beechey, Delamarche, Jansen, Ihlen, and Corrêa took part, this column was suppressed, on the ground that it might cause errors.

Column 8.—FORM AND DIRECTION OF CLOUDS. Mr. Delamarche was of opinion that this question was purely scientific, and that the column might be dispensed with.

Several members of the meeting differing from this view, Mr. Delamarche adopted the opinion of the majority, for the reason that the direction of the upper currents might lead to a knowledge of the lower currents.—The column was adopted.

Column 9.—PART OF THE SKY NOT OBSCURED. Captain Beechey proposed that they should use the expression *part of the sky covered;* this question was referred to the sub-committee. The expression *serenity of sky* being the contrary to *amount of clouds*, a choice is to be made between these two.

The column was adopted.

Column 10.—QUANTITY OF RAIN. Mr. Delamarche proposed that all observations upon rain be inserted in the column of Remarks, as it is very difficult on board ship to ascertain correctly the quantity of rain that falls; this opinion was shared by other members, but Captain Beechey thought a column should be devoted to rain, and that the words *hours of*, might be substituted for the words *quantity of*.

The column was adopted.

Columns 11 *and* 12.—WINDS (*direction and force*). Captain Corrêa proposed an addition of two columns; one for the true direction of the wind, the other for the apparent direction, and presented to the members a small work he had written on this subject. The proposition of Captain Corrêa was rejected, and the two columns of the plan were adopted.

Column 13.—BAROMETER. Captain Beechey proposed that a column should be added for the thermometer attached to the barometer.

Mr. Delamarche required, besides, a third column for the barometer reduced to the temperature of zero.

The first proposition was adopted unanimously, that of Mr. Delamarche was opposed by several members. Nevertheless, upon the request of Mr. Delamarche, the meeting decided that a third column shall be inserted in the plan if there is sufficient space.

Column 13 was adopted, and a new column was added, under No. 13′, for the thermometer attached to the barometer.

Column 14.—THERMOMETER FOR THE AIR. On the proposition of Captain Beechey, the term of *thermometer with the dry bulb* was substituted. The column was unanimously adopted.

Column 15.—THERMOMETER WITH THE WET BULB. Mr. Delamarche opposed the introduction of this column, as he believed it to be impossible to obtain satisfactory results with this instrument on board of ships. The column was put to the vote, and adopted by nine votes against two, those of MM. Delamarche and Gorkovenko.

Columns 16, 17, *and* 18.—TEMPERATURE OF WATER, AT THE SURFACE AND AT CERTAIN DEPTHS, SPECIFIC GRAVITY OF THE WATER. Captain Beechey requested that these three columns might be replaced by four others, comprising; 1. The temperature of water; 2. Its density *at the surface;* 3. The temperature, and 4. The density *at certain depths.*

Mr. Delamarche was of opinion that the determination of the gravity of the water at certain depths is extremely difficult, and it is an experiment that should only be made on board of ships engaged in scientific pursuits. He was apprehensive that the Conference would outstep its object (navigation), and assume too scientific a character.

The column was put to the vote, and was adopted by ten voices against that of Mr. Delamarche.

The plan of Captain Beechey was substituted for that of the original.

Column 19.—REMARKS. Adopted.

Captain James requested that a transposition might be made in the columns; this proposition was agreed to. In consequence, the order of the columns was changed and the following adopted:—

1. Date.
2. Hour.
3. Latitude observed.
3′. " dead reckoning.
4. Longitude observed.
4′. " dead reckoning.
5. Direction of currents.
5′. Velocity of do.
6. Magnetic variation observed.
7. Direction of winds.
7′. Force do.

8. Forms and direction of clouds.
9. Amount of clouds.
10. Hours of rain.
11. Barometer.
11′. Thermometer attached.
12. Thermometer, dry bulb.
12′. Thermometer, wet bulb.
13. Water at surface (temperature).
13′. " " (specific gravity).
14. Water at depths (temperature).
14′. " " (specific gravity).
15. Remarks.

The meeting resolved that the plan thus decided upon should be copied, and a copy given to every member, for the purpose of his becoming more fully acquainted with it, and of making any observations that the examination of it may suggest.

Mr. Ihlen desired that it be understood that if the Conference should, upon further discussion, find certain columns to be useless, they would be suppressed.

The President thought it prudent to proceed in this manner; and that, notwithstanding their having been adopted, certain columns might be removed, if their inutility was well established.

He wished to know in what manner the abstract logs were to be published.

The Committee do not consider that it has powers to decide on the form of publication for the logs; nevertheless, it is decided that Lieutenant Maury should be requested to state his opinion as to the best plan to be adopted.

The meeting adjourned at five o'clock, until eleven the next day.

QUETELET.

MINUTES OF THE MEETING OF THE 26TH OF AUGUST, 1853.

Proceedings commenced at half-past eleven. Present: MM. Beechey; Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; James; Jansen; Maury; Lahure; Pettersson; Quetelet, President.

The minutes of the preceding sitting were read and adopted with some slight corrections.

The first question in the order of the day was the further discussion of the proposed form of log, prepared at the last meeting. As this form is to be again submitted to the examination of a sub-committee, the discussion was adjourned to the next sitting.

Next in the order of the day was the statement to be made by Mr. Maury as to the means which he considers the most efficacious for circulating and rendering available the observations which may be collected. Mr. Maury commenced by recapitulating all that had been done by the Government of the United States.

He afterwards expressed his opinion that it would be desirable for the different governments to establish, under the direction of a competent professional person, a central office, in which the whole of the information collected should be concentrated. In Holland, a measure of this kind had been already taken, a central office having been created under the direction of Lieutenant Jansen. And here Lieut. Maury expressed his great satisfaction at the choice of that officer.

With respect to the communication and publication of the information acquired, he thought that it would be advisable to leave to each government to adopt the best system it can devise. The greatest reliance might in his opinion be placed upon the friendly relations existing between the various governments, upon the efforts which all nations are making to enlarge the domain of scientific knowledge, and the general interest which the undertaking must create.

The meeting returned thanks to Lieut. Maury for his explanations.

The third question for discussion in the order of the day was, whether a uniform system of making observations should be adopted, so as to allow of their being compared.

The President submitted to the Committee the question, whether it would recommend the use of uniform instruments and measures, or whether each one should be allowed to make his own observations with the instruments which he has been accustomed to.

Mr. Gorkovenko was of opinion that for the present it would be impossible to arrive at uniformity in instruments and measures. He thought they should be content if the results obtained with different instruments were so arranged as to admit of comparison.

Mr. Jansen considered that the obtaining of uniformity would be one of the greatest steps in advance that could possibly be made, and that the Conference should make every effort to bring it about, if not at present, at any rate at some future time.

Captain Beechey was of opinion that it was objectionable at present to recommend the general adoption of any specific instrument, as different countries had different scales and different standards, and that it would interfere too abruptly with long-established usages and long-established records, with which the observations now to be collected would require a reduction, before they could be compared. He also deprecated the specification of the name of any particular maker in preference to that of others. He thought it would be better for the present that each nation should continue its own instruments, and that it should be left to those persons who made use of the observations to make the necessary reductions from one scale to the other, when required.

Mr. Delamarche moved that it be inserted in the report, that this meeting considers the universal adoption of a uniform thermometer as highly desirable, but that he is quite aware that it would be extremely difficult to arrive at such a result. Should, however, the thing appear possible, the instrument to which attention should be directed, as constituting an improvement for the future, is the centigrade thermometer; and that, in order to facilitate the reading of the documents furnished by different countries, and to introduce amongst them the use of this instrument, the meeting recommends the making of thermometers with two scales, one being that most in use in any particular country, the other the centigrade.

Lieut. Maury was apprehensive that, in recommending a measure of this nature, the meeting would influence the opinion which might be formed by the members of a general congress, which would probably be assembled after the present one, and in which every scientific and meteorological question relating to observations to be taken on the land would be discussed.

Mr. Delamarche insisted upon the present Conference recording its opinion upon this question, without regard to anything that might be decided by a congress, the existence of which was quite hypothetical.

Lieut. Jansen was of opinion that the question should be divided into two propositions. First, shall this Conference recommend the use of thermometers with double scales? Secondly, shall it recommend that both scales shall be inserted in the log?

This motion was carried.

The first question was put to the vote and unanimously adopted. The second was rejected.

Mr. Delamarche proposed to add, that the Conference does not recommend the use of two scales in the barometer, on account of the difficulty of their construction.

Mr. Maury observed that the barometer is one of the most imperfect instruments made use of in navigation. He commented upon the different barometers in use, and expatiated at considerable length on the defects of each. He requested that mention might be made in the report, that a cheap barometer, which would indicate in a satisfactory manner the pressure of the atmosphere, at a time when a vessel was subject to the greatest vibration, would be a highly valuable addition to the science of navigation.

After a somewhat lengthened discussion, this proposal was unanimously adopted.

Mr. Delamarche observing, however, that, in his opinion, there existed at present in France barometers sufficiently accurate, Lieutenant Jansen proposed that mention should be made in the report that the "aneroid barometer" possesses qualities useful at sea, but that nevertheless the preference is always given to the mercurial barometer, inasmuch as it gives absolute results, whereas the aneroid barometer gives only relative ones.

Captain Beechey was of the same opinion.

The proposal was adopted.

The meeting proceeded to choose the two sub-committees appointed to examine the tabular form of the log, and to draw up the instructions.

The first committee, composed of MM. Beechey, Gorkovenko, Ihlen, Jansen, Lahure, and Maury, was appointed to examine all questions concerning latitude and longitude, currents, the magnetic variation, the temperature of the water, soundings, and the miscellaneous remarks to be made.

A second committee, composed of MM. Delamarche, James, De Mattos Corrêa, Pettersson, and Quetelet, was chosen to inquire into all that concerns the winds, the clouds, the serenity of the sky, the rain, the thermometer, and the barometer.

The first committee to meet at the Hotel de Belle-Vue, at the apartments of Mr. Maury; the second at the Observatory.

The meeting adjourned at 4 o'clock until Monday at 11.

QUETELET.

Minutes of the Meeting of the 29th of August, 1853.

The proceedings commenced at 11.30, A. M. Present: MM. Beechey; Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; James; Jansen; Lahure; Maury; Pettersson; Quetelet, President.

The minutes of the last meeting were read and adopted with some modifications.

Mr. Maury explained to the meeting that there had been a misunderstanding as to the offer made by Mr. Wells. In proposing to introduce him, he did not intend the meeting to understand that *Mr. Wells would draw up the scientific report of the Conference*, but simply that he would perform the duties of secretary, and thereby simplify the taking of the minutes, etc. The scientific report should, in his (Mr. Maury's) opinion, be confided to a member of the Conference.

To abridge, as far as possible, discussions upon the wording of the minutes, it is understood that, for the future, the part of this document, which concerns each member, shall be submitted to him before the sitting.

The question as to the language in which the report of the Conference should be made, was next discussed.

Mr. Delamarche proposed that two reports should be drawn up, at the same time, one in English and the other in French, both of which should be signed as originals by the members of the Conference. This proposition was adopted.

The choice of the reporter was next discussed. Mr. Maury was appointed.

Captain Beechey renewed his observations upon the resolution taken by the Conference to occupy itself exclusively with the plan of a log-book for the military navy.

Mr. Maury thought that it would be possible to satisfy all parties by a compromise, which should consist in adopting the tabular form of log proposed by the Government of the United States for the use of the mercantile marine, and to state in the report that the keeping of this log would be the *minimum* amount of observations expected from those to whom the Charts were delivered; but that all additional information which could be furnished would be gratefully received by each government.

He added that it might be left to the judgment of the officers appointed to examine the logs, to suggest any farther subjects upon which information could be obtained from the mercantile marine of his country.

Captain Beechey was of opinion that the form to be drawn up should be of such a nature that it could be used both by the Royal Navy and by the officers of the better-founded ships of the merchant service; and that it would be better so to arrange the form, that that part which was exclusively nautical, and was to be used by those vessels who might wish to become entitled to the Charts, should be distinct from the part which was purely appropriated to science, etc.

He deprecated entering into minute and detailed instructions for making these observations; for, if these instructions were to be given in as complete a manner as he considered would be necessary, it would occupy a very long time; and if not, he was unwilling to give any instructions which might be considered meagre and imperfect. As to the hours of meteorological observation, also, he considered they

had been already named, in the article upon meteorology in the *Admiralty Manual;* and to adopt other hours, because they might be convenient hours of observation in other respects, would subject our determinations perhaps to the criticism of men learned in meteorological science; but he should be perfectly satisfied to leave the hours of meteorological observation for Mr. Quetelet's determination.

Mr. Jansen thought that, in making a certain number of meteorological observations, nautical men would be rendering an important service to that science; and that, in consideration of such service, it would be unfair to reproach them with not having chosen the particular hours that meteorologists might prefer; whereas, in neglecting meteorological observations altogether, they would be open to the reproach of not having done for the science all that laid in their power.

Mr. Delamarche was of opinion that certain meteorological observations were indispensable, but that too much should not be required.

The President wished that, if meteorological observations be made at sea, those observations should be completed so as to conduct to the determination of the diurnal variations, or at least to the annual variations of the temperature, the pressure and the humidity of the air.

Mr. Maury was of opinion that the meeting was losing sight of the original question, which was that of adopting a *conform* system of meteorological observations. He reminded them that the proposal made by the British Government to that of the United States related to a system of meteorological observations on shore; and that the reply of the Government of the United States, giving a greater extension to this proposal, related to a general system of meteorological observations both at sea and on land.

The proposition for the land observations was virtually withdrawn; but the proposition relating to the sea was continued; and it was upon the terms employed by the invitation for meteorological observations, that the proposal was accepted, and with these views this Conference was convoked. Consequently, it would be impossible to lose sight of the meteorological part of the question.

The draft of the instructions prepared by the sub-committee was read, and the discussion thereon commenced.

First column.—DATE.

Mr. Beechey proposed to indicate the months by Roman figures, I. to XII., beginning with the month of January.

Mr. Gorkovenko remarked that Russia did not reckon dates according to the Gregorian calendar; nevertheless, as the object of the meeting was to arrive as nearly as possible at uniformity, he thought there would be no difficulty in adopting this calendar for meteorological observations.

Mr. Beechey's proposal was adopted.

The Committee proposed to insert in the instructions the following observation :—

"The time given in the abstract log should be civil time, but if not, mention the time which is given. Instead of writing the names of the months at length, denote them by Roman figures. Thus, for January I., for December XII."

This proposal was adopted.

Second column.—HOURS.

The Committee proposed, as the time for making observations, four in the morning, noon, and eight in the evening.

Mr. Beechey proposed to retain for the nautical part four in the morning, noon, and eight in the evening; and to adopt, for the meteorological part, the hours of three and nine in the morning, and three and nine in the evening.

Mr. Jansen proposed to retain the hours of four in the morning, noon, and eight in the evening for all the table; and to add, for the meteorological part, two supplementary hours. viz: nine in the morning, and three in the afternoon.

Mr. Delamarche was of opinion that one table only was necessary, and that the observations should be made by watches; but should two tables be adopted, and the time of observation not regulated by watches, he should then vote for the proposal of Mr. Beechey.

The President remarked that, in order to have an idea of the diurnal variation, observations should be made at least every three hours.

A discussion then took place on the proposal of MM. Jansen and Maury, namely, whether the hours of four in the morning, noon, and eight in the evening, should be retained, and the two complementary hours of nine in the morning and three in the afternoon be added.

Mr. Maury offered some remarks upon the advantage to be derived from the division of the day into three parts.

The meeting adjourned at 4¾ P. M. until to-morrow at 11 A. M.

QUETELET.

MINUTES OF THE MEETING OF THE 30TH OF AUGUST, 1853.

The proceedings commenced at eleven A. M. Present: MM. Beechey; Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; James; Jansen; Lahure; Maury; Pettersson; Quetelet, President.

The minutes of the last meeting were read, some corrections were made, and the minutes approved.

Order of the day: Continuation of the discussion of the draft of the instructions prepared by the subcommittees.

A long debate took place upon the nature and the extent of the instructions to be given, at the conclusion of which the meeting resumed the discussion of the instructions.

The Committee proposed the following:—

"The Maritime Conference recommends the adoption of the hours inserted in the second column namely: four in the morning, noon, and eight in the evening, for making the observations to be recorded in the seven first columns."

This wording was adopted.

Columns 3, 3′ 4, 4′.—LATITUDE AND LONGITUDE.

The Committee proposed the following wording:—

"The latitude and longitude should be observed frequently at sea, especially at the hours indicated in the second column, and the result recorded in the log at the hour nearest to those at which the observations are made, so as to determine as exactly as possible the position of the ship at those times. It will be more especially necessary to make these observations, when the ship is about to enter or cross any of the great currents or streams of the ocean (see *Currents*)."

If the longitude be determined by lunar distances, note it in the column with its proper sign. ⊙☾; if by chronometer, employ one of the following signs ○ or *.

Position by dead reckoning should be deduced from the position by the last observations.

Column 5, 5′.—CURRENTS.

The Committee proposed the following wording:—

"On ordinary occasions the current is to be determined at noon on each day, by the difference between the position of the ship as found by observation and by dead reckoning, and the direction and rate given for the 24 hours; but where the ship is expected to pass through any of the great currents of the ocean, or when any change is anticipated, the position of the ship is to be frequently determined by observations, and the current computed for the intervals."

The meeting adjourned at 4h. 30m. until the following day at 11 A. M.

QUETELET.

MINUTES OF THE MEETING OF THE 31st OF AUGUST, 1853.

The proceedings commenced at half-past eleven. Present: MM. Beechey; Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; James; Jansen; Lahure; Maury; Pettersson; Quetelet, President.

Order of the day: Continuation of the discussion upon the headings of the columns of the table.

Column 6.—MAGNETIC VARIATION OBSERVED.

§ 1. "Enter with the proper sign the variation ascertained, whether by azimuth or by amplitude."

Adopted.

§ 2. "The variation entered should be what it would have been, if, at the time the observation was made, the ship had been in such a position that the local deviation would have been 0. In other words, the variation entered should always be corrected for local deviation."

This section was put to the vote, and adopted by ten votes against one, viz: that of Mr. Beechey, who wished to have placed upon the minutes the following proposition, which he was desirous of substituting for that adopted by the meeting:—

"The variation should be given as it is observed, without any correction for local attraction of the ship; and the direction of the ship's head at the time of observation should be also given as a necessary element towards obtaining the correct variation; and that it should not be left to the master of a merchant ship to encumber the result with a quantity which he cannot in all probability know, and which, by the method proposed, there is no means of separating."

§ 3. "The variation should be entered in degrees and minutes."—Adopted.

§ 4. "When the variation is observed by the moon or a star, make after it the sign of ☾ or *."

§ 5. "It is desirable that every ship co-operating in this system of observations, should have a standard compass on board, by which all the observations for variations should be made, and to which a fixed place should be assigned. The standard compass used in the British Navy is recommended as the best instrument of the kind known. The Committee consider it superfluous to give here a detailed description of this instrument, or of the mode of using it, all of which is fully treated in the instructions issued by the English Admiralty, to which the observer is referred."

This section was divided into two parts. The first, which recommends that there be a standard compass was put to the vote; it was adopted.

The second part was negatived by 5 votes against 3; two members abstained.

Voted for: MM. Ihlen, Pettersson, Maury.

Voted against: MM. Beechey, Delamarche, Lahure, Gorkovenko, Jansen.

Abstained: MM. De Mattos Corrêa, James.

§ 6. "On board of vessels not having the advantage of a standard compass, and which are consequently compelled to make use of the common azimuth compass, it is recommended that choice be made of the place in the ship the least liable to be affected by local deviation, to fasten in the deck a copper tack, to mark the place of each of the three legs of the compass-stand, and to invariably place the compass in the position assigned to it."

Several members requested that the section might be suppressed. It was decided to divide the meeting upon the question whether the section should be retained with modifications.

MM. Delamarche, Beechey, Gorkovenko, Lahure, voted for the entire suppression.

MM. De Mattos Corrêa, Ihlen, Pettersson, Maury, Jansen, and Quetelet voted for retaining the section with modifications.

Mr. James abstained.

Mr. Beechey proposed the following amendment:—

"In the selection of a spot for the standard compass, or of any compass intended to be used in making observations on the variation, care should be taken to select a position for the compass, when it is to be used for observation, in that part of the ship, or as near as possible, which is most free from the effects of local deviation, and that it always stand in the same place."

Mr. Beechey's amendment was adopted.

§ 7. "When no observation has been obtained, the variation which has been used, is to be inserted in the variation-column, with an asterisk, the quantity having been corrected for the local attraction of the vessel."

Adopted.

Column 7.—Direction of the Wind.

The direction of the wind is the magnetic direction, with due allowance for appearances caused by the

motion of the vessel. It is the direction of the wind which has prevailed for the last 8 hours. It should be expressed to the nearest point of the compass.

Adopted.

Column 7.—FORCE OF THE WIND.

The force of the wind should be expressed in figures. The nomenclature of Admiral Beaufort was adopted.

In case of a squall, after the figure indicating the force of the prevailing wind, that of the squall to be entered in a parenthesis.

Adopted.

Column 8.—FORM AND DIRECTION OF THE CLOUDS.

"Howard's nomenclature for the form of the clouds was adopted."

"When, at the same time, there are two currents, an upper and a lower current, they are to be entered one above the other, separated by a line."

Adopted.

Column 9.—SERENITY OF THE SKY.

A discussion took place upon the term to be employed to express in English the equivalent of the French, *amount of clouds*, expressing the opposite of the term *sérénité du ciel.*

The heading, *proportion of sky clear*, was adopted.

"The *proportion of sky clear* to be expressed by figures from 0 to 10, the figures indicating the extent of sky clear."

Adopted.

Column 10.—HOURS OF RAIN.

It was decided that in this column should be comprehended fog, rain, snow, and hail; consequently, the following wording was proposed.

"The hours of fog, rain, snow, and hail, are to be indicated by a letter for each of these elements, viz: *A* fog, *B* rain, *C* snow, and *D* hail."

Adopted.

Column 11.—BAROMETER.

"It will be necessary to place at the commencement of the log-book the corrections of the barometer, or the date for making these corrections, specifying the place where the comparison has been made."

Adopted.

Column 12.—THERMOMETER.

A transposition of columns was acknowledged to be useful, and was adopted.

Same indications as those used for the thermometer. "If it rains at the time of observing the psychrometer, the letter *B* to be placed by the side of observation."

Adopted.

The discussion upon the HOURS commenced.

The President expressed the opinion that, in order to ascertain at sea the diurnal variation of the meteorological instruments, it would be convenient to adopt the project of bi-hourly observations, proposed by the Royal Society of London, or at least the project of tri-hourly observations, suggested by Captain Beechey. The first project, more rigorous, would have the advantage to come in the plan of the observations already adopted on land, and to be more convenient for the division of time in the service at sea.

After a discussion on the matter, the following instruction was adopted.

Column 2.—"In this column shall be placed the following hours, viz: 4 A. M., noon, and 8 P. M., when all the observations shall be made and written upon the lines on which those numbers stand, for the columns 3, 3′, 4, 4,′ 5, 6, 7, 8, 9, 10, 11, 11′, 12, 12′, and 13.—The observations of the 13′, 14, and 14′ columns should be made at least once a day. The observations for the columns 7, 7′, 11, 11′, 12, every two hours, if practicable; and if not, then at 9 A. M. and 3 P. M.

"But with reference to the columns 3′, 4′, and 6, it will be sufficient that the entries in these columns be made at noon on each day, except on such occasions as it may be desirable to detect the limits of any of the great currents of the ocean, or of the trade or other periodical wind, when a more frequent entry should be made, and the ship's place determined, at least at each of the hours specified in Column 2."

Mr. Gorkovenko. "Being perfectly convinced for myself of the great importance, both to science and navigation, of frequent observations, such as are comprised in the columns of our table, being made at sea, I ask permission to put a question with a view of eliciting the opinion of the Committee, viz: To what extent can the Navy comply with these requirements; and are they of opinion that the officers on board, having other duties to attend to, will be able to devote sufficient time to making the entire range of observations with the precision required? For it is to the Navy we must look more for correct than for numerous observations."

Mr. Maury. "I believe it is not only possible but very practicable and very easy. I think these observations may be made with perfect convenience, and with great benefit to science and navigation, by all ships of war that are provided with the instruments necessary 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.

The meeting adjourned at 5 P. M., until 11 A. M., on the following day.

QUETELET.

MINUTES OF THE MEETING OF THE 1st OF SEPTEMBER, 1853.

The proceedings commenced at eleven o'clock A. M. Present: MM. Beechey; Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; James; Jansen; Lahure, Maury; Pettersson; Quetelet, President.

The minutes of the last meeting were read and approved.

Order of the day: Continuation of the discussion of the instructions to be given with the table.

Column 13.—TEMPERATURE OF THE WATER AT THE SURFACE.

"Haul up the water in a clean wooden bucket, place 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."

Mr. Delamarche proposed to replace the paragraph by the following wording:—

"Let the method recommended for obtaining the temperature of the water at the surface of the sea, be inserted at the commencement of the log-book."

This proposal was rejected.

The President having been obliged to absent himself, the chair was taken by Mr. Jansen.

After a slight discussion, the question whether instructions should be given for the 13th column was put to the vote. It was decided in the affirmative.

Voted for: MM. Gorkovenko, Ihlen, Pettersson, Maury, Jansen.

Voted against: MM. Beechey, Delamarche, De Mattos Corrêa, Lahure.

Abstained: Mr. James.

Mr. Maury proposed, in order to conciliate the various opinions, to commence the instructions with the words:—

"There is a convenient method which consists in hauling the water, etc."

The section, thus amended, was put to the vote and adopted.

Voted for: MM. Ihlen, Pettersson, Gorkovenko, Maury, Jansen.

Voted against: MM. Beechey, De Mattos Corrêa, Delamarche, Lahure.

Abstained: Mr. James.

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

Adopted.

Mr. Delamarche: "The proposal of Mr. Maury is good; it is evident; and every one must be aware, that, in order to read off the degree of the thermometer which is to indicate the temperature of the sea-water, the instrument must be immersed in that water for some minutes. I think, however, if we prescribe the precautions to be taken, the question ought to be seriously studied by us, and the results carefully noted, for there may be very important precautions to be observed which we might omit. Considering, therefore, that we do not devote the time or take the necessary trouble to perform this duty properly, I must abstain from

taking any part in issuing instructions which appear to be incomplete and not so carefully examined as they might be; therefore, if the proposed instructions should be adopted, I would reserve to myself the right of expressing my opinion upon them in order to cover my responsibility."

§ 3. "The temperature of the water should also be tried during thunderstorms, and the heavy display of electrical phenomena."

Adopted.

§ 4. "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."

Adopted.

Column 14.—TEMPERATURE OF THE WATER AT CERTAIN DEPTHS.

§ 1. "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, $\frac{400}{200}$ fathoms."

Adopted.

§ 2. "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."

The paragraph was put to the vote and adopted.

Voted for: MM. Ihlen, Pettersson, Gorkovenko, Maury, Jansen.

Against: MM. Beechey, De Mattos Corrêa, Delamarche, Lahure.

Abstained: MM. James, Quetelet.

§ 3. "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."

The paragraph was adopted by the majority of the meeting.

§ 4. "It is desirable, whenever the temperature of the water let in to the ship is tried, that the speed of the ship at the time be noted."

This paragraph was likewise adopted by the majority.

§ 5. "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 off 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."

Adopted.

§ 6. "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 as it actually exists, the temperature of the water at the moment of making the observation should be noted."

Adopted.

§ 7. "A variety of instruments will probably be used for the purpose of filling this column; it is therefore deemed advisable to have the description of the use of the specific gravity-instrument at the office, from which each Navy may be supplied."

Adopted.

§ 8. "It may be permitted, however, to express the hope that whatever be the instrument used, a uniform scale will be adopted for all; that is, that the specific gravity of pure distilled water will be adopted as the unity, and that the specific gravity of sea-water will be expressed in decimals."

Adopted.

Mr. Delamarche requested that a note should be made that in his opinion the Conference should be silent as to the manner of making the observations. He thought that it ought to be left to the scientific societies of each nation to discuss and determine the best mode of observation. It is certainly desirable that complete directions as to a uniform mode of making observations should be adopted, but the present and progressive state of science makes it difficult to adhere to a decision which may be opposed to improvement.

Mr. Delamarche, as regards his own qualifications, dared not meddle with any but the nautical points, because these questions had already been submitted by Mr. Maury to the Academy of Sciences of France.

Mr. De Mattos Corrêa declared that he did not vote against the method of observations, but against the principle of giving explanations or instructions as to the mode of observing.

Mr. Jansen explained that he voted in favor, with a view of insuring as far as possible uniformity; which uniformity will never be attained, if instruments which every one can procure, and the most simple methods are not recommended.

The meeting adjourned at 4h. 30m. P. M. until 11 A. M. on the following day.

QUETELET.

Minutes of the Meeting of the 2d of September, 1853.

The proceedings commenced at 11 A. M. Present: MM. Beechey; Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; Jansen; Lahure; Maury; Pettersson; Quetelet, President.

Order of the day: Continuation of the discussions upon the instructions.

"It will be desirable to know whether the vessel on board of which the observations were made was a steamship, if it was steaming or sailing."

Adopted.

Mr. Maury, with a view of conciliating opinions, proposed that the following section, proposed before by Captain Beechey, be added:—

"Enter, uncorrected for local attraction, the variation observed, with the time of observation and the direction of the ship's head."

This proposition was adopted.

"Frequent mention is made by navigators of tide-rips at sea, particularly within the tropics; a close attention to these phenomena is recommended; noting, whenever they are seen, the age of the moon. Enter also sea-weed, drift-wood, and the like."

Adopted.

"It is desirable that navigators compare the phenomena connected with storms, thunder, lightning, etc., in other parts of the world, with the same phenomena in the vicinity of the Gulf Stream."

Adopted.

"When in those regions where ice is liable to be met with, a frequent resort to the water-thermometer is recommended; because in such regions fogs are prevalent, and often conceal the approaching danger. The distance of ice, within several miles, will generally be indicated by the water-thermometer, especially when vessels are to windward of the bergs."

Adopted.

"When in the presence of ice, note the direction in which the ice has been drifted, and describe its appearance."

Adopted.

"Mention the time when the dew commences to fall, and, in cases of extraordinary deposits, note the temperature of the air as closely to the surface of the sea as can be done, taking the temperature at the masthead at the same time."

Adopted.

"When considerable differences are found between the temperature at and below the surface, observe also the wet and dry bulb, and enter their readings among the Remarks."

Adopted.

"It is desirable that vessels co-operating in this system of observations should, in addition to the thermometer with which ships usually are supplied, have a white and black bulb, and also a bulb of marine blue that is as nearly the color of sea-water as may be."

Adopted.

"These three thermometers should be exposed to the sun in clear weather for a few minutes, and observed at 9 A. M., noon, and 3 P. M., and occasionally at night when the dew is heavy, and their readings should be entered in the column of Remarks."

Adopted.

"It is desirable that the bulbs of the colored thermometers be painted with water-color."

Mr. Delamarche observed that should the bulbs be painted, it would be impossible to compare them.

The President was of opinion that sometimes the water-colors should be washed, in order to compare the bulbs.

The section was put to the vote and adopted.

Voted for: MM. James, Ihlen, Pettersson, Maury, Jansen, Quetelet.

Against: MM. Delamarche, Lahure.

Abstained: MM. Beechey, Gorkovenko, De Mattos Corrêa.

Psychrometer.

Mr. Maury proposed the following:—

"The wet bulb should be observed, after having been wetted with *fresh* water of the temperature of the air, and after the instrument has been held in the shade in the open air for some minutes."

This proposal was put to the vote and adopted.

Voted for: MM. James, Ihlen, Pettersson, Gorkovenko, Maury, Jansen.

Against: MM. De Mattos Corrêa, Delamarche, Lahure.

Abstained: M. Quetelet.

Mr. James proposed the following paragraph:—

"When at anchor, it is desirable that hourly observations with the meteorological instruments should occasionally be taken, and especially at the equinoxes and solstices."

Adopted.

"In the case of storms, tornadoes, and whirlwinds, it is desirable to have a full description of the phenomena, and all the circumstances connected with them: such as the appearance of the sky and clouds; the state of the barometer before, during, and after the event; the electrical displays connected with it; the quantity and time of rain or hail, etc. The barometer should be noted frequently, and the time mentioned at which every variation in it, that amounts to one tenth of an inch, takes place."

Adopted.

"Also, it will be interesting for the navigator to avail himself of every favorable opportunity for determining the height and velocity of waves and the distance between them. He should note in this column the results, and describe the method used."

Adopted.

"When land birds and insects are met with at sea, the fact should be noted, and mention made of all the circumstances which are calculated to throw light upon their migration."

Adopted.

"Showers of dust and red fogs are sometimes met with at sea; in such cases, a description of the weather and of the appearance of the sky, as well as specimens of the dust, would be desirable."

Adopted.

"Note the direction of the winds which bring the rain, as well as the changes of the wind during and after the rain. By the term *rain*, hail and snow are understood to be included. With regard to hail,

describe the stones and any peculiarity connected with the snow-flakes, being careful to note all the displays of electrical phenomenon connected with the hail-storms."

"It would be interesting to know the temperature of the rain, and to have estimates of the quantity of dew."

Adopted.

Soundings.

"Deep-sea soundings should be made on all favorable occasions; for making these soundings comparable, the uniformity in the size of line used and the weight of the sinker is a desideratum. The time occupied for every 100 fathoms in going out should be observed, for the discussion afterwards of the soundings. When the sinker is recovered, the specimen of the bottom ought to be carefully labelled and preserved."

Adopted.

"When in harbor, tidal observations should not be neglected; the times of high and low water, with the direction and force of the current at various stages, both on the flood and the ebb, should be noted. Likewise thunder and lightning, the time of their duration, intensity, etc. When marked changes in the color of the water are observed, try the temperature of the water, get a cast of the deep-sea lead if practicable." Adopted. "In the Pacific Ocean, particularly, patches of pink or white-colored water are frequently met with; descriptions of them, with specimens of the water carefully preserved in phials with ground-glass stoppers, are desirable."

Adopted.

"Waterspouts: a detailed description; containing the duration, the circumstances of their formation, gyration, motion, form, breaking up, etc."

"Shooting-stars: the number of them observed during a certain time; the point of the heaven (the star or constellation) from which they are emanating and towards which they are converging, in particular about the 10th of August and middle of November.

"Aurora Borealis: duration or time for beginning and ending; its extension, form, tract of the heaven, intensity of light, color, rays, its motions and changes, etc. Note anything that is particular about rainbows and halos and meteors of every description, describing their place by reference to stars or the horizon."

At the commencement of the log-book should be entered: 1. The name of the ship, the nature of materials of which it is built, cargo, captain's name, class of ship, names of ports put into during the period the log has been kept.

2. Tables showing amount of local deviations observed before departure; stating whether cargo on board or not at time of observation being made; the methods employed to ascertain the local deviation to be minutely described.

3. Admiral Beaufort's nomenclature for the winds.

4. Howard's nomenclature for the form of clouds.

5. The corrections, or the rules for correcting all the instruments employed, more particularly the barometer and thermometer, with the places where the instruments have been compared with the standard.

6. Description of instruments, and methods employed in making observations.

7. Note down the meridian from which the longitude is reckoned.

A sub-committee, composed of MM. Delamarche, James, and Jansen, was trusted with revising the form of abstract logs and instructions.

Meeting adjourned at half-past 4 P. M., until to-morrow at 11 A. M.

QUETELET.

MINUTES OF THE MEETING OF THE 3D OF SEPTEMBER, 1853.

Proceedings commenced at eleven o'clock A. M. Present: MM. Beechey; De Mattos Corrêa; Gorkovenko; Ihlen; Lahure; Maury; Pettersson; Quetelet, President.

MM. Delamarche, James, and Jansen, composing the committee appointed to revise the tabular form of log, are absent from the meeting.

Minutes of last sitting were read and approved.

Mr. Maury read to the meeting the report he had drawn up at the request of the President.

Captain Beechey proposed a vote of thanks to Mr. Maury for his kindness in undertaking to draw up the report, and for the assiduity and ability with which he has performed his task.

Thanks were voted to Mr. Maury unanimously.

Mr. Maury: "I accept the vote of thanks with gratitude, and I am profoundly sensible of the honor conferred.

"I avail myself of the present opportunity to make an atonement for a seeming neglect in not stating before, in terms as distinctly as I should have stated, the cordial sympathy which I have received from British subjects with regard to this undertaking of mine. That sympathy has been manifested by distinguished officers of Her Majesty's Navy, by citizens of England, and by the subjects of Great Britain in various parts of the world; and particularly at Bombay, and in Mauritius.

"When the first Charts were published, the merchants of Bombay immediately started a subscription for the purpose of publishing a similar set of Charts of the Indian Ocean.

"This noble enterprise was confided to the Geographical Society of Bombay, whose activity and zeal in the cause of science are deserving of great praise. After considerable progress had been made, the gentleman in charge of the work died, and the undertaking fell through; but the Society, with a liberality the most praiseworthy, placed at the disposal of the Government of the United States, all the materials collected, and the work it had done, which was most gladly accepted; and I, when in London, met them on their way to the United States.

"Also, there was a response from the Island of Mauritius, which, in a meteorological point of view, occupies a most important position. Many ships annually touch there with log-books containing most

valuable materials. The Meteorological Society proposed to collect from these materials, and make them available for our purpose in Washington.

"With a view of having abstracts made of the logs, I was authorized by the proper authorities to place to the credit of the Secretary of that Society, Mr. Meldrum, the sum of 1,500 dollars, to pay for the expense of making the abstracts. This, with true English pride, which all can appreciate, and in becoming terms, was declined. But the Society did not rest there; at its last annual meeting, it set on foot measures in furtherance of this general system of meteorological research, from which I expect much valuable fruit.

"Two gentlemen then pledged themselves to the Society, to devote their time to the collection of meteorological data; and, from the enthusiasm which prevailed on the occasion, we, who expect much from that part of the world, will, I am sure, not be disappointed.

"I am very much obliged to Captain Beechey for his mention of my labors, and the kind terms in which it was conveyed; and I thank him, also, for affording me this opportunity of expressing my obligations to his countrymen, for the kind sympathy I have received at their hands."

The meeting decided that the discussion of the report should be adjourned until Monday, in order that each member should have time to read it, and present his observations thereon.

The meeting next examined the documents which form the record of its proceedings.

The meeting adjourned at half-past four, until Monday, at 11 A. M.

QUETELET.

MINUTES OF THE MEETING OF THE 4TH OF SEPTEMBER, 1853.

Proceedings commenced at 11 A. M. Present: MM. Beechey; De Mattos Corrêa; Gorkovenko; Ihlen; Lahure; Maury; Pettersson; Quetelet, President.

MM. Delamarche, James, and Jansen, forming part of the sub-committee appointed to revise the table and the instructions, were absent.

The minutes of the last meeting were read and approved.

The President read a letter from Mr. Kupffer, Director of the Central Physical Observatory of the Russian Empire, adressed to Mr. Maury, upon the subject of connecting the meteorological observations made at sea with those made on land. Mr. Kuffper is of opinion that the Russian Government would be disposed to encourage the undertaking.

It was decided that this letter should be mentioned in the minutes, and the President be requested to write to Mr. Kupffer, to the effect that the Conference was of opinion that it could not, without overstepping its functions, make a direct application to any government, but it would learn with the greatest satisfaction that those countries, in which meteorological observations are regularly made, had adopted a system by which the globe would be submitted to one uniform method of observation.

The meeting next proceeded to revise the minutes of several sittings.

At one o'clock, MM. Delamarche, James, and Jansen, joined the meeting.

Mr. Jansen, in the name of the sub-committee, read the report upon the revision of the journal or log and the instructions.

A discussion took place upon the title that should be given to the journal. The term "*Abstract Log*" was adopted.

Captain Beechey disapproved of the arrangement of the form. He thought there was much space wasted in the first nine columns which was much required in the remark column; and that the barometer and thermometer columns would be better placed if they followed the wind column, an arrangement which would keep together in one parcel what the merchant vessels would be required to fill up so as to entitle them to become co-operators. The first nine columns would at the most require only 3 lines for the entries to be made in them; whereas, by the present arrangement, there was space left for 14 lines. He proposed to transpose the barometer and thermometer columns in such a manner, that the columns which the merchant vessels were required to fill up, to entitle them to participate in the offer made by the American Government, might be kept in one parcel.

Mr. Maury seconded Mr. Beechey's proposal, which, after a short discussion, was put to the vote and rejected.

The table and instructions, as proposed by the sub-committee, were adopted.

The meeting adjourned at 5 P. M., until the next day at 11 A. M.

QUETELET.

MINUTES OF THE MEETING OF THE 6TH OF SEPTEMBER, 1853.

Proceedings commenced at 11h. 15m. A. M. Present: MM. Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; James; Jansen; Lahure; Maury; Pettersson; Quetelet, President.

Captain Beechey absent; being occupied with the report.

The minutes of the last meeting were read and approved.

The President rose to order:—

"It has been proposed to make some alteration in the wording of the minutes which have been approved. I wish the meeting to decide whether, contrary to the general practice, these changes can be allowed."

The meeting decided unanimously that no change could be permitted in the minutes which had been approved.

The attention of the Conference was next directed to the various questions which relate to the wording or drawing up of the minutes of the report.

The sub-committee who revised the table, the instructions, and the explanatory notes, proposed to add at the end of the remarks the following paragraph:—

"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, more especially if he has frequently made the same voyage."

Mr. Maury requested that this addition might be admitted only upon the condition of its being unanimously approved.

The proposition was put to the vote and adopted by every member present.

The meeting adjourned, at 1 o'clock, until the following day at 11 A. M.

QUETELET.

MINUTES OF THE MEETING OF THE 7TH OF SEPTEMBER, 1853.

Proceedings commenced at 11h. 45m. A. M. Present: MM. Beechey; Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; James; Jansen; Lahure; Maury; Pettersson; Quetelet, President.

The minutes of last meeting were read and approved.

Captain Beechey read the amendments made by him in the report, with the concurrence of Mr. Maury.

The report with the proposed modifications was put to the vote, and adopted unanimously.

Mr. Maury: "I propose a vote expressing the thanks of the Conference to Captain Beechey, for the ability and zeal he has displayed in the amendments to the report; which set forth, in so clear a light, the objects of the Conference, and the benefits to be derived by commerce and navigation from the adoption of the plan of observations recommended."

Thanks were voted unanimously to Captain Beechey.

Captain Beechey thanked the Conference for the kind expression of their sentiments, which he felt to be undeserved. He begged to say that, throughout the meetings, he had but one object in view; that of giving his best assistance towards the objects for which the Conference had been assembled.

Mr. Maury: "Being on the eve of closing our labors, I think we should do well to take a retrospective glance, and call to mind some of the circumstances which have enabled us to accomplish the object of our mission so quickly, so harmoniously, and satisfactorily.

"This result is mainly owing to the zeal, intelligence, and impartiality with which our deliberations have been directed by the eminent man whom we elected to preside over them.

"It is not only with reference to the plan we have just carried into execution, but to the future also that we should congratulate ourselves upon having for a President this distinguished *savant*, whose numerous and useful works have placed him amongst the scientific celebrities of our time, and whose reputation is world-wide.

"His cordial co-operation in our work may be considered as the connecting link of the chain which will one day unite the ocean and the land, and from this time forth we may entertain the hope of shortly seeing adopted a general system of observations embracing the two elements.

"I propose, therefore, that the meeting should vote its thanks to the President for the skill, zeal, and impartiality with which he has presided over our discussions."

Mr. Maury's proposal was warmly received by every member, and thanks to the President voted by acclamation.

The President:—

"GENTLEMEN: I cannot find words to express my gratitude for this new mark of your kindness. I may venture to hope that I have not been altogether unworthy of the distinguished honor conferred upon me, in being called to preside over a meeting composed of such eminent men, and whose labors afford such future promise of benefit to science.

"The kind sentiments to which Mr. Maury has given utterance, and in which you have so warmly joined, are certainly amongst the most flattering testimonials I have received throughout my scientific career, and as such they will always be dear to me."

Mr. Jansen proposed a vote of thanks from the meeting to Mr. Lahure, for the spontaneous manner in which he had taken charge of the various details connected with the labors of the Conference, and the zeal and activity he had displayed in arranging them.

Voted unanimously.

Captain Lahure returned thanks for that vote.

The meeting, upon the motion of the President, then returned thanks to Mr. Ch. De Groote, for his having attended the Conference as short-hand writer, and having prepared the minutes of the proceedings.

Captain Beechey: "I beg to propose that Mr. Quetelet be authorized on the part of the Conference to return its best thanks to M. le Ministre de l'Intérieur for his great kindness in appropriating to the use of the Conference one of the rooms at his own residence, for the purpose of holding its meetings, and for the polite personal attention the members have received from him."

This proposition was unanimously adopted.

Mr. Delamarche: "I propose the meeting should request the President to kindly undertake to deposit in the archives of the Royal Belgian Academy of Sciences, Belles-Lettres, and Fine Arts, the original reports."

Adopted unanimously.

The meeting adjourned to Thursday, 8th of September, at 3 P. M.

QUETELET.

MINUTES OF THE MEETING OF 8TH OF SEPTEMBER, 1853.

Proceedings commenced at 3h. 30m. P. M. Present: MM. Beechey; Delamarche; De Mattos Corrêa; Gorkovenko; Ihlen; James; Jansen; Lahure; Maury; Pettersson; Quetelet, President; Rothe, Captain-Lieutenant of the Danish Navy, and Director of the Naval Dépôt of Charts.

The minutes of the last meeting were read and approved.

The President informed the meeting that Mr. Rothe, who arrived in the course of the morning, had made himself acquainted with the forms and instructions already adopted.

The President then, in the name of the Conference, expressed to M. Rothe the satisfaction it felt at the participation of the Danish Government.

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

QUETELET.

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 farther 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

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

last 24 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 24 hours.

9th 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 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 O.

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.

10th Column—DIRECTION } of the WIND.
11th Column—FORCE }

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 in the first page; if there are squalls, their force should be given in a parenthesis ( ), opposite the hour at which it takes place.

12th and *13th 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.]

14th and *15th 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.

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

16th 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 96. When the clouds are observed to be going in different directions at the same time, the direction of the upper ones should be stated above that of the lower, and separated by a bar, thus: $\frac{\text{N. N. E. Ci}}{\text{S.W. Cu}}$. [Plate XVI. 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 $\underline{\text{B}}$, rain; 3 $\underline{\underline{\text{B}}}$, heavy rain.

The direction and force of the wind, etc., 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.]

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 thunderstorms, and when any electrical phenomena are observed.

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 ($\frac{039}{150}$). 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 a huge 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 should be entered above the specific gravity and separated from it by a bar ($\frac{54°}{035}$); 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 6 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. [Self-registering *metallic* thermometers are better.]

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 10 minutes before the bucket is filled, and the thermometer should be left two or three minutes [five] in the water, as before described, before reading it, and it may be well to note the rate 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 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, etc.—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, etc. 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, etc., 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 U. S. Navy, see 6th ed. *Maury's Sailing Directions.*]

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, etc. 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.

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.

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.N.E. . .		S.S.W. . .	
N.E. . . .		S.W. . . .	
E.N.E. . .		W.S.W. . .	
EAST. . .		WEST. . .	
E.S.E. . .		W.N.W. .	
S.E. . . .		N.W. . . .	
S.S.E. . .		N.N.W. . .	

When arrived.

SHIP'S HEAD.	DEGREES OF DEVIATION.	SHIP'S HEAD.	DEGREES OF DEVIATION.
NORTH. .		SOUTH. .	
N.N.E. . .		S.S.W. . .	
N.E. . . .		S.W. . . .	
E.N.E. . .		W.S.W. . .	
EAST. . .		WEST. . .	
E.S.E. . .		W.N.W. .	
S.E. . . .		N.W. . . .	
S.S.E. . .		N.N.W. .	

(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.

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. attach'd.
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.	PROP. 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) [a]	(15) [b]	(16) [a]	(17) [a]	(18) [a]	(19) [c]	(20) [a]	(21) [b]	(22) [b]	(23) [c]	(24) [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.
(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. Close-reefed topsails and courses.
10. Close-reefed main topsail and reefed foresail.
11. Stay sails.

FORMS OF CLOUDS ARE: cirrus (*Ci.*); cumulus (*Cu.*); stratus (*St.*); nimbus (*Ni.*), etc. [See Plate XVI.]

THE INDIAN OCEAN.

A Gulf Stream, nearly if not quite equal to our own in the Atlantic, has its genesis in the Indian Ocean. Its waters are nearly at blood heat; they frequently reach a temperature of 90°. Between the shores of China and one of the sources of this hot stream, but counter to it, is a current of cold water.

In this system of aqueous circulation thus detected, and in the prevailing winds of the Pacific, are to be found the conditions which cause the climates of the Atlantic States to be repeated along the coasts of China; the climate of Western Europe to be reduplicated in Northwestern America. Here, in the tepid waters of India, which this stream conveys towards the Fox Islands—the Newfoundland of the Pacific Ocean—is to be found the origin of the fogs of the North Pacific, and the European-like climate of Oregon. It may be expected that the storms which take their rise near the western margin of the Pacific Ocean, will also follow this stream in their course.

The passage from China to San Francisco is now (1852), made in 54 days. But with the knowledge which these Charts promise us, with regard to this stream and the winds of that ocean, there is reason to believe that the average passage under canvas may be yet still further and considerably reduced. [This expectation has been realized. The passage has been made in less than 40 days from Shanghai to San Francisco, and the clipper ship Sword Fish has just made the run from Shanghai to California in 32 days. November, 1853.]

There is a part, too, of the North Pacific, which answers to our Sargasso Sea of the Atlantic. In it, sea-weed and drift-wood will probably be found, though not in such quantities as in the Atlantic. I have already received some information concerning a sort of Sargasso Sea in the Pacific.

Bottles containing a paper with the date and place of the ship, and requesting the finder to cause the same to be published in the nearest newspaper, and forwarded to the Superintendent of the National Observatory, at Washington, with an account of the time and place at which it may be picked up, would, in many cases, afford much useful, valuable, and interesting information concerning the currents of the Pacific Ocean.

The practice of throwing bottles thus freighted overboard in that and the Indian Ocean is recommended to navigators who are co-operating with me in these investigations, and a frequent resort to this practice is earnestly commended to their attention.

The Indian Ocean is the fountain of another stream of warm water which flows south, and a branch of which is the well-known Lagullas current.

With the information to be derived from the abstract log-books with which I hope *every* American navigator that visits those seas will furnish me, I see reason for the anticipation of great improvements in the navigation there—particularly in the navigation between New Holland and India; and between India, China, and the Cape of Good Hope.

The discovery has already been made that, in certain parts of the China seas, each month almost has a

system of winds peculiar to itself. Thus, the winds between the parallels of 15° and 20° N., and the meridians of 110° and 115° E. are:—

In Dec., between	N. and N. E. inclusive.
Jan.,	N. and E.
Feb.,	N. N. E. and E.
March and April,	N. E. and S. E.
May,	N. by way of E. to S. W.

Lat. 5° and 10° N., long. 105° and 110° E.

April,	between N. E. and E. inclining to v'bl.
May,	around the Compass.
June,	between S. E. and S. W.
July,	" S. and S. W.
June,	" S. E. and S. S. W.
July,	" S. and S. W.
August,	" S. and W. S. W.
Sept.,	around the Compass.
Oct. and Nov.,	between N. and E.

5° and 10° N. 105° and 110° E.

Dec., Jan., and Feb.,	between N. and N. E.
March,	steady from N. E.
Aug. and Sept.,	between S. and W. N. W.
Oct. and Nov.,	variable, around Compass. Pl. I.

Lat. 15° and 20° N., long. 115° and 120° E.

Dec. to April,	between N. and E.
May and June,	Variable.
July and Aug.,	between S. S. W. and S. W.
Sept. and Oct.,	Variable.

These facts have been clearly brought out by patient and laborious investigation; and that such are the differences with regard to the winds in different parts of this ocean, and at different seasons of the year, there is no more doubt than there is as to the fact that the monsoons change.

Some few masters of merchantmen, I am aware, have refused or withheld co-operation in this undertaking, upon the plea that I have some theory of my own which I am seeking to build up by these researches.

They are mistaken; I am searching after the truths of Nature. I set out with no theory; and I have none to build up. I set out with the view of collecting facts, of gathering and presenting, side by side, the experience of every navigator with regard to the winds and currents, and the phenomena of the sea—of taking the records thereof from all the log-books I could obtain—and of discussing them, that I might ascertain, not from the reports of one or two witnesses, but from a multitude of seamen, the prevailing winds for every month in every part of the ocean; and as to the manner of doing this, I have been governed altogether by the principles of inductive philosophy.

The better to impress navigators with correct notions as to the degree of confidence which is due the results thus obtained and announced, I will explain, by way of example, the process by which those above quoted as to the winds in the China Sea, were obtained; for this purpose, I present for their examination a fac-simile taken from the sheet upon which Lieutenant Forrest is engaged in marking the direction of the winds recorded in their logs. It is also a sample of what I am doing for all parts of the ocean.

It is divided into districts of 5° of lat. by 5° of long. each, and in whatever part of one of these districts a navigator may be when he records the direction of the wind in his log, from that direction, the wind is

assumed to be blowing at that time all over that district; and this is the only assumption that is permitted in the whole course of investigation.

Now if the navigator will draw, or imagine to be drawn, in any such district, 12 vertical columns for the 12 months—and then 16 horizontal lines through the same district for the 16 points of the compass, *i. e.* for N., N. N. E., N. E., E. N. E., and so on, omitting the *by*-points, he will have before him a picture of the "Investigating Chart," out of which the "Pilot Charts" are constructed. In this case, the alternate points of the compass only are used; because, when sailing free, the direction of the wind is seldom given for such points as N. by E., W. by S., &c. Moreover any attempt, for the present, at greater nicety would be over-refinement; for navigators do not always make allowance for the aberration of the wind; in other words, they do not allow for the apparent change in the direction of the wind caused by the rate at which the vessel may be moving through the water, and the angle which her course makes with the true direction of the wind. Bearing this explanation in mind, the intelligent navigator will have no difficulty in understanding the wind diagram (Plate I.), and in forming a correct opinion as to the degree of credit due to the results afforded by it.

Instead of entering the wind in the log as from the *point* of the compass from which it blows, many seamen were too much in the habit, particularly when the wind was a little variable, to enter it as from the "Sd. and Wd.," "Nd. and Ed.," and so on, by quadrants.

In such cases, the officers here who are conducting the investigations, are at a loss to know how to enter such winds on the sheet; they do not know, in the case of the entry "Nd. and Ed.," for example, whether to enter it on the N. N. E., the N. E., or the E. N. E. line, for these are all "Nd. and Ed."

As soon as the attention of those who were keeping abstracts for me was called to this, they with great promptitude and fidelity, I have reason to believe, remedied the defect and adopted the plan recommended, by entering the wind for the first, middle, and latter part 3 times a day. They entered it from that point of the compass from which it most prevailed during each part. Thus, three entries or scores are made on the sheet for every day;—these scores are made in the column standing for the month, and on the line standing for the point of the compass from which the wind prevailed.

As the compiler wades through log-book after log-book, and scores down in column after column, and upon line after line, mark after mark, he at last finds that, under the month and from the course upon which he is about to make an entry, he has already made four marks or scores thus (IIII). The one that he has now to enter will make the fifth, and he "scores and tallies;" and so on, until all the abstracts relating to that part of the ocean upon which he is at work has been gone over, and his materials exhausted. These "fives and tallies" are exhibited on Plate I.

He then sums up the number of winds entered from each point for each month, and enters the same —expressed in figures—in its appropriate place on the "Wind-rose" of the Pilot Chart. Plate V.

The course of the winds as given in the abstracts are compass courses, and they are entered on his working sheet accordingly. For example: if the variation be more than one point, and less than three, the compiler, when he goes to transfer results to the Pilot Chart, makes the correction for all at once, by

allowing for two points of variation, so that the Pilot Chart may show the true courses of the winds as nearly as possible.

Thus, suppose that, in the district which the compiler is about to transfer, the variation be two points east; what he has recorded in his working sheet as north winds, for instance, are transferred to the Pilot Chart as N. N. E. winds, and so on, correcting every course for variation. If the variation be one point or less, then the transfer is made without any correction.

Now, with this explanation, it will be seen that in the district marked A (Plate I.), there have been examined the logs of vessels that, giving the direction of the wind for every eight hours, have altogether spent days enough to enable me to record the calms and the prevailing direction of the wind for eight hours, 2,144 times: of these, 285 were for the month of August; and of these 285 observations for August, the wind is reported as prevailing for as much as eight hours at a time: from N. 3 times; from N. N. E. 1; N. E. 2; E. N. E. 1; E. 0; E. S. E. 1; S. E. 4; S. S. E. 2; S. 24; S. S. W. 45; S. W. 93; W. S. W. 24; W. 47; W. N. W. 17; N. W. 15; N. N. W. 1; Calms (the little 0's) 5; total 285 for this month in this district.

Now the only questions to be asked and answered, as expressive of doubt with regard to these results are: Were these observations made under the usual condition of things? And if so: Are there enough of them to afford a fair average as to the prevailing directions of the winds in that district?

The log-books are taken at random, examined with care and quoted with fidelity, and therefore, as the observations were made by mariners as they chanced to pass to and fro through this or that part of the ocean, the presumption is a fair one that their records show fairly.

Are the observations sufficiently numerous to afford the data for a fair average?

The answer in this case depends upon the opinion of him who undertakes to reply; but to be sure of erring on the right side, if err I must, I have aimed to get at least, on the average, 100 observations for every month in every district. This is my aim, but practically I have found it difficult to accomplish it. In some districts, I have obtained as many as 1,800 observations for a single month; whereas, in another month, in a neighboring district, I have not been enabled to obtain a single observation; and such is liable to be the case as long as some parts of the ocean, as there must be, are frequented more than other parts, or as long as crops come to market at different periods of the year, and commerce has its seasons of annually recurring activity and repose.

There is then this satisfaction to the practical navigator, when he sees a blank Wind-rose on the Pilot Chart: he wants most to use the parts of the ocean that are the most frequented and are the great highways; while those parts which lie out of the paths of commerce possess so little practical interest to him, that he does not care to know which way the wind blows there. The navigator, therefore, stands a very good chance of getting all he wants from these Charts;—it is the philosopher who wishes to trace in "his circuit" the winds in the unfrequented parts of the ocean, and for his sake it is desirable to have records extending over all parts of the ocean, and in all seasons alike.

But Plate I. incomplete as it is, affords much that is interesting to the philosophical navigator; though

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it has been said in high places in this country, that philosophical research and the pursuits of the sailor are incompatible: as seamen became philosophers, they "lose the qualities and habits necessary for command at sea." So said one high in office, and to whose sayings, *place*, and not the man, gives importance. Divested of his little brief authority, his opinion is of no consequence; for, being neither sailor nor philosopher, he is no judge in such a case at least.

There is no calling of men who have done more for philosophy than mariners; and any one who will take the trouble to examine Plate I., which is made up entirely of observations by this much-abused class, will find it abounding with philosophical truths, principles, and instruction. More than any other class, the sailor, out upon the great deep, is accustomed to observe the workings of nature; and *he*, to be fit for his calling, must be a philosopher in the truest sense of the term.

Upon this Plate, he sees marked out, in the most beautiful and striking manner, the path of the "wind in his circuits" over the part of the ocean to which it relates. He perceives, by examination, that the law which governs the wind in district A, is not the law which governs it in district B.

That in the former, the month of September is remarkable for the pertinacity and steadiness with which the wind clings to the S. W. quadrant. That in the latter, it is all around the compass for September, inclining to prevail most from the N. E. quadrant. After looking at A, he will conclude that every season of the year, winter, spring, summer, and autumn, may be said there to have each its own monsoons or peculiar system of winds. The winds take almost from December to September, gradually to get from northward and eastward, around the compass to southward and westward; and they leap back almost at a single bound, it may be said, in the month of October.

There are many other respects in which the philosophical navigator (and I hold every properly qualified navigator to be a philosopher) will find himself interested with regard to the statistics exhibited in this Plate.

The number expressed in figures denotes the whole number of observations of calms and winds together, that are recorded for each month and district.

In C, the wind in May *sets* one third of the time from west. But in A, which is between the same parallels, the favorite quarter for the same month is from S. to S. W., the wind setting one-third of the time in that quarter, and only 10 out of 221 times from the west; or, on the average, it blows from the west only 1⅓ day during the month of May.

In B, notice the great "Sun Swing" of the winds in September, indicating that the change from summer to winter, in that region, is sudden and violent; from winter to summer, gentle and gradual.

The proposition to collect a great number of log-books with the view of patiently examining them all, one by one; of taking from each an exact account of the winds and currents mentioned, and of carefully collecting all the information to be gathered from such sources, touching the industrial pursuits of the sea, and of so presenting that information as to embody the united experience of every navigator, and show it all at one view, could not fail to commend itself most favorably to every intelligent and public-spirited mariner. The manner in which American shipmasters and owners finally received this proposition

has been highly gratifying; and, on account of the co-operation which I have received at the hands of this class of my fellow-citizens, the undertaking, though but just begun, has, nevertheless, been crowned with results which I dared not anticipate.

These results have been beneficial to commerce and navigation in a high degree. Wherever the Charts have been extended, there has been a great gain of knowledge as to winds, &c.; consequently, a shortening of voyages and a saving of time, by rendering passages to and fro less uncertain.

During the course of these investigations, facts new, in many instances, have been elicited to confirm what philosophers already knew, and had proclaimed, touching the winds and currents of the sea. In other instances, facts and circumstances have been revealed, which may be regarded as new, and in some cases as amounting to valuable if not important discoveries.

As all the results derived from these Charts, whether in confirmation of what was already suspected, or in evidence of increasing knowledge as to the laws of nature, have been obtained by a new and independent system of research, they, or the most striking of them, deserve to be enumerated, in order that the importance of the undertaking may be better appreciated by those upon whom I have called for help and co-operation.

These are some of them:—

1. The discovery of a new and better route hence to the equator.

2. A system of southwardly monsoons in the equatorial regions of the Atlantic Ocean.

3. Ditto in the Gulf of Mexico, and off the west coast of America in the Pacific.

4. The vibratory motion of the trade-wind zones, with their belts of calms.

5. The limits of these have been determined, and the parallels between which those limits are to be found for any month, pointed out to the mariner.

6. The fact has also been made clear, and brought within the compass of demonstration, that the S. E. trade-winds are stronger than the N. E.; that they cover a broader belt on the ocean, and keep in motion a greater volume of atmosphere; that at a mean in the Atlantic, the breadth of the band of trade-winds is about 22° of latitude for the N. E.; and 29° for the S. E.

7. That in the general system of atmospherical circulation, the prevailing winds of the southern are stronger than the prevailing winds of the northern hemisphere.

8. That the mean temperature of the northern is higher than that of the southern hemisphere.

9. That the greatest density or specific gravity of the surface waters of the Atlantic Ocean, is near the parallels of 17° north and of 15° south. So, probably, also of the Pacific.

10. The causes of the rainy and dry seasons, and the means of telling wherever on the earth's surface the seasons are so divided by nature.

11. The parts of the ocean in which sperm and right whales most resort have been discovered and pointed out.

12. The interesting fact in the natural history of this animal has been brought to light, viz: that the species known to fishermen as the right whale cannot cross the torrid zone.

13. That, in certain parts of the Indian Ocean, the waters are warmer than in any other sea.

14. That there is a cold current along the coast of China, and a warm one between Australia and Cape Horn.

15. And that there are many highly interesting and beautiful anomalies touching the Gulf Stream, the cold and warm currents of the sea, and the distribution of heat over the surface of the land and water; for an account of which, I refer to the Charts themselves.

I have intimation of other results: that if this system of interrogating Nature, touching the laws by which the circulation of the air and water is regulated, be patiently pursued, many instructive replies, and much information that is truly valuable will be elicited.

And in order to cheer the large corps of mariners who are co-operating in this work, I may be excused for enumerating some of the most striking of the probable results, which these investigations encourage us to anticipate, or induce us to inquire for.

1. These investigations will probably show that the mean temperature of the ocean for any parallel is higher than that of the air for the same parallel at sea, even though a cold current be present.

2. They afford room to suppose, and themselves suggest the supposition, that the air which the S. E. trade-winds discharge into the belt of equatorial calms, after ascending there, flows for the most part over into the northern hemisphere; while that which the N. E. trades discharge into the same belt, passes in like manner over into the southern hemisphere.

3. That the calms of Cancer and of Capricorn are caused by the meeting of two upper currents; the one from the pole being dry, the other from the equator being charged with vapor.

4. That there is a region of calms near the poles in which the barometer on a level with the sea, probably stands lower than it does generally on the sea level of the earth; and the inquiry is suggested whether the magnetic pole be not within this region.

5. That the trade-wind regions are the evaporating regions; and that we ought to inquire whether the electricity displayed in our thunderstorms does not come from the trade-wind regions and go up into the clouds with the vapor from the sea.

6. That the waters of the Mississippi River and the great American Lakes are rained from clouds, the vapor for which was taken up from the South Pacific Ocean, while the waters of the Amazon and Oronoco are evaporated exclusively from the Atlantic.

7. That the springs in the ocean which supply the sources of all the great rivers of the northern hemisphere are, for the most part, to be found where the S. E. trade-winds blow, in the Atlantic, Pacific, and Indian Oceans.

8. That magnetism is probably an agent in giving direction to the circulation of the atmosphere; and the question is raised, if it be not concerned in the currents of the ocean also.

9. That the "red fogs" of the Cape Verde Islands, and the so-called "African dust" of the North Atlantic, is dust from the basin of the Amazon and Oronoco, taken up by the winds in the dry seasons, and transported in the upper current from the equator towards the pole, that is, counter to the N. E. trade-winds.

This "dust" is known to consist, for the most part, of infusoria, from the river basins of South America, and the microscopic examinations of Prof. Ehrenberg go far to prove that such is the origin of the "red fogs and sea dust."

10. That the basin which holds the Gulf of Mexico, is about a mile deep, on the average;* that the Caribbean Sea in the deepest parts is nearly three miles, if no more; that the North Atlantic is more than six miles; the South at least three; and the Gulf Stream in the Florida Pass, 500 fathoms deep.

11. Agencies have been revealed which suggest the conjecture that at the head of the Red Sea, near the Isthmus of Suez, the waters are lower, salter, and heavier, than they are near its mouth. That at its head there is a winter and a summer level, and that there is a strong undercurrent from it into the Indian Ocean.

12. That the same whale is found in Behring's Straits and Baffin's Bay; and the fact is pretty nearly proved, that this fish cannot get from the one place to the other except through the Arctic Ocean.

I do not wish to be understood as claiming this catalogue of phenomena as actual results already derived from the investigations of log-books; nor do I intend, by this enumeration of them, to commit myself with regard to them, farther than I have done in the body of this work. Whether they be regarded as questions for further research, as probabilities, as actual discoveries, or as confirmations of known truths, I have enumerated them for the purpose of showing those who are laboring in connection with this work, that the field is both rich and wide; that good use is made of the materials which are furnished; that the plan of treating these materials is a good one, because, resting on an independent and separate system of observations, the manner of discussion is such as to confirm almost all that was known before with regard to the winds and currents of the sea; and I have enumerated these phenomena for the purpose also of showing that, though much that is valuable and important has been done, much that is inviting remains yet to be done.

Neither do I mean to embarrass this beautiful system of investigations by implying that all these indications are to be established, and all these questions to be answered in the affirmative. But inasmuch as they are indications and questions which mark the progress of the Charts, and which the Charts themselves have revealed or suggested, I expect the Charts will throw more light upon most of them, and enable us to give some conclusive answer, pro or con, with regard to them.

In a system of research such as this is, questions will arise—and there are many such which are continually pressing themselves upon the philosopher—to which a satisfactory answer, whether in the negative or the affirmative is equally desirable, and will be equally conducive to the great end in view, viz: progress in the collection of physical facts, and advancement in studying the laws of nature. Such is the character of many of the questions which these Charts move us to propound.

For the materials from which these results have been obtained, or are promised, I am mainly indebted

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* See the deep soundings of the U. S. ship Albany, Commander Platt, and Sounding Journal of Lt. Wm. Rogers Taylor, U. S. N., in another part of this work.

to the voluntary co-operation of American shipmasters and owners; for the results themselves, I am indebted, first, to the countenance which the Navy Department and the Chief of the Bureau of Ordnance and Hydrography have extended to the work; and next, to the fidelity and zeal with which those of my brother officers of the Navy, who from time to time have been engaged with me upon it, have carried out my views with regard to the manner of conducting it.

Ever since log-books have been kept at sea, and preserved in old sea-chests and garrets on shore, the materials for such a system of investigation as this is have existed. But the labor of collecting from such records the remarks on the wind and weather, and of collating the experience of each one in relation thereto, of classifying it, and arranging it side by side with the experience of all the rest, and of presenting the combined results in such a manner as to be obvious at a glance, and available to all, appeared a Herculean task, which no one before had offered to undertake. Therefore, since these Charts are but a compilation of what has fallen under the observation of others, and, consequently, of what was already known to some person or another, it, in one sense, may be said that they have discovered nothing. Be that as it may, it is certain that they have brought to light before the public, and made available to navigators generally, facts, circumstances, and conditions which before were known only to a few, and were not available to navigators generally.

In 1842, the first official move was made with regard to this matter. In that year, I called it to the notice of the late Commodore Wm. M. Crane, the Chief of the Bureau of Ordnance and Hydrography, himself an officer of the most exalted worth. He at once appreciated the importance of the undertaking, and entered, as he always did with regard to everything that was useful in his profession, honorable to his country, or beneficial to the great interests of navigation, most heartily into the spirit of it.

The following circular letter was accordingly issued by him:—

BUREAU OF ORDNANCE AND HYDROGRAPHY,
Washington City, 16*th December*, 1842.

SIR: This Bureau is making arrangements for collecting, with the view of rendering accessible to navigators, all that valuable information relating to the navigation of distant seas, which is collected by our enterprising commanders of merchant vessels in their various pursuits; and much of it hitherto, for the want of some regular channel of communication, has been lost to the public at large.

To enable it to bring this undertaking to a useful issue, this Bureau relies much on the public spirit and intelligence of American owners and masters of ships. It takes this opportunity of inviting their co-operation, and of requesting the favor of you to communicate any information of a general character, that you may now or at any time possess, relating to the following subjects:—

1. Discoveries of islands, rocks, shoals, and dangers, or obstructions of any kind to navigation.

2. Shifting bars and shoals, errors of charts, wrong or corrected latitude and longitude.

3. Direction, rise and fall of tides, time of high and low waters, on full and change days, at ports but little known. Any tidal phenomena, such as extraordinary rises, one ebb and flow in 24 hours, etc.

4. Discoveries of new anchorages or harbors, with sailing directions, together with information as to wood, water, and everything of interest to the navigator.

5. Force and set of currents.

6. Variation of the compass.

7. Latitude and longitude of icebergs when out of their usual track.

8. Tracks of remarkably short passages.

9. Limits of the trade-winds at particular seasons of the year.

10. Any information relating to commerce and navigation.

Respectfully, your obedient servant,

W. M. CRANE.

From some cause or other this call for information passed by unheeded. The only response to it was made nine years afterwards by Captain Potter. I quote it as a part of the history connected with the Wind and Current Charts. It is as follows:—

WILLIAM M. CRANE, Esq.

SIR: According to your request I note the following particulars. On my passage to Japan Sea, in March of 1848, passed over the position of Bishop's Rock of Hone's Chart; 20° 10′ North, 136° 50′ East. Does not exist. Saw Douglass Reef, which is dangerous; Lat. 20° 25′ North; Long. 136° 25′ East. Saw Loo Choo Islands, passed to westward of them; which is a good route for Straits of Corea. April 17, passed Tsusima Island in Straits of Corea, leaving it on the starboard hand, which is the best passage in to the Sea of Japan; the Straits of Matsmai being dangerous and difficult on account of strong currents; several ships having lost cables and anchors in this passage. Cruised in this sea until the 4th of August, when I went through Perouse Straits.

Winds in Japan Sea variable, but mostly from S. to S. W. Ships bound through Perouse Straits must give the Island of Kefunkerz, or Tee Shee, a good berth, as there is a reef off the N. W. end of the island not on the chart—distance 5 to 10 miles—on which the ship David Poddoik was totally lost in July, 1848.

September 10—ran through Boussole Strait. Found the Island of Marekan laid down 30 miles to westward of its true position; have been informed that most of the Kurile Islands are laid down wrong.

This information is generally known to the whaling fleet, but perhaps may not be known to your Department.

Respectfully, your obedient servant,

OLIVER POTTER,

Ship Mechanic, Newport, R. I.

AT SEA, *April* 30, 1851.

This attempt to collect materials for a set of charts having failed, I next went to the old log-books of the Navy, and obtained authority to construct, from the materials afforded by them, a set of "Wind and Current Charts."

Upon examination, it was found that many of these old logs were wanting, and the number on hand not large. But though slender the data and meagre the materials, it was determined that a beginning should be made. It was made, but the requisite data and means were wanting. It proved an up-hill business, and so we balked.

I then brought the subject to the notice of the men of science of the country, with the view of procuring their countenance to the work; and, in papers read on the "Currents of the Sea" before the National Institute, and the Association of American Geologists and Naturalists, now the American Association, I explained the meagre state of our information with regard to the currents of the sea, urged the value of what was locked up in the old sea-chests of mariners, and pressed the importance to science, commerce, and navigation, of the information which navigators might give were they enlisted in a common plan of observation concerning the phenomena of the ocean.

These institutions expressed an interest in the matter, and resolved to second my efforts by appointing a committee to press the subject upon the attention of the Government. The Hon. Jno. Y. Mason, then Secretary of the Navy, heartily seconded the plan, and did, as his successors have done, much towards its advancement and progress.

In the mean time I obtained the assistance of Lieut. Wm. B. Whiting, United States Navy, a most accomplished draftsman and hydrographer. He was ordered to report for duty at this office in 1845.

The labor was commenced anew; more log-books had been procured from our men-of-war. It was now seen that we should obtain more and better materials than we had before; all the former work was therefore rubbed out, and we began anew.

But our men-of-war seldom went to England or the north of Europe, therefore nothing was to be done in that quarter. The direction in which they most cruised was south of the parallel of 40° north.

The beginning of 1848 found three sheets—those which correspond to Nos. 1, 2, and 3 of the present Track Charts, series A, North Atlantic—engraved and published.

They contained only the tracks of men-of-war; but though there were few of these, I was satisfied that the work, so far, enabled me to point out a shorter and a quicker, and a better route to Rio than the one usually pursued. This was a discovery, as far as the great body of navigators was concerned; and as such I announced it. The barque W. H. D. C. Wright, Jackson, of Baltimore, was the first to try this new route. She crossed the line in longitude 31° west, the 24th day out (it has since been done in 18 days, the usual time before was 41 days), and made the trip to Rio and back in 75 days. A remarkably quick voyage it was, and a complete demonstration of the problem that I had so long endeavored to prove.

Navigators now appeared for the first time to comprehend clearly what it was I wanted them to do; they appreciated the importance of the undertaking, and came forward readily with offers of hearty, zealous, and gratuitous co-operation.

In a short time a large fleet, without the promise or hope of reward, was found zealously co-operating with me, each one engaged in collecting, according to the same plan, materials for the work. It was now the rolling snowball: ship after ship joined the fleet of observers; so that more than a thousand navigators

are now busied night and day in all parts of the world, in making observations and gratuitously collecting materials of great value to science, commerce, and navigation; never before has there been such a corps of observers scattered over the world, yet laboring together and acting in concert, with regard to any system or subject of philosophical research.

This fact speaks volumes in favor of the intelligence and public spirit of American navigators, and as a sailor I mention it with proud satisfaction.

Being now fairly under weigh, with new and more abundant materials, and having the assistance of such a large, able, and zealous corps of observers in collecting more, it was again found necessary to rub out and begin afresh with the Charts.

The third trial was more successful. It has placed us where we are.

As, therefore, these Charts, so far, are the results of the joint labors of American navy officers and ship masters, and as each one who has contributed to them may be supposed to feel more or less interest in the progress of the work as well as in the results obtained, it is proper that for the satisfaction of those concerned, if for no other purpose, I should give an account somewhat in detail of the manner in which the work has been conducted, and of the results, step by step, as they have been obtained and announced to the public.

The manner in which the investigations for each set of Charts have been conducted, is fully explained in another part of this paper; and this will be readily understood by a reference to the plates and diagrams which accompany this volume.

The results, so far as they have appeared satisfactory and conclusive to my own mind, have, for the most part, already been made public: sometimes as official reports; sometimes in the shape of letters; sometimes in public lectures, or in scientific papers; and sometimes directly to mariners, as a notice in the newspapers.

I shall therefore recapitulate, as I go along, the substance of these announcements, occasionally presenting the results first announced, not as they have since been modified, but as they appeared at the time; so that those who have helped to raise the structure to its present proportions, may have an opportunity of contemplating the scaffolding also. They will thus be enabled to retrace the work, and to follow it in its progress, step by step, realizing as they advance how it is that our views enlarge, and the horizon expands, as we ascend from one fact to another, and rise higher and higher as fact is traced to effect, and effect back to cause.

The first log-books that were used in the construction of these Charts, not being kept with the view of ever being so used, gave the winds generally, and especially when sailing free, as from the *quadrant* instead of from the *point* of the compass.

Thus, vessels on the homeward track from Rio, after meeting the N. E. trades, generally recorded the winds as "Northward and Eastward." This induced me to suppose that the winds were from the N. E. *point* of the compass, rather than from any other of the N. E. *quadrant*, and to infer, after the brushes by

which the course and direction of winds are represented on the "Track" Charts were drawn, that these winds were for the most part fair winds for going to the equator also.

So understanding the entries in the log, I saw that it was practicable for a vessel under canvas to sail on a great circle from New York to Cape St. Roque in Brazil. I therefore recommended a more direct route than had hitherto been pursued; and it is this route, which, with the additional information and the modifications and exceptions which subsequent researches have enabled us to make with regard to it, has proved so short and successful.

Seeing this defect in the old log-books, a form was prepared expressly for those navigators who were volunteering to co-operate with me. In this form, they are requested particularly always to note the *point* of the compass from which the wind comes; and when it is variable, to note and enter, at the time, the point of the compass from which it may have most prevailed, during each of the "three parts" into which mariners are accustomed to divide the 24 hours. *When a navigator fails to do this, he returns to me a useless log.* These three parts are usually called "first," "middle," and "latter part;" each being of 8 hours; the first extending from noon to 8, the middle from 8 P. M. to 4 A. M., and the latter from 4 A. M. to noon.

INFLUENCE OF THE GULF STREAM ON THE TRADE OF CHARLESTON.*

Before the Gulf Stream was known to practical navigators, the course of trade between England and America was such as to make Charleston the half-way house between the mother country and the New England States, including Pennsylvania and New York among the latter.

At that time, the usual route of vessels bound to America, was to run down on the other side of the Atlantic towards the Cape de Verdes, and until they got the N. E. trades, and with them steer for America. This was the route taken by Columbus; this route brought them upon the coast of the Southern States, where their first landfall was generally made. Then steering to the northward, they drifted along with the Gulf Stream until they made the Capes of the Delaware, or other headlands to the north.

If now, as it often happened in the winter season, they were driven off the coast by snow-storms and westerly gales—instead of running off into the Gulf Stream, as vessels now do, to thaw themselves, they stood back to Charleston, or the West Indies, where they would spend the winter, and wait until the spring before making another attempt to enter the northern ports.

It should be borne in mind that vessels then were not the sea-boats or the sailers they now are. I have in my collection the log-book of a West India trader in 1740. Her average rate of sailing per log, was about two miles the hour. This log was copied in the 3d edition of this work. It is instructive.

At that time, the instruments of navigation were rude; chronometers were unknown, and lunars were impracticable; and it was no uncommon thing for vessels in those days, when crossing the Atlantic, to be

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* See Proceedings of the American Association, at Charleston, in 1850—for a paper "On the Influence arising from a Discovery of the Gulf Stream on the Commerce of Charleston."

out of their reckoning 5°, 6°, and even 10°. And when it was announced that a vessel might know, by consulting the water thermometer, when she crossed the eastern edge of the Gulf Stream, and again when she crossed the western edge, navigators likened the discovery to the drawing of blue and red streaks in the water, by which, when the mariner crossed them, he might know his longitude.

The merchants of Providence, R. I., Dr. Franklin being in London, sent a petition to the Lords of the Treasury, asking that the Falmouth packets might run to Providence instead of to Boston. They maintained that though Boston and Falmouth were between Providence and London, yet that practically the two former were farther apart than the two latter; for it was shown in the memorial, that the average passage of the London traders to Providence, was fourteen days less than the average by the packet line from Falmouth to Boston.

Dr. Franklin, on being questioned as to this fact, consulted Captain Folger, an old New England Captain who had been a whaler, and who informed the Doctor that the London traders to Providence were commanded for the most part by New England fishermen, who knew how to avoid the Gulf Stream, while the Falmouth packets were commanded by Englishmen, who knew nothing about it.

These two drew a chart, which was published at the Tower, and the limits of the Gulf Stream, as laid down there by that Yankee whaler, have been preserved upon our charts till within a few years.

It is yet within the recollection of most navigators, how the traders from the New England States to the West Indies used to find their way out, "by running down the latitude," as it was called; the practice was to steer south until the latitude of their port was reached, and then to steer due west until they made the land. Their track was, therefore, on the two legs, instead of along the hypothenuse of a triangle.

The cause of this practice was in the practical difficulty of finding longitude at sea; for the general use of chronometers, on board ships, is an innovation which the masters of that kind of craft had not learned, 20 years ago, to tolerate.

Well might thermometrical navigators, therefore, when the chart appeared from the Tower, giving the longitude of the inner and outer edge of the Gulf Stream, liken those two lines to blue and red streaks painted on the ocean to show mariners their longitude.

At the time that Dr. Franklin made it known how navigators, simply by dipping a thermometer in the water, might know when they entered and when they cleared the Gulf Stream, Charleston had more commerce than New York, and all the New England States put together.

This discovery* changed the route across the Atlantic, shortened the passage from sixty to thirty days coming this way, and, consequently, changed the course of trade also.

Instead of calling by Charleston as they came from England, vessels, after this, went direct to the port of their destination; instead of running down to Charleston to avoid a New England snow-storm, they stood off for a few hours, until they reached the tepid waters of the Gulf Stream, in the genial warmth of

* Though it was Dr. Franklin and Captain Folger who first turned the Gulf Stream to nautical account, the discovery that there was a Gulf Stream, cannot be said to belong to either of them, for its existence was known to Anghiera, and to Sir Humphrey Gilbert, in the sixteenth century.

which the crew recovered their frosted energies, and, as soon as the gale abated, they were ready for another attempt to make their haven.

In this way stations were shifted; the northern ports became the half-way house, and Charleston an outside station.

This revolution in the course of trade commenced about 1795. It worked slowly at first, but in 1816–17, it received a fresh impulse from Jeremiah Thompson, Isaac Wright, and others, who conceived the idea of establishing a line of packets between New York and Liverpool. This was at a period when the scales of commercial ascendency were vibrating between New York, Boston, Philadelphia, and other places. The packet ships of the staid New York Quaker turned the balance. Though only of 300 or 400 tons burden, and sailing but once a month, they had their regular day of departure, and the merchants of Charleston, Philadelphia, etc., found it convenient to avail themselves of this regular and stated channel, for communicating with their agents in England, ordering goods, etc. Those packets went on increasing in numbers and size until now, at the present day, we have them measuring 2,000 tons, sailing every day, and running between New York and every fifth-rate seaport town in the United States, and to many foreign ports.

Thus an impulse was given to the prosperity of New York; one enterprise begat another, until that city became the great commercial emporium and centre of exchange of the New World. All these results are traceable to the use of the water thermometer at sea.

Other causes, doubtless, have operated to take away from Charleston her relative commercial importance—but the primary cause was that discovery which removed Charleston from the way-side of commerce with Europe, and which placed her on the outskirts of the great commercial thoroughfares, and away from the commanding position which she had before occupied.

In consequence of the improvements since made in navigation, ship-building, etc., a ship can now go from New York to England, and back, in less time than, when Charleston was the half-way house, she could get to Charleston from London.

I therefore submit, whether this fact be not sufficient to turn the scales of commerce; and I claim the result as one that is due to the influence of the Gulf Stream upon the course of trade, and the use of the water thermometer by mariners is the key to it all.

I have now in the process of construction at the National Observatory, a series of charts relating to the thermal state of the ocean, that, when completed, will give us more information with regard to the temperature of that sea, than we now possess with regard to the temperature of any district on shore for one-tenth part of the extent.

I have quoted in the third edition of this work, but think it unnecessary to repeat it here, "*The first Log-book of the Celia, on the Voyage from Jamaica to Bristol, in Great Britain*, 1748." From it the mariner, the merchant, and the statesman, the political economist and the philosopher, may all draw instruction.

If this log-book be a fair sample of the log-books of that day, and there is no reason to suppose it otherwise, the wonder is, not that the philosopher, in arranging the different avocations of mankind, should

have been doubtful whether to class the mariner at sea with the living or the dead; but that men should have been found rash enough to become mariners at all, or merchants bold enough to make ventures abroad.

This voyage was performed without any other means of finding the way across the Atlantic, than such as are afforded by the log and line.

It was performed under circumstances which forcibly remind one of the buccaneers, the sea robbers, the obstructions to commerce, and dangers to navigation, with which the ocean swarmed in those days. Ships had then to sail in company, and beg convoy for protection. The speed of the fastest in the fleet was regulated by the dullest sailer of them all; and under such a state of things, naval architecture must needs be in a rude state. The enterprising merchant had no inducement to incur the expense of building a fast-sailing ship, because her speed would be practically regulated by the snail's pace of the dullest ship, and the most indolent master in the convoy. The Celia, we may infer from the air of exultation with which, when going 4 knots, the entry is made in the log, "ahead of all the fleet," was at least a fair sailer for her day; and the most that they got out of the Celia, that voyage, was five knots.

The better to appreciate the advantages which we of the present day enjoy, in consequence of so many of the obstructions and trammels which fettered commerce having been stricken off from its various departments, and in consequence of the advances which have been made since that day towards free trade, we have but to suppose a decree ordaining that our ships, sailors, implements, means, circumstances, and conditions of navigation and commerce, should suddenly be reversed, and become such as they were in 1740. The ruin that would follow, would not only swamp merchants, but it would sit heavily upon governments and nations.

CURRENTS OF THE SEA.

In studying the system of oceanic circulation, I have found it necessary to set out with the very obvious and simple principle, viz: that, from whatever part of the ocean a current is found to run, to the same part a current of equal volume is obliged to return.

Upon this principle is based the whole system of currents and counter-currents of the air as well as of the water.*

It is not necessary to associate with oceanic currents the idea that they must of necessity, as on land, run from a higher to a lower level.

So far from this being the case, some currents of the sea actually run up-hill, while others run on a level.

The Gulf Stream is of the first class. In a paper read before the National Institute in 1844, I showed why the bottom of the Gulf Stream ought, theoretically, to be an inclined plane, running *upwards*. If the Gulf Stream be 200 fathoms deep in the Florida Pass,† and but 100 fathoms off Hatteras, it is evident that

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* *Vide* paper "On the Currents of the Atlantic Ocean," Proceedings of the American Association, Charleston, March, 1850.

† Soundings made by order of Commodore Warrington, on board the U. S. ship Albany, Commander Charles T. Platt, U. S. N., a few weeks since, show it to be at least 500 fathoms deep in the Florida Pass.

the bottom would be uplifted 100 fathoms within that distance; and, therefore, while the bottom of the Gulf Stream runs up-hill, the top preserves the water-level, or nearly so; for its banks are of sea-water, and being in the ocean, are themselves on a water-level.

The currents which run from the Atlantic into the Mediterranean, and from the Indian Ocean into the Red Sea, are the reverse of this. Here the bottom of the current is probably a water-level, and the top an inclined plane, running *down-hill.*

Take the Red Sea current as an illustration. That sea lies for the most part within a rainless and riverless district. It may be compared to a long and narrow trough.

Being in a rainless district, the evaporation from it is immense; none of the water thus taken up is returned to it either by rivers or by the rains.

It is about 1,000 miles long; it lies nearly north and south, and extends from latitude 12° or 13° to the parallel of 30° North.

I am not able to state the daily rate of evaporation there;* but it may be safely assumed—and for the illustration I will assume it—at the rate of two-tenths (0.2 in.) of an inch a day.

Now, if we suppose the current which runs into that sea to average from mouth to head 20 miles a day—and this is conjecture merely, but for the purpose of illustration also—it would take the water fifty days to reach the head of it. If it lose two-tenths of an inch from its surface, by evaporation, it would appear that, by the time it reached the Isthmus of Suez, it would have lost ten inches from its surface.

Thus, the waters of the Red Sea ought to be lower at the Isthmus of Suez than they are at the Straits of Babelmandeb. They ought to be lower from two causes, viz: evaporation and temperature—for the temperature of that sea is necessarily lower at Suez, in latitude 30°, than it is at Babelmandeb, in latitude 13°.

To make this quite clear; suppose the channel of the Red Sea to have no water in it, and a wave ten feet high to enter the Straits of Babelmandeb, and to flow up its channel at the rate of twenty miles a day,

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* I learn from Johnston's beautiful Physical Atlas, that "from May to October, in the upper part of this sea, the water is two feet lower than in the other months;" and this he accounts for, by the wind which is said to prevail from the northward there, during this season of the year.

This is the hot season; it is the season when evaporation is going on most rapidly; and when we consider how dry, and how hot the winds are which blow upon this sea at this season of the year, we may suppose the daily evaporation to be immense; no less, certainly, than half an inch, and probably twice that amount. We know that the waste from canals by evaporation, in the summer time, is an element which the engineer, when taking the capacity of his feeders into calculation, has to consider. With him, it is an important element; how much more so must the waste by evaporation from this sea be, when we consider the physical conditions under which it is placed; its feeder, the Arabian Sea, is a thousand miles from its head—its shores are burning sands—the evaporation is *ceaseless;* and none of the vapors, which the scorching winds that blow over it carry away, are returned to it again in the shape of rains.

The Red Sea vapors are carried off and precipitated elsewhere. The depression in the level of its head waters in the summer time, therefore, it appears to me, is owing quite as much to the effect of evaporation as to the effect of the wind in blowing the waters back from it into the ocean. Analysis will probably show the surface water at the head, and the deep sea-water at the mouth to be salter, and therefore heavier, than are the surface waters at the mouth of the Red Sea.

Philosophers will acknowledge, in grateful terms, the services of any traveller by the overland route to India, who will collect specimens of these waters, and afford chemists an opportunity of testing them.

for fifty days, losing daily, by evaporation, two-tenths of an inch; it is easy to perceive that, at the end of the fiftieth day, this wave would not be so high, by ten inches, as it was the first day it commenced to flow.

The top of that sea, therefore, may be regarded as an inclined plane, made so by evaporation.

But the salt water, which has lost so much of its freshness by evaporation, becomes salter, and, therefore, heavier. The lighter water at the straits cannot balance the heavier water at the isthmus, and the colder and salter, and therefore the heavier water must either run out as an under-current, or it must deposit its surplus salt in the shape of crystals, and thus gradually make the bottom of the Red Sea a salt bed; or it must abstract all the salt from the ocean—and we know that neither the one process nor the other is going on. Hence, we infer that there is from the Red Sea an under or outer current, as from the Mediterranean through the Straits of Gibraltar. Analysis would probably show the surface waters at the head, to be salter than those near the mouth of the Red Sea, and it is hoped that some of my fellow-laborers in the Red Sea trade, will collect specimens of its waters, and afford us an opportunity of testing them.

And, to show why there should be an outer and under current from each of these two seas, let us suppose the case of a long trough, opening into a vat of oil, with a partition to keep the oil from running into the trough. Now, suppose the trough to be filled up with wine, on one side of the partition, to the level of the oil on the other.

The oil is introduced to represent the lighter water, as it enters either of these seas from the ocean; and the wine, the same water after it has lost some of its freshness by evaporation, and, therefore, has become salter and heavier.

Now, suppose the partition to be raised, what would take place? Why, the oil would run in as an upper current, overflowing the wine, and the wine would run out as an under current.

The rivers which discharge in the Mediterranean are not sufficient to supply the waste of evaporation —and it is by a process similar to this, that the salt which is carried in from the ocean is returned to it again; were it not so, the bed of that sea would be a mass of solid salt.

The equilibrium of the seas is preserved, beyond a doubt, by a system of compensation as exquisitely adjusted as are those by which the "music of the spheres" is maintained.

I have also, on a former occasion, pointed out the fact that, inasmuch as the Gulf Stream is a bed of warm water, lying between banks of cold water—that as warm water is lighter than cold—therefore, the surface of the Gulf Stream ought, theoretically, to be in the shape of a double inclined plane, like the roof of a house, down which we may expect to find a shallow surface or roof-current, running from the middle towards either edge of the stream.

The fact that this roof-current does exist, has been fully established: A person who has been engaged on the Coast Survey with observations on the Gulf Stream, informed me that, when he tried the current in a boat, he found it sometimes east and sometimes west, but scarcely ever in the true direction; whereas the vessel, which drew more water, showed it to be constantly in a northeasterly direction.

My object at present is, not to account for the currents of the Atlantic, but merely to mention the fact, to call attention to it; that, though there be well-known currents which bring immense volumes of water

into the Atlantic, we know of none which carry it out again, and which, according to the principle with which I set out, ought to be found running back from that ocean.

The La Plata and the Amazon, the Mississippi and St. Lawrence, with many other rivers, and several large oceanic currents, run into this very small ocean, and it is not probable that all these waters are taken up from it again by evaporation; "yet the sea is not full." Where does the surplus go? The ice-bearing current, from Davis's Straits, which is counter to the Gulf Stream, moves an immense volume of water down towards the equator.

The ice-bearing current which runs from the Antarctic regions, and passes near Cape Horn into the Atlantic, and the Lagullas current, which sweeps into it around the Cape of Good Hope, both move immense volumes of water also, and bear it along also towards the equatorial regions of the Atlantic.

This water must get out again, or the Atlantic would be constantly rising.

A part of the Gulf Stream runs around North Cape into the Arctic Ocean. The thermal charts of the Atlantic Ocean now in process of construction, prove this, as do also the admirable charts of Prof. Dové, of Berlin.

This current around North Cape probably performs the circuit of the Arctic Ocean, and returns to the Atlantic with increased volume.

There are the rivers of Northern Europe, and all the great rivers of Asia and America, that empty into the Frozen Ocean; also the current from the Pacific Ocean, through Behring's Straits. All these sources of supply serve, in my opinion, to swell the current down from Baffin's Bay through Davis's Straits into the Atlantic. How does all this water escape from this ocean again, is the question?

That there is an open water communication, sometimes at least, from Behring's Straits to Baffin's Bay, has been all but proved by the results of investigations undertaken about two years ago, at the National Observatory, with regard to the habits, migrations, etc., of the whale.

These researches were commenced at this office by Lieutenant Herndon, and they were conducted in such a manner as to show, by a glance at the chart, in what parts of the ocean, and in what months of the year, whales had and had not been seen.

These investigations soon led to the discovery, that to the right whale, the equator is as a wall of fire —that that animal is never found near it, seldom or never within a thousand miles of it, on either side.

This fact induced me to inquire of the whalemen, whether the right whale of the northern and the right whale of the southern hemispheres was the same animal.

The answer was "No." The right whale of the latter region, as described by these men, is a small pale animal, the largest scarcely yielding more than fifty barrels of oil. Whereas, that of the northern region is a large dark animal, yielding frequently to the single fish upwards of two hundred barrels.

About this time the whale-ship Superior returned from a voyage through Behring's Straits, where she also found the right whale of the North Pacific.

This fact induced the further inquiry, as to whether the right whale of Behring's Straits, and the right whale of Davis's Straits were the same animal. For since the fact had been established that the right

whale of the North Pacific could not cross the equator, and, therefore, could not get into the North Atlantic by either of the Capes, a reply in the affirmative to this inquiry would be another link in the chain of circumstantial evidence, going to prove the existence of a so-called northwest passage.

The answer from the whalemen in this instance, was in effect: "We have not had an opportunity of comparing the two animals, except after long intervals; but, so far as we can judge, they are the same fish." So far as other facts go, it would appear probable that there is, at times, at least an open water communication between the two straits; for the instincts of the whale, one might suppose, would prevent him from sounding under icebergs, neither could he pass under barriers of great depth or breadth. Seeing that water runs through Behring's Straits from the Pacific, as well as around the Capes, into the Atlantic, where, therefore, is the escape-current from the Atlantic?

The trade-winds, I am prepared to show, are the great evaporating winds. They are the winds, which, returning from the polar regions, deprived of all the moisture which the hyperborean dew-point can compress from them, first come in contact with the surface of the earth (and consequently with an evaporating surface), where they are first felt as trades, and where, therefore, they are dry winds.

Now, could the vapor taken up by these winds so increase the saltness of this sea in the trade-wind region, as to make the water there, though warmer, yet specifically heavier than that below, and also than that within the regions of the variable winds, and of "constant precipitation?" If so, might we not have the anomaly of a warm under current in the South Atlantic Ocean? for that almost seems to be the only place of escape for a counter current from the Atlantic.*

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* NOTE.

MAIL STEAMER GEORGIA,
Off Havana, March 31, 1852.

DEAR SIR: On the 26th of March we crossed the (Gulf) Stream, and when in lat. 34° 55′ N. and long. 74° 08′ W., at 11 A. M. with a moderate S. W. breeze blowing, temperature of air in the shade 69°.5, I put the thermometer in a bucket of surface water; after 2 minutes' immersion, it stood at 74°.5. I then proceeded to the main deck, to wash a deck pump, which receives its water 6½ feet below the surface. Here I pumped 8 buckets of water, and in the 9th placed the thermometer, which, after 2 minutes' immersion, stood steady at 79°. I went then to the hold, and opened a cock 16½ feet below the surface, and allowed it to run a full clear stream into the hold for 15 minutes. This I did that the cock and pipe might take the temperature of the water, and thus prevent the heat of the ship from affecting the water whose temperature I desired to take. After it had run 15 minutes, I drew a wooden bucket full, in which I placed the thermometer as before. After two minutes' entire immersion, it stood at 86°.5, thus showing clearly and conclusively a difference between the surface water and that at the depth of 16½ feet, of 12°.

These results I can assure you are exact, as the observations were several times repeated without difference, and I am confident that the water whose temperature I tested was in no degree affected by the heat of the vessel, I so carefully guarded against it.

This is the only time that I have been in the strength of the Gulf Stream; but yesterday, the 30th, in lat. 24° 10′, long. 80° 11′ (which you will perceive by the chart, and which the observation itself proves, does not place us entirely within the influence of the Stream, but very near its edge), I took another set of temperatures.

The thermometer stood in the shade at 79°, surface water was 78°, and water from the depth of 16½ feet stood, after a fair and deliberate trial, at 79°.5. The water from the 6½ feet pump I did not try, as there was so much sea on, that there could be no certainty whether it came from the surface or 12 feet below. I have had no further opportunities for observations of this character than these, but I hope that these, scanty as they are, may be gratifying to you.

Very truly yours,

(Signed) A. C. JACKSON, U. S. N.
Acting master Cal. Com.

M. F. MAURY, *Superintendent of the Observatory.*

Lieut. Walsh, of the schooner Taney, and Lieut. S. P. Lee, of the brig Dolphin, who were sent out by the Government, to make certain observations in connection with these researches concerning the winds and currents of the ocean, were at my request instructed, among other things, to examine for such a current. But neither of these officers had an opportunity of making the examination. It is hoped that a suitable opportunity will soon occur, and that advantage will be taken of it.

ON THE GENERAL CIRCULATION OF THE ATMOSPHERE.*

Several years ago, I commenced to gather from old sea journals, such information as they might be found to contain, relative to the winds and currents of the sea, and to embody the information so obtained on a series of charts, in such a manner as to show, by pictures, the prevailing direction of the winds and currents for every month, and in every part of the ocean. Indeed, the plan of the undertaking was to address the eye, to collect the experience of every navigator, and to present the combined results of the whole in such a manner that each one might, with a glance, have the benefit of the experience of all who had preceded him in any of the frequented parts of the ocean.

This enterprise has been seconded both by the Government and individuals. American shipmasters generally have come into it with great zeal. They make the observations required on every voyage, and send them to me at Washington. There are some thousand or more ships voluntarily co-operating with me; and, as it might be supposed, from such a number of active and intelligent observers, we are collecting materials of great value.

During the course of these investigations, many interesting facts have been developed, amounting, in some cases, to actual discoveries of great interest—such as a new route, which shortens the sailing distance to the equator some fifteen or twenty per cent., and, of course, proportionately to all ports beyond; the existence in the North Atlantic of a regular monsoon—and in the North Pacific, near the west course, of a perpetual southwest trade-wind near the equator—a unique phenomenon; also the existence, near the same place, of a system of monsoons.

My present purpose, however, is not to speak of these discoveries, but rather to treat of the insight which these investigations, undertaken on such a large scale, afford as to the general system of atmospherical circulation over the earth.

They teach us to regard the atmosphere as a vast machine, that is apparently tasked to its utmost; but as one that is always in order and never breaks down.

It is a sewer into which, with every breath, we cast vast quantities of dead animal matter. It is a laboratory, into which, when the light and heat enter, they act upon this dead matter, decompose it, and resolve it into gaseous substances, to be, by the action again of certain imponderable agents, condensed into plants and trees.

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* See paper read before the American Association for the advancement of science, Charleston, S. C., March, 1850.

If it were not for this condensation, the air would become tainted; it would send its impurities back into the lungs; and, continually receiving back more dead matter in return, it would finally become unfit for the respiration of certain animals, and man would perish from the face of the earth.

We hunger: we take as food that which has been gathered from the vegetable kingdom, into the stomach; there, we elaborate it into flesh and blood. After it has coursed through the system, and performed its office, it is again cast forth into the atmosphere, to be reconverted into more vegetables, to serve as food for other animals. Doubtless the animal and vegetable kingdoms are in exact counterpoise; the one destroying, the other rearranging and rendering fit for use again, this same dead matter. In Infinite Wisdom, the two kingdoms are so balanced that there is not an insect too much on one side, nor a green leaf too little on the other. The atmosphere affords that compensation by which the proper proportions of each are maintained.

These are only some of the operations that are carried on daily and hourly through the machinery of the atmosphere which we are breathing. How important and profitable, therefore, does the study of its laws become!

It is an engine which pumps our rivers up from the sea, and carries them through the clouds to their sources in the mountains. Air and water are the great agents of the sun in distributing his heat over the surface of the globe, cooling this climate and tempering that; and in this light, I propose to consider the winds and to allude to the currents of the sea.

Though the winds blow here from the four quarters, and sometimes with such violence as to fill the mind with emotions of terror, yet such winds, in comparison with the general system of atmospheric circulation, are but eddies to the main current. They have no more effect in deranging or disturbing that system of circulation, than the shower which they bring with them has in disturbing the course of the Gulf Stream, and other great currents of the sea.

From the parallel of about 30° north and south, nearly to the equator, we have two zones of perpetual winds, viz: the zone of northeast trades on this side, and of southeast on that. They blow perpetually, and are as steady and as constant as the currents of the Mississippi River—always moving in the same direction.

As these two currents of air are constantly flowing from the poles towards the equator, we are safe in assuming that the air which they keep in motion must return by some channel to the place near the poles, whence it came in order to supply the trades. If this were not so, these winds would soon exhaust the polar regions of atmosphere, and pile it up about the equator, and then cease to blow for the want of air to make more wind of.

This return current, therefore, must be in the upper regions of the atmosphere, at least until it passes over those parallels between which the trade-winds are always blowing on the surface. The return current must also move in the direction opposite to the direction of that wind which it is intended to supply. These direct and counter currents are also made to move in a sort of spiral or loxodromic curve, turning to the

west as they go from the poles to the equator, and in the opposite direction as they move from the equator towards the poles.

This turning is caused by the rotation of the Earth on its axis.

The earth, we know, moves from west to east. Now, if we imagine a particle of atmosphere at the north pole, where it is at rest, to be put in motion in a straight line towards the equator, we can easily see how this particle of air, coming from the pole, where it did not partake of the diurnal motion of the earth, would, in consequence of its *vis inertia*, find, as it travels south, the earth slipping under it, as it were, and thus it would appear to be coming from the northeast, and going towards the southwest; in other words, it would be a N. E. wind.

On the other hand, we can perceive how a like particle of atmosphere that starts from the equator, to take the place of the other at the pole, would, as it travels north, in consequence of its *vis inertia*, be going towards the east faster than the earth. It would, therefore, appear to be blowing from the southwest, and going towards the northeast, and exactly in the opposite direction to the other. Writing south for north, the same takes place between the south pole and the equator.

Now this is the process which is actually going on in Nature; and if we take the motions of these two particles as the type of the motion of all, we shall have an illustration of the great currents in the air, the equator being near one of the nodes, and there being two systems of currents—an upper and an under—between it and each pole.

Let us return now to our northern particle, and follow it in a round from the north pole to the equator and back again; supposing it, for the present, to turn back towards the pole after reaching the equator.

Setting off from the polar regions, this particle of air, for some reason which does not appear to have been satisfactorily explained by philosophers, travels in the upper regions of the atmosphere, until it gets near the parallel of 30°. Here it meets, also in the clouds, the hypothetical particle that is going from the equator to take its place toward the pole.

About this parallel of 30°, then, these two particles meet, press against each other with the whole amount of their motive power, produce a calm and an accumulation of atmosphere sufficient to balance the pressure from the two winds north and south.

From under this bank of calms, two surface currents of wind are ejected; one towards the equator, as the northeast trades—the other towards the pole, as the southwest passage winds—supposing that we are now considering what takes place in the northern hemisphere only.

These winds come out at the lower surface of the calm region, and consequently the place of the air borne away in this manner must be supplied, we may infer, by downward currents from the superincumbent air of the calm region.

Like the case of a vessel of water which has two streams from opposite directions running in at the top, and two of equal capacity discharging in opposite directions at the bottom—the motion of the water in the vessel would be downward; so is the motion of the air in this calm zone.

The barometer, in this calm region, is said, by Humboldt and others, to stand higher than it does

either to the north or to the south of it; and this is another proof as to the banking up here of the atmosphere, and pressure from its downward motion.

Following our imaginary particle of air from the north across this calm belt, we now feel it moving on the surface of the earth as the northeast trade-wind; and as such it continues till it arrives near the equator, where it meets a like hypothetical particle, which has blown as the southeast trade-wind.

Here, at this equatorial place of meeting, there is another conflict of winds, and another calm region, for a northeast and southeast wind cannot blow at the same time in the same place. The two particles have been put in motion by the same power; they meet with equal force; and, therefore, at their place of meeting, are stopped in their course. Here, therefore, there is also a calm belt.

Warmed by the heat of the sun, and pressed on each side by the whole force of the northeast and southeast trades, these two hypothetical particles, taken as the type of the whole, ascend. This operation is the reverse of that which took place at the other meeting near the parallel of 30°.

This imaginary particle now returns to the upper regions of the atmosphere again, and travels there until it meets, near the calm belt of Cancer, its fellow particle from the north, where it ascends as before, and continues to flow towards the pole as a surface wind from southwest.

Entering the polar regions obliquely, it is pressed upon by similar currents coming from every meridian; here, our imaginary particle approaches the higher parallels more and more obliquely, until it, with all the rest, is whirled about the pole in a continued circular gale; finally reaching the vortex, it is carried upwards to the regions of atmosphere above, whence it commences again its circuit to the south as an upper current.

Now the course we have imagined an atom of air to take is this (Plate II.): an ascent at P, at the north pole; an efflux thence as an upper current, until it meets G (also an upper current), over the calms of Cancer. Here there is supposed to be a descent, as shown by the arrows along the wavy lines which envelop the circle. This upper current from the pole now becomes the N. E. trade-wind B, on the surface; it rises up at the equator, and returns thence—we will suppose for the present only—back, towards the north pole, as G, until it reaches the calms of Cancer, where it descends, and is felt on the surface as H, the S. W. passage wind; and so the circuit is completed for the northern hemisphere.

The Bible frequently makes allusions to the laws of nature, their operation and effects. But such allusions are often so wrapped in the folds of the peculiar and graceful drapery with which its language is occasionally clothed, that the meaning, though peeping out from its thin covering all the while, yet lies, in some sense, concealed, until the lights and revelations of science are thrown upon it; then it bursts out and strikes us with the more force and beauty.

As our knowledge of Nature and her laws has increased, so has our understanding of many passages in the Bible been improved.

The Bible called the Earth "the round world;" yet for ages it was a most damnable heresy for Christian men to say, the world is round; and, finally, sailors circumnavigated the globe, proved the Bible to be right, and saved Christian men of science from the stake.

"Canst thou tell the sweet influences of the Pleiades?"

Astronomers of the present day, if they have not answered this question, have thrown so much light upon it as to show that, if ever it be answered by man, he must consult the science of astronomy.

It has been recently all but proved, that the Earth and Sun, with their splendid retinue of comets, satellites, and planets, are all in motion around some point or centre of attraction inconceivably remote, and that that point is in the direction of the star Alcyon, one of the Pleiades! Who but the astronomer, then, could tell their "sweet influences?"

And as for the general system of atmospherical circulation, which I have been so long endeavoring to describe, the Bible tells it all in a single sentence: "The wind goeth towards the south, and turneth about unto the north; it whirleth about continually, and the wind returneth again according to his circuits." Ecc. i. 6.

A like operation takes place in the southern hemisphere. We now see the general course of the "wind in his circuits," as we see the general course of the water in a river. There be many abrading surfaces, irregularities, etc., which produce a thousand eddies to the main stream; yet, nevertheless, the general direction of the whole is not disturbed nor affected by those counter currents; so with the atmosphere and the variable winds which we find here in this latitude.

We see, also, that there must be about the habitable parts of the earth *at least* three zones or nodes, in which calms and light airs are the prevalent condition of the air. One of these zones is near the equator, where the northeast and southeast trade-winds meet, and form what is called the belt of equatorial calms.

The other zones lie between those parallels where the "wind that goeth towards the south" meets that which "turneth about unto the north." They are the calms of Cancer and of Capricorn. (*See* Plate II.)

About each pole we have, or, according to the views I have been endeavoring to make plain, we ought to have, a perpetual whirl of the wind in the ascending nodes there. I have endeavored to represent them by the direction of the curved arrows at the poles, P and P. (Plate II.) Here then are two more nodes—five in all.

The wind approaches the north pole by a series of spirals from the southwest. If we draw a circle about the north pole, on a common terrestrial globe, and intersect it by spirals to represent the direction of the wind, we shall see that the wind enters all parts of this circle from the southwest; and consequently that a whirl ought to be created thereby, in which the ascending column of air revolves from right to left, or *against* the hands of a watch.

At the south pole the winds come from the northwest, and consequently there they revolve about it *with* the hands of a watch.

That this should be so, will be obvious to any one who will look at the arrows on the polar sides of the calms of Cancer and Capricorn, Plate II. These arrows are intended to represent the prevailing direction of the wind at the surface of the earth, on the polar side of these calms.

It is a singular coincidence between these two facts thus deduced and other facts which have been

observed, and which have been set forth by Redfield, Reid, Piddington, and others, viz: that all rotary storms in the northern hemisphere revolve as do the whirlwinds about the north pole, viz: from right to left, and that all circular gales in the southern hemisphere revolve in the opposite direction, as does the whirl about the south pole.

How can there be any connection between the rotary motion of the wind about the pole and the rotary motion of it in a gale caused here by local agents?

So far, we see how the atmosphere moves; but the atmosphere, like every other department in the economy of nature, has its offices to perform; and they are many. I have already alluded to some of them. But I only propose at this time to consider some of the meteorological agencies which, in the grand design of creation, have probably been assigned to this wonderful machine.

To distribute moisture over the surface of the earth, and to temper the climate of different latitudes, it would seem, are two great offices assigned by their Creator to the ocean and the air.

When the northeast and southeast trades meet and produce the equatorial calms of the Atlantic, the air by this time is heavily laden with moisture—for, in each hemisphere, it has travelled obliquely over a large space of the ocean. The two winds meet here with opposing forces so nicely balanced that they neutralize each other, and a calm is the consequence; and, as one is pressing from the north and the other from the south, upon the belt of the atmosphere over this calm region, and each with the whole amount of force that sets it in motion, we ought to have in this calm region an upward motion of the atmosphere, the motive power of which is the sum of these two forces. Now, if we had barometrical determinations accurately made in the region of these calms, we should probably obtain an expression, in horse power, if you please, of the whole amount of force exerted by the Sun in keeping up this system of atmospherical circulation—for it is the heat of the Sun, it is thought, which causes the winds to blow and the waters to flow; at least, it is supposed to be the chief source of their motive power.

The air of the equatorial calms being charged with moisture, and thus pressed upon by the trade-winds north and south, has no room for escape but in the upward direction. It expands as it ascends and becomes cooler; a portion of its vapor is thus condensed, and comes down in the shape of rain. Therefore it is that, under these calms, we have a region of constant precipitation.

Old sailors tell us of such dead calms of long continuance here, of such heavy and constant rains, that they have scooped up fresh water from the surface of the sea.

The conditions to which this air is exposed here under the equator, are probably not such as to cause it to precipitate all the moisture that it has taken up in its long sweep across the waters.

Let us see what becomes of the rest—for Nature, in her economy, permits nothing to be taken away from the earth which is not to be restored to it again in some form, and at some time or other.

Consider the great rivers—the Amazon and the Mississippi, for example—we see them day after day, and year after year, discharging an immense volume of water into the ocean.

"All the rivers run into the sea, yet the sea is not full." Ecc. i. 7.

Where do the waters so discharged go, and where do they come from?

They come from their sources, you will say. But whence are their sources supplied?—for, unless what the fountain sends forth be returned to it again, it will fail and be dry.

We see simply, in the waters that are discharged by these rivers, the amount by which the precipitation exceeds the evaporation throughout the whole extent of valley drained by them—and by precipitation I mean the total amount of water that falls from, or is deposited by the atmosphere, whether as dew, rain, hail, or snow.

The springs of these rivers are supplied from the rains of heaven, and these rains are formed of vapors which are taken up from the sea, that "it be not full," and carried up to the mountains through the air.

"Note the place whence the rivers come, thither they return again."

Behold now the waters of the Amazon, of the Mississippi, the St. Lawrence, and all the great rivers of America, Europe, and Asia, lifted up by the atmosphere, and flowing in invisible streams back through the air, to their sources among the hills; and that through channels so regular, certain, and well defined, that the quantity thus conveyed one year with the other is nearly the same: for that is the quantity which we see running down to the ocean through these rivers; and the quantity discharged annually by each river is, as far as we can judge, nearly constant.

We now begin to see what a powerful machine is the atmosphere; and though it is apparently so capricious and wayward in its movements, here is evidence of order and arrangement which we must admit, and proof which we cannot deny, that it performs this mighty office with regularity and certainty, and is therefore as obedient to law as is the steam-engine to the will of its builder.

It too is an engine. The South Seas themselves, in all their vast extent, are the boiler for it, and the northern hemisphere is its condenser.

The proportion between the land and the water in the northern hemisphere, is very different from the proportion between them in the southern. In the northern hemisphere, the land and water are nearly equally divided. In the southern, there is several times more water than land. All the great rivers in the world are in the northern hemisphere, where there is less ocean to supply them. Whence then are their sources replenished? Those of the Amazon are supplied with rains from the equatorial calms and trade-winds of the Atlantic. That river runs east, its branches come from the north and south; it is always the rainy season on one side or the other of it; consequently, it is a river without periodic stages of a very marked character. It is always near its high-water mark. For one half of the year its northern tributaries are flooded, and its southern for the other half. It discharges under the line, and as its tributaries come from both hemispheres, it cannot be said to belong exclusively to either. It is supplied with water from the Atlantic Ocean.

Taking the Amazon, therefore, out of the count, the Rio de la Plata is the only great river of the southern hemisphere.

There is no large river in New Holland. The South Sea Islands give rise to none, nor is there one worth naming in South Africa that we know of.

The great rivers of North America and North Africa, and all the rivers of Europe and Asia, lie

wholly within the northern hemisphere. How is it, then, considering that the evaporating surface lies mainly in the southern hemisphere—how is it, I say, that we should have the evaporation to take place in one hemisphere and the condensation in the other? The total amount of rain which falls in the northern hemisphere is much greater, meteorologists tell us, than that which falls in the southern. The annual amount of rain in the north temperate zone is half as much again as that of the south temperate.

How is it, then, that this vapor gets from the southern into the northern hemisphere, and comes with such regularity, that our rivers never go dry, and our springs fail not? It is because of the beautiful operations and the exquisite *compensation* of this grand machine—the atmosphere. It is exquisitely and wonderfully counterpoised. Late in the fall, throughout the winter, and in early spring, the Sun is pouring his rays with the greatest intensity down upon the seas of the southern hemisphere; and this powerful engine which we are contemplating is pumping up the water there for our rivers with the greatest activity. At this time, the mean temperature of the entire southern hemisphere is said to be about 10° higher than the northern.

The heat which this heavy evaporation absorbs, becomes latent, and with the moisture is carried through the upper regions of the atmosphere, until it reaches our climates. Here the vapor is formed into clouds, condensed and precipitated. The heat which held this water in the state of vapor is set free, it becomes sensible heat, and it is that which contributes so much to temper our winter climate. It clouds up in winter, turns warm, and we say we are going to have falling weather. That is because the process of condensation has already commenced, though no rain or snow may have fallen; thus we feel this southern heat, that has been bottled away in the clouds of southern summer, and set free in the process of condensation in our northern winter.

While evaporation is going on with most activity in the southern hemisphere, precipitation is taking place to the greatest extent here; the fall spell, the winter rains, and the "long season in May," are familiar terms of wet weather to us all. These are the seasons at which we look for high water, and expect our "inland seas" to be in good navigable order.

The vapor comes through the upper regions of the atmosphere, and is probably condensed here not many days after it is taken up there. Suppose it to travel with the velocity of the trade-winds, at the computed rate of twenty miles the hour; it will only take it about twenty days to reach us from the middle of the southern hemisphere.

We cannot ascend into the upper regions of the atmosphere to see what is going on there; but we have such a train of well-established facts derived from observations here below, that reason mounting on them boldly soars aloft, and bids us confidently to assert knowledge of what is going on there.

When we see and feel, as in the trade-wind region we do see and feel day after day, the year around, the wind blowing as steadily from the poles towards the equator, as the Mississippi runs down to the Gulf, we are forced to the conclusion that as much air, precisely as much, as we see coming from towards the poles, and going towards the equator, has to go from the equator back towards the poles. If this were not so, there would be an exhaustion, and this wonderful engine that we are considering would break down,

for there would finally be a vacuum about the poles with a tremendous atmospherical accumulation about the equator.

Recurring to the illustration given just now, and considering both hemispheres, we shall see that the atmosphere, like the string of a musical instrument, has its nodes or points of rest. These nodes serve as escape-valves to the winds. In the equatorial calms, both the N. E. and the S. E. trades have run their course on the surface; they are going up to blow as upper currents; and therefore the motion of the air here in these calms, could it be seen and measured, would be upwards; and for the same reason, when the two upper currents meet in the region of the tropics, the motion of the air is downward, for, after passing this node, each upper current becomes a surface wind, and each is going whence the other came.*

Important operations are carried on, and purposes grand in the system of terrestrial economy are doubtless subserved by these atmospheric nodes.

This singular fact has been brought out by the investigations which we are conducting at the Observatory, with regard to the winds. Our investigations in the Atlantic, for we have not carried them much farther, show us that the S. E. trade-wind region is much larger than the N. E.—I speak of its extent over the Atlantic Ocean only.

The S. E. trades are the fresher; they often push themselves up to 10° or 15° of north latitude, whereas the N. E. trade-wind seldom gets south of the equator.

Seeing that there is so much more room for evaporation in the southern than in the northern hemisphere, and that there is so much more precipitation on this than on the other side of the equator, we are led to one of two conjectures: First, that aqueous vapor in its invisible state can permeate the atmosphere; in other words, it can flow through the air in separate or independent currents of its own, like some of the gases. In this case, we must farther conjecture the seat of some power unknown, which would always drive this vapor from the southern over into the northern hemisphere. We know of no such tendency in vapor, of no such permeability of atmosphere, and of no such force in nature; and in this age, therefore, men would scarcely receive such a conjecture, as one having plausibility enough to command their respect.

Abandoning this, therefore, we are led to another conjecture, which is, that the motion of the air in the general system of circulation is not exactly such as I have already described; but that the N. E. trade-winds, for instance, when they reach the equatorial calms, instead of turning back towards the north, as I have supposed, keep on towards the south, and the S. E. trade-winds make the tour north. In this case, the course of the winds, as described by Solomon, would be, as represented by the arrows, along the wavy curves (Plate II.), A, B, C, D, to the south pole, thence up with the arrow P and around with the hands of a watch, and back as indicated by the arrows along E, F, G, and H. Of course, as the surface winds, H and D, approach the poles, there must be a sloughing off, if I may be allowed the expression, of air from

* If this interchange of atmosphere did not take place between the two hemispheres, how would a proper mixture of the air be preserved? In the north there is much more land, and many more plants and animals to corrupt the air, than in the south, and, unless the interchange did take place, there would be a reason to infer a difference as to atmospherical purity in the two hemispheres.

the surface winds, in consequence of their approaching the poles. For as they near the poles, the parallels become smaller and smaller, and the surface current must either extend much higher up, and blow with greater rapidity, as it approaches the poles, or else a part of it must be sloughed off above, and so turned back before reaching the poles. The latter is probably the case.

If this plate and description fairly represent the course of the winds, we shall see that the S. E. trade-winds would enter the northern hemisphere, and bear into it all their moisture, except that which is precipitated in the region of equatorial calms.

The South Sea, then, if this reasoning be good, supplies mainly the water for this engine, while the northern hemisphere condenses it; we should, therefore, have more rain in the northern hemisphere. The rivers tell us that we have—at least on land: the great watercourses of the globe, and half the fresh water in the world, are found on our side of the equator. This fact, alone, is strongly corroborative of this hypothesis.

The rain gauge tells us also the same story. The yearly average of rain in the north temperate zone is, according to Johnston, 37 inches. He gives but 26 in the south temperate.

Moisture is never extracted from the air by subjecting it from a low to a higher temperature, but the reverse. Thus, all that air which comes loaded with moisture from the other hemisphere, and is borne into this, with the S. E. trade-winds, travels in the upper regions of the atmosphere until it reaches the calms of Cancer—here it becomes the surface wind that prevails from the southward and westward. As it goes north it grows cooler, and the process of condensation commences.*

We may now liken it to the wet sponge, and the decrease of temperature to the hand that squeezes that sponge. Finally reaching the cold latitudes, all the moisture that a dew-point of zero, and even far below, can extract, is rung from it; and this air then commences "to return according to his circuits" as dry atmosphere. And here we can quote Solomon again: "The north wind driveth away rain." This is a meteorological fact of high authority and great importance in the study of the circulation of the atmosphere.

This air that is returning from the north in the general channels of circulation, does not ordinarily come in contact with the surface of the water, but remains in the upper regions, isolated from all sources of vapor, except the upper clouds, until it descends in the calms of Cancer, and commences to blow the trades, as at B, (Plate II.) Here it is as the dry sponge, taking up and evaporating fresh water from the sea with great avidity. This supposition is strengthened by the circumstance that the saltest part of the ocean is near the calm belts of Cancer and Capricorn. By the time these winds reach the equatorial calms, they are saturated with moisture; thus loaded, they return to refresh the earth with rain, to cover the hills with snow, and to supply the fountains of our great rivers with water.

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* The peculiar clouds of the trade-winds are formed between the two currents of air. They are probably formed of vapor condensed from the upper current, and evaporated as it descends, by the lower and dry current from the poles. It is the same phenomenon up there, which is so often observed here below; when a cool and dry current of air meets a warm and wet one, an evolution of vapor or fog ensues.

By reasoning in this manner, we are led to the conclusion that our rivers are supplied with their waters principally from the trade-wind regions—the northern rivers from the southern trades, and the southern rivers from the northern trade-winds.

Taking for our guide such faint glimmerings of light as we can catch from nature, and supposing these views to be correct, then the saltest portion of the sea should be in the trade-wind regions, where the water for all the rivers is evaporated—and there the saltest portions are found.

Dr. Ruschenberger, of the Navy, on his late voyage to India, was kind enough to conduct a series of observations on the specific gravity of sea-water.

In about the parallel of 17° N. and S. towards the polar borders of the trade-wind regions—he found the heaviest water. Though so warm, the water here was heavier than the cold water to the south of the Cape of Good Hope.

In summing up the evidence in favor of this view of the general system of atmospherical circulation, it remains to be shown how it is, if the view be correct, there should be smaller rivers, or less rains in the southern hemisphere.

The winds that are to blow as the N. E. trade-winds, returning from the polar regions where the moisture has been compressed out of them, remain, as we have seen, dry winds until they cross the calm zone of Cancer, and are felt on the surface as the N. E. trades. About two-thirds of them only can there blow over the ocean; the rest blow over the land, over Asia, Africa, and North America, where there is but comparatively a small portion of evaporating surface exposed to their action.

The zone of the N. E. trades extends, on an average, from about 29° north to 7° north. Now, if we examine the globe, to see how much of this zone is land, and how much water, we shall find, commencing with China and coming over Asia, the broad part of Africa, and so on, across the continent of America to the Pacific, land enough to fill up, as nearly as may be, just one-third of it. This land, if thrown into one body between these parallels, would make a belt equal to 120° of longitude.

Upon this supposition, then, two-thirds only of the N. E. trade-winds are fully charged with moisture, and only two-thirds of the amount of rain that falls in the northern hemisphere falls in the southern.

This estimate as to the quantity of rain in the two hemispheres, is one which is not capable of verification by any more than the rudest approximations; for the greater extent of S. E. trades on one side, and of high mountains on the other, must each of necessity, and independent of other agents, have its effects.

These calm and trade-wind regions or belts move up and down the earth, annually, in latitude nearly a thousand miles. In July and August, the zone of equatorial calms is found between 7° N. and 12° N.; sometimes higher; in March and April, between latitude 5° S. and 2° N.

With this fact, these points of view, and the Trade-wind Chart before us, it is easy to perceive why it is that we have a rainy season in Oregon, a rainy and dry season in California, another at Panama, two at Bogota, none in Peru, and one in Chili.

In Oregon it rains every month, but more in the winter months.

The winter there is the summer of the southern hemisphere, when this steam-engine is working with

the greatest pressure. The vapor that is taken up by the S. E. trades, is borne along over the region of N. E. trades to latitude 35° or 40° N., where it descends and appears on the surface with the S. W. winds of those latitudes. Driving upon the highlands of the continent, this vapor is condensed and precipitated, during this part of the year, almost in constant showers.

In the winter, the calm belt of Cancer approaches the equator. This whole system of zones, viz: trades, calms, and westerly winds, follow the Sun; and they of our hemisphere are nearer the equator in the winter and spring months than at any other season.

The S. W. winds, backing down at this season to the south, reach as far down as the lower part of California. In winter and spring, the land in California is cooler than the sea air, and is quite cold enough to extract moisture from it. But in summer and autumn the land is the warmer, and cannot condense the vapors of water held by the air. So the same cause which made it rain in Oregon, now makes it rain in California. As the Sun returns to the north, he brings the calm belt of Cancer, and the N. E. trades along with him; and now, at places where, six months before, the S. W. winds were the prevailing winds, the N. E. trades are found to blow. This is the case in the latitude of California. The prevailing winds, then, instead of going from a warmer to a cooler climate, as before, are going the opposite way. Consequently, they cannot, if they have the moisture in them to make rains of, precipitate it under such circumstances.

Panama is in the region of equatorial calms. This belt of calms, as may be seen by the Charts, travels during the year, back and forth, over about 17° of latitude, coming farther north in the summer, where it tarries for several months, and then returns so as to reach its extreme southern latitude some time in March or April. Where these calms are, it is always raining, and the chart shows that they hang over the latitude of Panama, from June to November; consequently, from June to November is the rainy season at Panama. The rest of the year, that place is in the region of the N. E. trades, which, before they arrive there, have to cross the mountains of the isthmus, on the cool tops of which they deposit their moisture, and leave Panama rainless and pleasant, until the Sun returns north with the belt of equatorial calms after him. They then push the belt of N. E. trades farther to the north, occupy a part of the winter zone, and refresh that part of the earth with summer rains.

This belt of calms moves over more than double of its breadth, and the entire motion from south to north is accomplished generally in two months, May and June.

Take the parallel of 4° N. as an illustration; during these two months, the entire belt of calms crosses this parallel, and then leaves it in the region of the S. E. trades. During these two months, it was pouring down rain on that parallel. After the calm belt passes it the rains cease, and the people in that latitude have no more wet weather till the fall, when the belt of calms recrosses this parallel on its way to the south. By examining the "Trade-wind Chart," it may be seen what the latitudes are that have two rainy seasons, and that Bogota is within the bi-rainy latitudes.

The coast of Peru is within the region of perpetual S. E. trade-winds. Though the Peruvian shores are on the verge of the great South Sea boiler, yet it never rains there. The reason is plain, and the Charts make it obvious.

The S. E. trade-winds in the Atlantic Ocean first strike the water on the coast of Africa. Travelling to the N. W., they blow obliquely across the ocean until they reach the coast of Brazil. By this time, they are heavily ladened with vapor, which they continue to bear along across the continent, depositing it as they go, and supplying with it the sources of the Rio de la Plata and the southern tributaries of the Amazon.

Finally, they reach the snow-capped Andes, and here is wrung from them the least particle of moisture that that very low temperature can extract.

Reaching the summit of the range, they now tumble down as cool and dry winds on the slopes beyond. Meeting with no evaporating surface, and with no temperature *colder* than that to which they were subjected on the mountain-tops, they reach the ocean before they become charged with fresh vapor, and before, therefore, they have any which the Peruvian climate can extract. Thus, we see how the top of the Andes becomes the reservoir from which are supplied the rivers of Chili and Peru.

We see, moreover, that the Andes and all other mountains which run north and south have a dry and a rainy side, and that the prevailing winds of the latitude determine which is the rainy and which the dry side.

Thus, let us take the southern coast of Chili for illustration. In our summer time, when the sun comes north, and drags after him his belts of perpetual winds and calms, that part of the coast is left within the regions of the N. W. winds—the winds that are counter to the S. E. trades—which, cooled by the winter temperature of the highlands of Chili, deposit their moisture copiously. During the rest of the year, the most of Chili is in the regions of the S. E. trades, and the same causes which operate in California to prevent rain there, operate in Chili; only the dry season in one place is the rainy season of the other.

Hence, we see that the weather side of all such mountains as the Andes is the wet side, and the lee side the dry.

We shall now be enabled to determine, if the views which I have been endeavoring to present be correct, what parts of the earth are subject to the greatest fall of rain. They should be on the slopes of those mountains which the trade-winds first strike after having blown across the greatest tract of ocean. The more abrupt the elevation as the land rises from the ocean, the greater the amount of precipitation.

If, therefore, we commence at the parallel of about 30° N. in the Pacific, where the N. E. trade-winds first strike that ocean, and trace them through their circuits till they first strike high mountains, we ought to find such a place of heavy rains.

Commencing at this parallel of 30°, therefore, in the North Pacific, and tracing thence the course of the N. E. trade-winds, we shall find that they blow thence, and reach the region of equatorial calms near the Caroline Islands. Here they rise up; but instead of pursuing the same course in the upper stratum of winds through the southern hemisphere, they, in consequence of the rotation of the earth, are made to take a S. E. course. They keep in this upper stratum until they reach the calms of Capricorn, between the parallels of 30° and 40°; after which they become the prevailing N. W. winds of the southern hemisphere, which correspond to the S. W. of the northern. Continuing on to the S. E. they are now the surface winds; they are going from warmer to cooler latitudes; they become as the wet sponge, and are abruptly

intercepted by the Andes of Patagonia, whose cold summit compresses them, and with its low dew-point squeezes the water out of them. Captain King found the astonishing fall of water here of nearly 13 feet (151 inches) in 41 days; and Mr. Darwin reports that the sea-water along this part of the South American coast is sometimes quite fresh.

We ought to expect a corresponding rainy region to be found to the north of Oregon; but there the mountains are not so high, the obstruction to the S. W. winds is not so abrupt, the highlands are farther from the coast, and the air which these winds carry in their circulation to that part of the coast, though it be as heavily charged with moisture as at Patagonia, has a greater extent of country over which to deposit its rain, and consequently the fall to the square inch will not be as great.*

In like manner, we should be enabled to say in what part of the world the most equitable climates are to be found. They are to be found in the equatorial calms, where the N. E. and S. E. trades meet fresh from the ocean, and keep the temperature uniform under a canopy of perpetual clouds.

The mean annual fall of rain on the entire surface of the earth is estimated at about 5 feet.

To evaporate water enough annually from the ocean to cover the earth, on the average, 5 feet deep with rain; to transport it from one zone to another; and to precipitate it in the right places, at suitable times, and in the proportions due, is the office of the grand atmospherical machine. This water is evaporated principally from the torrid zone. Supposing it all to come thence, we shall have, encircling the earth, a belt of ocean 3,000 miles in breadth, from which this atmosphere evaporates a layer of water annually 16 feet in depth. And to hoist up as high as the clouds, and lower down again, all the water in a lake 16 feet deep, and 3,000 miles broad, and 24,000 long, is the yearly business of this invisible machinery. What a powerful engine is the atmosphere!†

We see light beginning to break upon us—for we now begin to perceive why it is that the proportions between the land and water were made as we find them in nature. If there had been more water and less land, we should have had more rain, and *vice versâ;* and then climates would have been different from what they now are, and the inhabitants, neither animal nor vegetable, would have been as they are.

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* I have since, through the kindness of A. Holbrook, Esq. U. S. Attorney for Oregon, received the *Oregon Spectator* of February 13, 1851, containing the Rev. G. H. Atkinson's Meteorological Table, kept in Oregon City, during the month of January, 1851. The quantity of rain and snow for that month is 13.63 inches, or about one-third the average quantity that falls here during the year.

† Since this paper was read, the *Transactions* of the Bombay Geographical Society, from May, 1849, to August, 1850, vol. ix., has been published. From it, I derived valuable information in relation to this as well as many other subjects. In his Annual Report to the Society, Dr. Buist, the Secretary, states, on the authority of Mr. Laidly, the evaporation at Calcutta to be "about 15 feet annually; that between the Cape and Calcutta averages in October and November nearly ¾ inch daily;—betwixt 10° and 20° in the Bay of Bengal, it was found to exceed an inch daily—supposing this to be double the average throughout the year, we should," continues the Doctor, "have 18 feet of evaporation annually," p. c. v.

If, in considering the direct observations upon the daily rate of evaporation in India, it be remembered that the seasons there are divided into wet and dry; that in the dry season evaporation in the Indian Ocean, because of its high temperature—and also of the high temperature and dry state of the wind—probably goes on more rapidly there than anywhere else in the world—if, moreover, we remember that the regular trade-wind regions proper, are for the most part rainless regions at sea; that evaporation is going on from them all the year round; we shall have reason to consider the estimate of 16 feet annually for the trade-wind surface of the ocean not too high. What a powerful engine, therefore, may not the atmosphere be considered!

And as they are, that wise Being, who, in his kind Providence, so watches over and regards the things of this world that he takes knowledge of the sparrow's fall, and numbers the very hairs of our head, doubtless designed them to be.

In some parts of the earth, the precipitation is greater than the evaporation; thus, the amount of water borne down by every river that runs into the sea, may be considered as the excess of the precipitation over the evaporation that takes place in the valley drained by that river.

In other parts of the earth, the evaporation and precipitation are exactly equal, as in those inland basins such as that in which the city of Mexico, Lake Titicaca, the Caspian Sea, etc. etc., are situated; which basins have no ocean drainage.

If more rain fell in the valley of the Caspian than is evaporated from it, that sea would finally get full and overflow the whole of that great basin. If less fell than is evaporated from it again, then that sea, in the course of time, would dry up, and plants and animals would all perish there for the want of water.

In the sheets of water which we find distributed over that and every other inhabitable inland basin, we see reservoirs or evaporating surfaces just sufficient for the supply of that degree of moisture which is best adapted to the well-being of the plants and animals that people such basins.

In other parts of the earth still, we find places, as the Desert of Sahara, in which neither evaporation nor precipitation takes place, and in which we find neither plant nor animal.

In contemplating the system of terrestrial adaptations, these researches have taught me to regard the great deserts of the earth, as the astronomer does the counterpoises to his telescope—though they be mere dead weights, they are, nevertheless, necessary to make the balance complete, the adjustments of this machine perfect. These counterpoises give ease to the motions, stability to the performance, and accuracy to the workings of the instrument. They are *compensations.*

Whenever I turn to contemplate the works of nature, I am struck with the admirable system of compensation, with the beauty and nicety with which every department is poised by the others; things and principles are meted out in directions the most opposite, but in proportions so exactly balanced and nicely adjusted, that results the most harmonious are produced.

It is by the action of opposite and compensating forces that the Earth is kept in its orbit, and the stars are held suspended in the azure vaults of heaven; and these forces are so exquisitely adjusted, that, at the end of a thousand years, the Earth, the Sun, and Moon, and every star is found to return to its proper place at the proper moment.

Nay, philosophers tell us, when the little snow-drop, which in our garden walks we may now see raising its beautiful head to remind us that spring is at hand, was created, that the whole mass of the Earth from pole to pole, and from circumference to centre, must have been taken into account and weighed, in order that the proper degree of strength might be given to the fibres even of this little plant.

Botanists tell us that the constitution of this plant is such as to require that, at a certain stage of its growth, the stalk should bend, and the flower should bow its head, that an operation may take place, which is necessary, in order that the herb should produce seed after its kind; and that, after this, its vege-

table health requires that it should lift its head again and stand erect. Now, if the mass of the earth had been greater or less, the force of gravity would have been different; in that case, the strength of fibre in the snow-drop, as it is, would have been too much or too little; the plant could not bow or raise its head at the right time; fecundation could not take place, and its family would have become extinct with the first individual that was planted, because its "seed" would not have been "in itself," and therefore it could not reproduce itself.

Now, if we see such perfect adaptation, such exquisite adjustment, in the case of one of the smallest flowers of the field, how much more may we not expect "compensation" in the atmosphere, upon the right adjustment and due performance of which depends not only the life of that plant, but the well-being of every individual that is found in the entire vegetable and animal kingdoms of the world.

When the east winds blow for a little while, they bring us air saturated with moisture from the Gulf Stream, and we complain of the sultry, oppressive, heavy atmosphere; the invalid grows worse, and the well man feels ill, because when he takes this atmosphere into his lungs, it is already so charged with moisture, that it cannot take up and carry off that which encumbers his lungs, and which nature has caused to be deposited there, that this atmosphere may take up and carry off. At other times the air is dry and hot; he feels that it is conveying off matter from the lungs too fast, he realizes the idea that it is consuming him, and he calls it parching.

Therefore, in considering the general laws of atmospherical circulation, in order to get at the clue to them, I have felt myself constrained to set out with the assumption that, if the atmosphere had had a greater or less capacity for moisture, or if the proportion of land and water had been different—if the earth, air, and water had not been in exact counterpoise—the whole arrangement of the animal and vegetable kingdoms would have varied from its present state. But God chose to make those kingdoms what they are; for this purpose it was necessary, in his judgment, to establish the proportions between the land and water, and the desert, just as they are, and to make the capacity of the air to circulate heat and moisture just what it is, and to have it to do all its work in obedience to law, and in subservience to order. If the proportions of each were not adjusted according to the reciprocal capacities of all to perform the functions required by each, why should we be told that he "measured the waters in the hollow of his hand, and comprehended the dust in a measure, and weighed the mountains in scales, and the hills in a balance?" Why did he span the heavens, but that he might mete out the atmosphere in exact proportion to all the rest, and impart to it those properties and powers which it was necessary for it to have, in order that it might perform all those offices and duties for which he designed it? I have not the time, and if I had the time, I have not the heart so to abuse the patience of those who read, as I should do, by attempting to discuss, at this time, the currents of the ocean, and to tell of the beautiful discoveries to which our system of investigations has led us with regard to those great agents in the terrestrial economy.

Harmonious in their action, the air and sea are obedient to law and subject to order in all their movements; when we consult them in the performance of their offices, they teach us lessons concerning the wonders of the deep, the mysteries of the sky; the greatness, and the wisdom, and goodness of the

Creator. The investigations into the broad-spreading circle of phenomena connected with the winds of heaven and the waves of the sea, are second to none for the good which they do, and the profit which they give.

The astronomer sees the hand of God in the sky; but the right-minded mariner, who looks aloft as he ponders over these things, hears his voice in every wave of the sea that "claps its hands," and feels his presence in every breeze that blows.

RED FOGS AND SEA DUST.

Every seaman has seen or heard of the "sirocco dust" of the Mediterranean, and of the "African dust," or "red fogs," of the Cape de Verdes and the adjoining ocean.

This dust is described by Ehrenberg and others, as of a brick-red or cinnamon color, and it sometimes comes down in such quantities as to cover the sails and rigging, though the vessel may be hundreds of miles from the land. This dust had generally been supposed to come, as its name imports, from Africa.

Now, the patient mariner, who has had the heart to follow me around with "the wind in his circuits," will perceive that proof is yet wanting to establish it as a fact, that the N. E. and S. E. trades, after meeting and rising up in the equatorial calms, do cross over and take the tracks represented by C and G—Plate II.

Statements, and reasons, and arguments enough have already been made and adduced, to make it highly probable, according to human reasoning, that such is the case; and though the theoretical deductions showing such to be the case be never so good, positive proof that they are true cannot fail to be received with delight and satisfaction.

Were it possible to take a portion of this air, as it travels down the S. E. trades, representing the general course of atmospherical circulation, and to put a tally on this portion of air, by which we could always recognize it again, then we might hope actually to prove, by evidence the most positive, the channels through which the air of the trade-winds, after ascending at the equator, returns whence it came.

But the air is invisible; and it is not easily perceived how either marks or tallies may be put upon it, that it may be traced in its paths through the clouds.

The skeptic, therefore, who is hard of belief that the general circulation is such as Plate II. represents it to be, might consider himself safe in his unbelief, were he to declare his willingness to give it up the moment any one should put tallies on the wings of the wind, which would enable him to recognize that air again, and those tallies, when found at other parts of the Earth's surface.

As difficult as this seems to be, it has actually been done. Ehrenberg, with his microscope, has established almost beyond a doubt, that the air which the S. E. trade-winds bring to the equator, does rise up and pass over into the northern hemisphere.

The Sirocco, or African dust, which he has been observing so closely, has turned out to be tallies put upon the wind in another hemisphere; and this beautiful instrument of his enables us to detect the marks

on these little tallies as plainly as though those marks had been written upon labels of wood and tied to the wings of the wind.

This dust, when subjected to microscopic examination, is found to consist of infusoria and organisms, whose *habitat* is not Africa, but South America, and in the S. E. trade-wind region of South America. Prof. Ehrenberg has examined specimens of sea dust from the Cape de Verdes and the regions thereabout, from Malta, Genoa, Lyons, and the Tyrol; and he has found such a similarity among them, as would not have been more striking, had these specimens been all taken from the same pile.

South American forms he recognizes in all of them; indeed, they are the prevailing forms in every specimen he has examined.

It may, I think, be now regarded as an established fact, that there is a perpetual upper current of air from South America to North Africa; and that the volume of air in these upper currents, which flows to the northward, is nearly equal to the volume which flows to the southward with the N. E. trade-winds, there can be no doubt.

The "rain-dust" has been observed most frequently to fall in spring and autumn; that is, the fall has occurred after the equinoxes, but at intervals from them varying from 30 to 60 days—more or less. To account for this sort of periodical occurrence of the falls of this dust, Ehrenberg thinks it "necessary to suppose *a dust-cloud to be held constantly swimming in the atmosphere by continuous currents of air, and lying in the region of the trade-winds, but suffering partial and periodical deviations.*"

Now, any one who will take the trouble to consult the "Trade-wind Charts" of the Atlantic Ocean, will see that, at the time of the vernal equinox, the equatorial calms are "raging" between the parallels of 4° N. and 5° S., and that consequently the places between these parallels are then in their rainy season.

The "rain dust," therefore, it may be inferred, could not well be taken up between these two parallels at such a season. The earth is then flooded with rain, and there prevails a great calm; and as the air is saturated with moisture, and consequently as there is no—little or no—evaporation going on at such a time and place, it is difficult to imagine how any of the microscopic organisms of a locality so situated should be taken up in the atmosphere.

But if the examination of these Charts be carried a little farther, it will be perceived that, at the time of the vernal equinox, the valley of the lower Oronoco is then in its dry season—everything is parched up with the drought; the pools are dry, and the marshes and plains arid wastes. All vegetation has ceased, the great serpents and reptiles have buried themselves for hibernation;* the hum of insect life is hushed; and the stillness of death reigns through the valley.

Under these circumstances, the light breeze, raising dust from lakes that are dried up, and lifting motes from savannahs that are parched up, will bear them away like clouds in the air.

This is the period of the year when the surface of the earth in this region, strewed with impalpable and feather-light remains of animal and vegetable organisms, is swept over by whirlwinds, gales, and

* Humboldt.

tornadoes of terrific force; this is the period for the general atmospheric disturbances which have made characteristic the equinoxes. Do not these conditions appear sufficient to afford the "rain-dust" for the spring showers?

At this period of the autumnal equinox, another portion of the Amazonian basin is parched with drought, and liable to winds that fill the air with dust, and with the remains of dead animal and vegetable matter; these impalpable organisms, which each rainy season calls into being, to perish the succeeding season of drought, are perhaps distended and made even lighter by the gases of decomposition which has been going on in the period of drought.

May not, therefore, the whirlwinds which accompany the vernal equinox sweep over the lifeless plains of the lower Oronoco, take up the "rain-dust" which descends in the northern hemisphere in April and May; and may it not be the atmospherical disturbances which accompany the autumnal equinox, that take up the microscopic organisms from the upper Oronoco and the great Amazonian basin for the showers of October?

If there be reason in this question, and plausibility in the answer it suggests, an affirmative reply would authorize us to infer that the "fatherland" of the "rain-dust" is one place for the spring and another for the autumn; and therefore it might be expected that the microscope would detect certain infusoria that are peculiar each to its own dust and locality.

These are the periods and these the conditions most favorable for raising the "sea-dust;" and may we not therefore refer to these conditions, and suggest that in them is to be found reason for the greater liability of the "rain-dust" to fall in April and May, October and November, than at other times?

If one season of the year be most favorable to the taking up of the infusoria, another season may be most favorable for letting them down again. The Charts indicate the former; the microscope shows the latter to be the case.

And may we not, therefore, regard the interval between the time most favorable for the ascent, and the time in which the descent is most likely to occur, as a sort of general indication as to the length of the time required for the transportation; and therefore as to the rate of motion of the atmosphere in its general channels of circulation?

These suggestions as to the taking up the dust in the valley of Oronoco, derive weight from the observations of the closest of observers:—

The Baron von Humboldt, in his *Aspects of Nature*, thus contrasts the wet and the dry seasons there:—

"When under the vertical rays of the never-clouded sun, the carbonized turfy covering falls into dust, the indurated soil cracks asunder as if from the shock of an earthquake. If at such times two opposing currents of air, whose conflict produces a rotary motion, come in contact with the soil, the plain assumes a strange and singular aspect. Like conical-shaped clouds, the points of which descend to the earth, the sand rises through the rarefied air on the electrically-charged centre of the whirling current, resembling the loud waterspout, dreaded by the experienced mariner. The lowering sky sheds a dim, almost straw

colored light, on the desolate plain. The horizon draws suddenly nearer, the steppe seems to contract, and with it the heart of the wanderer. The hot, dusty particles which fill the air increase its suffocating heat, and the east wind blowing over the long-heated soil brings with it no refreshment, but rather a still more burning glow. The pools which the yellow, fading branches of the fan-palm had protected from evaporation, now gradually disappear. As in the icy north the animals become torpid with cold, so here, under the influence of the parching drought, the crocodile and the boa become motionless and fall asleep, deeply buried in the dry mud. * * * * * * * * *

" * * * The distant palm-bush, apparently raised by the influence of the contact of unequally heated and therefore unequally dense strata of air, hovers above the ground, from which it is separated by a narrow intervening margin. Half concealed by the dense clouds of dust, restless with the pain of thirst and hunger, the horses and cattle roam around, the cattle lowing dismally, and the horses stretching out their long necks and snuffing the wind, if haply a moister current may betray the neighborhood of a not wholly dried-up pool. * * * * * * * * * *

"* * * At length, after the long drought, the welcome season of the rain arrives; and then how suddenly is the scene changed! * * * * * * * * * *

"* * * Hardly has the surface of the earth received the refreshing moisture, when the previously barren steppe begins to exhale sweet odors, and to clothe itself with killingias, the many panicles of the paspulum, and a variety of grasses. The herbaceous mimosas, with renewed sensibility to the influence of light, unfold their drooping, slumbering leaves, to greet the rising Sun; and the early song of birds, and the opening blossoms of the water plants, join to salute the morning." * * * * *

The color of the "rain-dust," when collected in parcels, and sent to Ehrenberg, is "brick-red," or "yellow ochre;"—when seen by Humboldt in the air, it was less deeply shaded, and is described *by him* as imparting a "straw color" to the atmosphere. In the search of spider lines for the diaphragm of my telescopes, I procured the finest and best threads from a cocoon of a mud-red color; but the threads of this cocoon, as seen singly in the diaphragm, were of a golden color; there would seem, therefore, no difficulty in reconciling the difference between the colors of the rain-dust, when viewed in little piles by the microscopist, and when seen attenuated and floating in the wind by the great traveller.

It appears, therefore, that we here have placed in our hands a clue, which, attenuated and gossamer-like though it at first appears, is nevertheless palpable and strong enough to guide us along the "circuits of the wind" into "the chambers of the south."

The frequency of the fall of "rain-dust" between the parallels of 17° and 25° N., and in the vicinity of the Cape Verde Islands, is remarked upon with emphasis by the author. It is worthy of remark; because, in connection with the investigations at the Observatory, it is significant.

The latitudinal limits of the northern edge of the N. E. trade-winds are variable. In the spring, they are nearest to the equator, extending sometimes at this season not farther from the equator than the parallel of 15° N.

The breadth of the calms of Cancer is also variable; so also are their limits. The extreme vibration of this zone is between the parallels of 17° and 38° north, according to the season of the year.

According to the Charts, and the hypothesis suggested by them, this is the zone in which the upper currents of atmosphere that ascended in the equatorial calms, and flowed off to the northward and eastward, descend. This, therefore, is the zone in which the atmosphere that bears the "rain-dust," or "African sand," descends to the surface; and this, therefore, is the zone, it might be supposed, which would be the most liable to showers of this "dust." This is the zone in which the Cape Verde Islands are situated; they are in the direction which theory gives to the upper current of air from the Oronoco and Amazon with its "rain-dust," and they are in the region of the most frequent showers of "rain-dust," all of which are in striking conformity with this theory as to the circulation of the atmosphere.

It is true that, in the present state of our information, we cannot tell why this "rain-dust" should not be gradually precipitated from this upper current, and descend into the stratum of trade-winds, as it passes from the equator to higher northern latitudes. Neither can we tell why the vapor which the same winds carry along, should not, in like manner, be precipitated on the way; nor why we should have a thunder-storm, a gale of wind, or the display of any other atmospherical phenomenon to-morrow, and not to-day;—all that we can say is, that the conditions of to-day are not such as the phenomenon requires for its own development.

Therefore, though we cannot tell why the sea-dust should not fall always in the same place, we may nevertheless suppose that, in passing the same parallels, it does not always meet with the conditions—electrical and others—favorable to the descent—and that these conditions might occur now in this place, now in that. But that the fall does occur always in the same atmospherical vein or general direction, my investigations would suggest, and Ehrenberg's researches prove.

Judging by the fall of sea or rain-dust, we may suppose that the currents in the upper regions of the atmosphere are remarkable for their general regularity, for their general direction and sharpness of limits, so to speak.

We may imagine that certain electrical conditions are necessary to a shower of "sea-dust," as well as to a thunderstorm; and that the interval between the time of the equinoctial disturbances in the atmosphere and the occurrence of these showers, though it does not enable us to determine the true rate of motion in the general system of atmospherical circulation, yet it assures us that it is not less on the average than a certain rate.

I do not offer these remarks as an explanation with which we ought to rest satisfied; I rather offer them in the true philosophical spirit of the distinguished microscopist himself; simply as affording, as far as they are entitled to be called explanation, that explanation which is most in conformity with the facts before us, and which is suggested by the results of a novel and beautiful system of philosophical research.

Thus, though we have tallied the air, and put labels on the wind, to "tell whence it cometh, and whither it goeth," yet there evidently is an agent concerned in the circulation of the atmosphere, whose functions are manifest, but whose presence has never yet been recognized.

Where the air which the N. E. trade-winds meet in the equatorial calms, that of the S. E., and the two rise up together, what is it? Where is the power which guides that from the north over to the south, and that from the south up to the north?

The following conjectures, as to the relation "between magnetism and the circulation of the atmosphere," may perhaps throw some light upon the answer to this question.

ON THE PROBABLE RELATION BETWEEN MAGNETISM AND THE CIRCULATION OF THE ATMOSPHERE.*

The discoveries of Faraday in dia-magnetism are calculated to guide me, and to illuminate the darkness in which many a philosopher has, no doubt, often found himself surrounded, as he has endeavored to follow "the wind in his circuits" over the trackless wastes of the ocean.

Oxygen, philosophers now say, composes one-fifth part of the atmosphere, and is magnetic.

The discovery that the oxygen of the atmosphere is magnetic, presents itself to the mind as a great physical fact, which perhaps is to serve as the keystone for some of the most grand among the sublime and beautiful structures which philosophy is erecting for monuments to the genius of the age.

The facts elicited from the Wind and Current Charts had, before I was aware of Faraday's discoveries, pointed me to the work of some agent whose office in the grand system of atmospherical circulation was neither understood nor recognized.

In following these facts to their legitimate conclusions, and in studying all the phenomena that these Charts have successfully revealed touching the grand system of the distribution of moisture and the circulation of the atmosphere over the surface of the earth, I have often been induced to suspect that some other agent besides heat, and the rotation of the earth on its axis, was concerned in creating the currents of the sea as well as the currents of the atmosphere.

Never suspecting the character of this agent for the atmosphere, its foot-prints, at least, have at last been detected; and there is reason to suppose that Faraday has discovered its lurking-place to be in the oxygen of the atmosphere. Can there be in the oxygen of the water, too, a magnetic force capable of influencing the currents of the sea?

These Charts had enabled me to trace from the belt of calms, near the tropic of Cancer, which extends entirely across the seas, an efflux of air both to the north and to the south; from the south side of this belt the air flows in a never-ceasing breeze, called the N. E. trade-winds, towards the equator.

On the north side of it, the prevailing winds come from it also; but they go towards the N. E. They are the well-known southwesterly winds which prevail along the route from this country to England, in the ratio of two to one.

Now these last-named winds are going from a warmer to a colder climate; and therefore it may be

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* See letter to Hon. Wm. A. Graham, January 30, 1851; Appendix, Washington Astronomical Observations, 1846.

supposed that nature exacts from them what we know she exacts from the air under similar circumstances, but on a smaller scale before our eyes, viz: more precipitation than evaporation.

Where, then, does the vapor, which these winds carry along, come from? was one of the questions suggested by the Charts.

They afford grounds for the supposition that the air of which the N. E. trade-winds are composed, and which comes out of the same zone of calms as do these southwesterly winds, so far from being saturated with vapor at its exodus, is dry; the N. E. trade-winds are for the most part dry winds; reason suggests, and philosophy teaches, that going from a lower to a higher temperature, the evaporating powers of these winds are increased; that they have to travel in their oblique course, towards the equator, a distance of nearly 3,000 miles; that, as a general rule, they evaporate all the time, and all the way, and precipitate little or none on their route; investigations have proven that they are not saturated with moisture until they have arrived fully up to the regions of equatorial calms, a zone of constant precipitation.

This calm zone of Cancer borders, also, it was perceived, upon a rainy region.

Where, then, does the vapor, which is here on the northern edge of this zone of Cancer, condensed into rains—and where, also, does the vapor which the rain winds that flow out on the polar side of this zone—where?—was the oft-repeated question—does the vapor which is condensed into rains for the extra-tropical regions of the north, come from?

Could it be taken up by the N. E. trade-winds; and could it be the residuum, which, after supplying the equatorial calms with their rain, was carried up in the ascending column of air there, and which residuum was brought back in the upper regions of the atmosphere by the current which we know perpetually blows up there, counter to the trade-winds: could this be so?

We know that there is an upper current of perpetual winds from the equatorial to the tropical calms —that the volume of air moved by these two upper currents, north and south, to Cancer and to Capricorn, is equal to the volume that is felt on the surface, as the N. E. and S. E. trade-winds.

I know of no law of nature, or rule of philosophy, which would forbid the supposition that the air which has been brought along as the N. E. trade-winds to the equatorial calms, should, after ascending there, return by the counter and upper currents to the calm zone of Cancer, here descend and reappear on the surface as the N. E. trade-winds again. I knew of no agent in nature which would *prevent* it from taking this circuit, nor did I know of any which would compel it to take this circuit; but while I knew of no agent in nature that would prevent it from taking this circuit, I knew, on the other hand, of circumstances which rendered it probable that such in general is not the course of atmospherical circulation—that it does not take this circuit. I speak of the rule, not of the exceptions; these are infinite, and for the most part are caused by the land.

And I moreover knew of facts which greatly strengthen the supposition that the winds which have come in the upper regions of the atmosphere from the equator, do not, after arriving at the calms of Cancer, and descending, return to the equator on the surface; but that they continue on the surface towards the pole.

Such are the circumstances which favor the conjecture that the winds which flow in the upper regions of the atmosphere from the equator to the calms of Cancer, do not, after arriving and descending in the midst of these calms, turn about, and go back to the equator with the N. E. trades. On the contrary, the following are the facts and circumstances which give strength to the supposition that these winds continue from the calm belt of Cancer towards the pole, as the prevailing southwesterly winds of the extra-tropical north:—

We have seen that, on the north side of this calm zone of Cancer, the prevailing winds on the surface are from this zone towards the pole; in other words, if s represent the total volume of atmosphere which blows on the surface towards the north on the polar side of Cancer, and ϕ the total volume which moves on the surface from the pole towards the calms of Cancer, then s being the rule, and ϕ the exception, we shall have $s > \phi = s'$. Therefore s' is the quantity which must return in the upper regions of the atmosphere from the Arctic regions to the calm zone of Cancer; and if we take δ'' as the quantity which comes from the equator in the upper regions of the atmosphere to this same zone of calms, we shall have the momentum of δ'' equal to the momentum of s' as intimated by nature, in the fact that she has established, near each tropic, a zone, or belt of calms.

The Cancer zone of calms in the Atlantic Ocean is known to American seamen as the "Horse Latitudes," from the circumstance that the vessels formerly engaged in carrying horses from New England to the West Indies, found it so difficult to cross this zone. They would often be detained in the calms for many days; during which time, the large cargo of horses would exhaust the stock of water, become frantic with thirst, and, to save a part, the rest would have to be thrown overboard. Hence the name of "Horse Latitudes" to the calms near the tropics of Cancer, and which I have called by the name of that sign.

This is the place where the upper currents of air represented by s' and δ'' meet; they balance each other, produce a calm, and descend to reappear as surface winds, one blowing to the north, and the other to the south from this calm-belt.

Now s' could not bring the vapors here which form the rains that are precipitated between this calm belt and the polar regions, because s' has already performed the circuit as a surface wind between this zone and those regions; because in that circuit, it had been subjected to a temperature far below zero, and had given out all the moisture that a dew-point so very low could extract from it; and as it had returned in the upper regions of the atmosphere, where it encountered no fluid surface to replenish it with moisture, it had no vapor on its arrival from the north at the calms of Cancer, to make rains of, except such as it may have evaporated from the clouds, formed in the upper regions of the surface wind.

Hence, if s' returned to the north as a surface wind after descending in the calm zone of Cancer, it would first have to remain a long time in contact with the sea, in order to be supplied with vapor enough to fill the great rivers, and supply the rains for the whole earth between us and the north pole.

In this case, we should have an evaporating region on the north as well as on the south side of this zone of Cancer; but the Charts show no such region; I speak exclusively of the ocean.

Therefore, I think I perceive plausibility in the inference that s' does not come out on the north side

of this calm zone of Cancer, but on the south side; that thence it takes the circuit of the N. E. trade-winds, in which it is replenished with vapor. Now, if it be admitted that such is the general course of s', it must of necessity be admitted that δ'' probably reappears on the north side of this zone, as the prevailing surface wind, which precipitates, on its way to the Arctic regions, the residuum of the vapor which it has taken up in the trade-wind region and brought from the equatorial calms.

Moreover, if these premises be admitted thus far, and if it be true that δ'' have the vapor, which, by condensation, is to water with showers the extra-tropical regions of the northern hemisphere, nature, we may be sure, has provided a guide for conducting δ'' across this belt of calms, and for sending it on in the right way. Here it is, at this crossing of the winds, that I thought I first saw the foot-prints of an agent whose character I could not comprehend. It was this guide to s' and δ''.

Heat and cold, the early and the latter rain are not distributed over the earth by chance; they are dispensed, no doubt, according to design, and in obedience to laws that are as certain and as sure in their operations as the seasons in their rounds.

If there were really, in the calms of Cancer, a general mingling of the atmosphere which comes from the north, with that which comes from the south—of the moist and the dry air as it descends here to the surface of the earth—if it depended upon chance, whether the dry air should come out on this side, or on that of their calm belt; or whether the moist air should return whence it came or not; if such were the case in nature, we perceive that, so far from any regularity as to seasons, we should have, or might have, years of droughts the most excessive, and then again seasons of rains the most destructive; but so far from this, we find for each place a mean annual proportion of both, and that, too, so regulated withal, that year after year the quantity is preserved with remarkable regularity.

Therefore, seeing reasons why s' and δ'' should cross each other in the calms of Cancer, and seeing no reasons why they should not, I was led to the inference that here probably is a node in the circulation of the atmosphere, where the wind from the north meets the wind from the south; and that each, after a pause, continues on its course, and returns again to complete his circuit. The fact, it appeared to me, was probable, but the cause a mystery; for did this crossing of currents not take place, here would be a barrier in the atmosphere; and we, the inhabitants of the extra-tropical regions of the north, would have always to breathe an atmosphere, which circulates, not over all parts of the earth, and in both hemispheres, but only in the north, between the calms of Cancer and the pole.

Having thus shown that there is no reason for supposing that the upper currents of air, when they meet over the calms of Cancer and Capricorn, are turned back to the equator; but having shown that there is reason for supposing that the air of each current, after descending, continues on in the direction towards which it was travelling before it descended; we may go farther, and by a similar train of circumstantial evidence, afforded by the Charts, and other sources of information, show that the air kept in motion on the surface by the two systems of trade-winds, when it arrives at the belt of equatorial calms, and having ascended, continues on thence, each current towards the pole which it was approaching while on the surface.

There is no reason for supposing that the atmosphere does not pass freely from one hemisphere to another; on the contrary, many reasons for supposing that it does, present themselves.

If it did not—the proportion of land and water, and consequently of plants and warm-blooded animals, being so different in the two hemispheres—we might imagine that the constituents of the atmosphere in them, would, in the course of ages, probably, become different; and that, consequently in such a case, man could not safely pass from one hemisphere to the other.

I considered the manifold beauties in the whole system of terrestrial adaptations; I reflected what a perfect and wonderful machine is this atmosphere; how exquisitely balanced, and beautifully compensated it is in all its parts. We all know that it is perfect; that in the performance of its manifold offices it is never once left to the guidance of chance—no, not for a moment. Therefore, I was led to ask myself why the air of the N. E. trades, when arrived at the zone of equatorial calms, should, after ascending, rather return to the north than to the south. Where and what is the principle upon which its course is decided?

Here again, I found circumstances which induced me to suppose it probable, that neither turned back to the north, nor mingled with the air which came from the regions of the S. E. trades, ascended, and then flowed indiscriminately to the north or the south.

But I saw reasons for supposing that what came to the equatorial calms as the N. E. trade-winds, continued to the south as an upper current; and that what had come to the same zone as S. E. trade-winds, ascended and continued over into the northern hemisphere as an upper current, bound for the calm zone of Cancer.

And these are the principal reasons upon which this supposition was based:—

At the seasons of the year when the sun is evaporating most rapidly in the southern hemisphere, the most rain is falling in the northern. Therefore, I supposed that much of the vapor which is taken up there is precipitated here.

The evaporating surface in the southern hemisphere is greater, much greater, than that in the northern; still, all the great rivers are in the northern hemisphere; the Amazon being regarded as common to both. And this, as far as it goes, is corroborative of the above.

Independently of other sources of information, the Charts taught me to believe that the mean temperature of the tropical regions was higher in the northern than in the southern hemisphere; for they show that the difference is such as to draw the equatorial edge of the S. E. trades far over on this side of the equator, and to give them force enough to keep the N. E. trade-winds out of the southern hemisphere almost entirely.

Consequently, as before stated, the S. E. trade-winds being in contact with a more extended evaporating surface, and continuing in contact with it for a longer time, or through a greater distance, they would probably arrive at the trade-wind place of meeting, more heavily laden with moisture than the others.

Taking the laws and rates of evaporation into consideration, I could find no part of the ocean of the northern hemisphere from which, according to the indications of the Charts, the sources of the Mississippi, the St. Lawrence, and the other great rivers of our hemisphere could be supplied.

It appeared to me, therefore, that the extra-tropical regions of the northern hemisphere stood in the relation of a condenser to a grand steam machine, the boiler of which was in the region of the S. E. trade-winds; and that the trade-winds of this hemisphere performed the like office for the regions beyond Capricorn.

The calm zone of Capricorn is the duplicate of that of Cancer, and the winds flow from it as they do from that; both north and south: with this difference, that on the polar side of the Capricorn belt, they prevail from the N. W. instead of the S. W.; and on the equatorial side from the S. E. instead of N. E.

Now, if it were so, that the vapor of the N. E. trade-winds were condensed in the extra-tropical regions of the southern hemisphere, the following path, on account of the effect of diurnal rotation of the earth upon the course of the winds, would represent the mean circuit of a portion of the atmosphere moving according to the general system of its circulation over the Pacific Ocean, viz: coming down from the north as an upper current, and appearing on the surface of the earth in about longitude 130° W., and near the tropic of Cancer, it would here commence to blow the N. E. trade-winds of that region.

Its course would be towards the equator, somewhat in the direction of the King's Mill group of islands. Meeting no land in this long oblique track over the tepid waters of a tropical sea, it would, somewhere to the east of these islands, arrive at the belt of equatorial calms, which always divides the N. E. from the S. E. trade-winds.

Here, depositing a portion of its vapor as it ascends, it would with the residuum take, on account of diurnal rotation, a course in the upper region of the atmosphere to the S. E. as far as the calms of Capricorn. Here it descends and continues on towards the coast of South America, in the same direction, appearing now as the prevailing N. W. wind of the extra-tropical regions of the southern hemisphere.

Travelling on the surface from warmer to colder regions, it must, in this part of its circuit, precipitate more than it evaporates.

Now it is a coincidence, at *least*, that this is the route by which, on account of the land in the northern hemisphere, the N. E. trade-winds have the fairest sweep over that ocean. That this is the route by which they are longest in contact with an evaporating surface; the route by which all circumstances are most favorable to complete saturation; and this is the route by which they can pass over into the southern hemisphere, most heavily laden with vapors for the extra-tropical regions of that half of the globe; and this is the supposed route which the N. E. trade-winds of the Pacific take to reach the equator, and to pass from it.

Accordingly, if this process of reasoning be good, that portion of South America between the calms of Capricorn and Cape Horn, upon the mountain ranges of which this part of the atmosphere, whose circuit I am considering as a type, first impinges, ought to be a region of copious precipitation. I accordingly turned to the hyetography of Berghaus and Johnson, and find it stated, on the authority of Captain King, that upwards of 12* feet of rain fell there in 41 days.

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* 153 inches.

Passing the snow-clad summits of the Andes, this same wind tumbles down upon the eastern slopes of the range, and then traverses the almost rainless and barren regions of Patagonia and South Buenos Ayres.

These conditions, the direction of the prevailing winds, and the amount of precipitation, were regarded as evidence afforded by nature, if not in favor, certainly not against the conjecture that such had been the voyage of this vapor through the air. At any rate, here was proof of the immense quantity of vapor which these winds of the extra-tropical regions carry along with them towards the poles; and I could imagine no other place than that suggested, whence these winds could get so much vapor.

I am not unaware of the theory, or of the weight attached to it, which requires precipitation to take place in the upper regions of the atmosphere on account of the cold there, irrespective of proximity to mountain tops and snow-clad hills.

But the facts and conditions developed by these Charts are in many respects irreconcilable with that theory. With a new system of facts before me, I have, independent of all preconceived notions and opinions, set about to seek among them for explanations and reconciliations.

Arrived at this stage in the process of deduction and finding conformity, the next step was to trace back the vapor that supplies the sources of the Mississippi River and its tributaries with rain, to its place in the ocean whence it came (for that the vapor of water is distributed over the earth by the winds, and not by permeation, my researches abundantly prove).

It rains more in the valley drained by that river than is evaporated from it again. The difference for a year is the volume of water annually discharged by that river into the sea.

At the time and place that the vapor which supplies this immense volume of water was lifted by the atmosphere up from the sea, it was reasoned that the thermometer stood higher than it did at the time and place where it was condensed and fell down as rain in the Mississippi Valley.

I looked to the south for the springs in the sea which supply the fountains of this river with rain. But I could not find spare evaporating surface enough for it in the first place; and if the vapor, I could not find the winds which would convey it to the right place.

The prevailing winds in the Caribbean Sea, and southern parts of the Gulf of Mexico, are the N. E. trade-winds. They have their offices to perform in the river basins of tropical America; and the rains which they may discharge into the Mississippi Valley now and then are exceptions, not the rule.

The winds from the north cannot bring vapors from the great lakes to make rains for the Mississippi, for two reasons; first, the basin of the great lakes receives from the atmosphere more water in the shape of rain than they give back in the shape of vapor. The St. Lawrence River carries off the excess.

2. The mean climate of the lake is colder than that of the Mississippi Valley; and, therefore, as a general rule, the temperature of the Mississippi Valley is unfavorable for condensing vapor from that quarter.

It cannot come from the Atlantic, because the greater part of the Mississippi Valley is to the windward of the Atlantic Ocean. The winds that blow across it go to Europe with their vapors; and in the

Pacific, from the parallels of California down to the equator, the direction of the wind at the surface is from, not toward, the basin of the Mississippi. Therefore, it seemed to be established, with some degree of probability—or, if that expression be too strong—with something like apparent plausibility, that the rain winds of the Mississippi Valley, as the general rule, do not get their vapors from the North Atlantic Ocean, nor from the Gulf of Mexico, nor from the great lakes, nor from that part of the Pacific Ocean over which the N. E. trade-winds prevail.

The same process of reasoning which induced me to look to the trade-wind region of the northern hemisphere for the sources of the Patagonian rains, induced me to look to the trade-wind regions of the South Pacific Ocean for the vapor springs of the Mississippi.

I therefore last summer addressed a circular letter to the farmers and planters of the Mississippi Valley, requesting to be informed as to the direction of the rain winds of each locality; and with the view of acquiring some idea as to the general hygrometric condition of the atmosphere, I asked also to be informed as to the kind and quality of fruits, and the like.

To this, I have received the following replies:—

From J. M. Janney, Warren County, Ohio.

Lat. 39° 30′ N.; Long. 84° W.

Winds from the southwest, with but few exceptions, bring rain; this is the result of eleven and a half years' observation.

Farm situated between the Miami Rivers. There are no mountains nearer than the Cumberland and Alleghany; the one lying in a southeast direction, and the other east of this locality. The nearest point to these elevations is perhaps not short of 225 or 250 miles. Lake Erie, situated about 100 miles northeast of us, is the nearest sheet of water.

The fruits are apples, pears, cherries, strawberries, raspberries, currants, gooseberries, quinces, and peaches. Grapes also thrive well. The products of the soil are maize, wheat, oats, flax, rye, and potatoes.

I may observe that the cold south winds often prevail through the winter; and during the spring cool, rather piercing northwest winds frequently assail us; during the prevalence of which drought is almost sure to exist. Snow-storms generally come from the southwest, but occasionally we have a heavy storm of this kind from the East. To me it is obvious that the winds that bring us rain sweep through the great Mississippi and Ohio valleys in their course northeast. [That is, they are southwest winds.]

From Wm. J. Payne, near Rushville, Rush County, Indiana.

Lat. 39° 30′ N.; Long. 85° 30′ W.

The winds are various; the west wind sometimes brings most rain during some years, but the southwest winds are more prevalent, and bring rain the greatest number of years.

Fruits are peaches, apples, pears, and cherries.

Productions—Corn, wheat, oats, rye, &c.

From Louis Moore, Carrollton, Mississippi.

Lat. 33° 30′ N.; Long. 90° W.

On an average, the winds that bring us rain are the southwest. Farm situated in a hilly district, some 150 miles from the sea-coast. The most common fruits are apples, peaches, &c., and melons in abundance. Agricultural staples are cotton, corn, oats, potatoes, &c.

From Turner Vaughan, La Guardo, Tennessee.

Lat. 36° 30′ N.; Long. 86° 30′ W.

Winds S. by W. bring the most rain, and W. N. W. the most storms; the latter, however, are unfrequent here, and very partial, owing perhaps to remoteness from the *sea.*

Whenever the lightning appears to linger in the north at eventide, rain almost invariably follows speedily; not so in the south.

Farm situated twenty-five miles above Nashville; surface undulating, abounding in limestone. Hemp and corn do well; tobacco, also; wheat and cotton inferior; grapes tolerable.

From Thomas Meaux, Amelia County, Virginia.

Lat. 37° 20′ N.; Long. 78° W.

Point of observation about thirty miles W. S. W. from Richmond.

Prevalent wind in spring, summer, and autumn from S. W., rain falling in showers during these seasons. Gusts and tornadoes, with black clouds, come from N. W. in late summer; protracted rains in spring and fall come from N. E.

Prevalent winds in winter E. to W. northwardly. Rains and snows in winter from N. E. Lowest observed temperature 6° Fahrenheit, at sunrise, Jan. 29, 1844; highest, 97°, noon, in shade, 20 July, 1844.

These observations made for twenty years.

From Willis Fawcett, St. Charles, Missouri.

Lat. 39° N.; Long. 90° 30′ W.

Wind from any point of the eastern half of the horizon will bring rain generally, after blowing twelve hours. It frequently happens that we have winds in a dry time to blow much longer, even several days, from that direction, without rain; but on the wind's shifting to the opposite side, we are sure of rain. I think our rains during summer come most frequently from the S. E. Wind from the S. W. is generally accompanied by good dry weather. West and N. W. are dry. I have noticed that thunder and lightning in the north is almost invariably followed here by storms of rain and hard winds within twelve or twenty-four hours.

My farm is on an alluvial prairie plain (probably formed by the washings of the Missouri and Mississippi), six miles below St. Charles.

The apple is our main dependence. Peaches also flourish finely; as do plums, cherries (except the

black), strawberries, gooseberries, wild and cultivated. Wheat and corn are the principal productions. Timothy hay will soon be exported from our neighborhood to a considerable extent. I cultivate wheat and corn almost exclusively.

These answers, as far as they go, show that the S. W. winds—the winds suggested by the Charts—are, except in Western Missouri, the rainy winds. These winds, like those between the same parallels upon the ocean, are going from a higher to a cooler temperature; and these winds in the Mississippi Valley, not being in contact with the ocean, or with any other evaporating surface to supply them with moisture, must bring with them from some sea or another, the moisture which they deposit.

Therefore, though it may be urged, inasmuch as the winds which brought the Patagonia rains came direct from the sea, that they therefore took up their vapors as they came along; yet it could not be so urged in this case; and if these winds could pass with their vapors from the equatorial calms through the upper regions of the atmosphere to the calms of Cancer, and then as surface winds into the Mississippi Valley, it was not perceived why the Patagonian rain winds should not bring their moisture by a similar route. These last are from the N. W., from warmer to colder latitudes; therefore, being once charged with vapors, they must precipitate as they go, and take up less moisture than they deposit.

This was circumstantial evidence. No fact had yet been elicited to prove that the course of atmospherical circulation suggested by my investigations is the actual course in nature. It is a case in which I could yet hope for nothing more direct than such conclusions as might legitimately flow from circumstantial evidence.

My friend Lieut. De Haven was about to sail in command of the American Expedition in search of Sir John Franklin. Infusoria are sometimes found in sea-dust, rain-drops, hail-stones or snow-flakes; and if by any chance it should so turn out that the *locus* of any of the microscopic infusoria which might be found descending with the precipitation of the Arctic regions should be identified as belonging to the regions of the S. E, trade-winds, we should thus add somewhat to the strength of the very slender clue by which we were seeking to enter into the chambers of the wind, and to "tell whence it cometh, and whither it goeth."

It is not for man to follow the "wind in his circuits;" and all that could be hoped was, after a close examination of all the facts and circumstances which these Charts have placed within my reach, to point out that course which seemed to be most in accordance with them; and then, having established a probability or even a possibility as to the true course of atmospheric circulation, to make it known and leave it for future investigations to confirm or set aside.

It was at this stage of the matter* that my friend Baron von Gerolt, the Prussian Minister, had the kindness to place in my hand Ehrenberg's work, "Passat-Staub und Blut-Regen."

Here I found the clue which I hoped, almost against hope, De Haven would place in my hands.

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* See my letter to him, in another part of this work; also, paper read by me before the American Association, at its meeting in Charleston, March, 1850.

That celebrated microscopist reports that he found South American infusoria in the blood-rains, and sea-dust of the Cape Verde Islands—Lyons, Genoa, and other places.

Thus confirming, as far as such evidence can, the indications of the "Wind and Current Charts," and increasing the probability that the general course of atmospherical circulation is in conformity with the suggestions of the Charts as I had interpreted them, viz: that the trade-winds of the southern hemisphere, after arriving at the belt of equatorial calms, ascend and continue in their course towards the calms of Cancer as an upper current from the S. W., and that, after passing this zone of calms, they are felt on the surface as the prevailing S. W. winds of the extra-tropical parts of our hemisphere; and that for the most part they bring their moisture with them from the trade-wind regions of the opposite hemisphere.

Continuing on towards the north pole from the S. W. they enter the Arctic regions on a spiral curve, continually lessening the gyrations until, whirling about in a *direction contrary to the hands of a watch*, this air ascends and commences its return as an upper current towards the calms of Cancer.

It returns to this zone from the opposite direction, N. E., by which it approached the pole.

The atmosphere in this part of the circuit is moving in the direction called s' in a previous part of this paper.

Arrived at the calms of Cancer, s' meets δ'' in the upper regions of the atmosphere.

They both descend—and the fact that the barometer stands higher here* than upon any other parallel, shows that here there is an increased atmospheric pressure, caused in part by accumulation produced by the opposing forces of s' and δ''; and in part by the downward currents.

Having descended, s' is forced out on the equatorial side of the zone, and appears on the surface as Δ—the N. E. trade-winds—and so continues until it reaches the belt of equatorial calms.

Here then is precipitation, an ascent of atmosphere, and a fall of the barometer; Δ now becomes δ or an upper current flowing in a S. E. direction—*i. e.* from N. W. towards the zone of the calms of Capricorn. Here it is met by the upper current from the Antarctic regions, descends with a rise in the barometer again, and appears on the polar side of this zone of calms, as Δ'—the prevailing N. W. surface winds in the extra-tropical regions of the southern hemisphere.

Δ' now approaches the Antarctic regions in a *spiral, gyrating with* the hands of a watch and contracting its convolutions as it draws nearer and nearer the pole, where theoretically there is another atmospherical node in which Δ' ascends with a low barometer, and commences its return towards the equator as δ' in the upper regions of the atmosphere.

The same cause—diurnal rotation—which made the Δ' on the surface to approach from the N. W., now operates to make it return as δ' in the direction whence it came.

Arriving in the upper regions at the calm zone of Capricorn, δ meets δ'; the two descend, and δ' continues to flow towards the equator as Δ', the S. E. trade-wind.

Arrived at the zone of equatorial calms, it ascends, and continues thence in the upper regions of the

* Humboldt.

atmosphere as δ'', until it reaches the calm zone of Cancer. Here it descends, and continues on as the S. W. passage winds of the northern hemisphere, whose circuit has been already described.

Thus, at the risk of repetition and of being thought tedious, I have described the progress which investigations connected with the Wind and Current Charts had enabled me to make in the theory of atmospherical circulation; and I have presented that theory as far as it had been developed in my own mind, when I received the *London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, No. 1, vol. i. 4th series, containing a synopsis of Dr. Faraday's *Experimental Researches in Electricity*, 24th, 25th, 26th, and 27th series; and also the letter of Prof. Von Feilitzsch on the "Physical Distinction of Magnetic and Diamagnetic Bodies."

This account, though meagre, is the first account that I have seen of the Doctor's discoveries relative to the magnetism of the atmosphere.

A new era in our knowledge of the laws, and the agents concerned in the general system of atmospherical circulation, will probably be dated from these discoveries.

With the accounts of them before me, I feel somewhat in the condition of the tempest-tossed mariner who has been buffeting with the waves in storm, clouds, and darkness, until he feels himself almost bewildered and lost in the mist that surrounds him; when suddenly a light appears, and, like the grateful mariner, I wished, before taking a fresh departure, to bring up my reckoning, and to ascertain how far I was out, in order to show how great was the service rendered by the sympathizing hand which put forth that light.

Dr. Faraday has shown that, as the temperature of oxygen is raised, its paramagnetic force diminishes, being resumed as the temperature falls again.

"These properties it carries into the atmosphere, so that the latter is, in reality, a magnetic medium, ever varying, from the influence of natural circumstances, in its magnetic power. If a mass of air be cooled, it becomes more paramagnetic; if heated, it becomes less paramagnetic (or diamagnetic), as compared with the air in a mean or normal condition."*

Now, is it not more than probable that here we have, in the magnetism of the atmosphere, that agent which guides the air from the south through the calms of Capricorn, of the equator, and of Cancer, and conducts it into the north; that agent which causes the atmosphere, with its vapors and infusoria, to flow above the clouds from one hemisphere into the other, and whose foot-prints had become so palpable?

With the lights which these discoveries cast, we see why that air, which has completed its circuit to the whirl† about the Antarctic regions, should then, according to the laws of magnetism, be repelled from the south, and attracted by the opposite pole towards the north.

And when the S. E. and the N. E. trade-winds meet in the equatorial calms of the Pacific, would not these magnetic forces be sufficient to determine the course of each current; bringing the former, with its vapors of the southern hemisphere, over into this, by the courses already suggested?

This force and the heat of the sun, would propel it to the north. The diurnal rotation of the earth

* Phil. Mag. and Journal of Science, 4th series, No. 1, January, 1851, page 73.

† "It whirleth about continually."—*Bible.*

propels it to the east; consequently, its course, first through the upper regions of the atmosphere, and then on the surface of the earth, after being conducted by this newly discovered agent across the calms of Cancer, would be *from* the southward and westward to the northward and eastward.

These are the winds which, on their way to the north, from the South Pacific, would pass over the Mississippi Valley, and they appear to be the rain winds there. Whence then, if not from the trade-wind regions of the South Pacific, can the vapors for those rains come?

According to this conjecture, and not taking into account any exceptions produced by the land and other circumstances upon the general circulation of the atmosphere over the ocean, the S. E. trade-winds which reach the shores of Brazil near the parallel of Rio, and which blow thence for the most part over the land, should be the winds which, in the general course of circulation, would be carried towards northern Africa, Spain, and the South of Europe.

They might carry with them the infusoria of Ehrenberg, but, according to his theory, they would be wanting in moisture. Now, those portions of the Old World are for the most part dry countries, receiving but a small amount of precipitation.

Hence the general rule: those countries to the north of the calms of Cancer, which have large bodies of land situated to the southward and westward of them, in the S. E. trade-wind region of the earth, should have a scanty supply of rain, and *vice versâ.*

Now, the extra-tropical part of New Holland comprises a portion of land thus situated in the southern hemisphere. Tropical India is to the northward and westward of it; and tropical India is in the N. E. trade-wind region, and should give extra-tropical New Holland a slender supply of rain. But what modifications the monsoons of the Indian Ocean may make to this rule, or what effect they may have upon the rains in New Holland, my investigations in that part of the ocean have not been carried far enough for a decision.

Taking up the theory of Ampère with regard to the magnetic polarity induced by an electrical current, according as it passes through wire coiled *with* or coiled *against* the sun, and expanding it in conformity with the discoveries of Faraday, we perceive a series of facts and principles which, being applied to the circulation of the atmosphere, make the conclusions to which the Charts have led me, touching the continual "whirl" of the wind in the Arctic regions *against*, and in the Antarctic *with the hands of a watch*, very significant—much more so than I had supposed them to be.

In this view of the subject, we see light springing up from various sources, by which the shadows of approaching confirmation are clearly perceived. One such source of light comes from the observations of Quetelet, at Brussels, which show that the great electrical reservoir of the atmosphere is in the upper regions of the air. It is filled with positive electricity, which increases as the temperature diminishes. We have another from the University of Greifswald, in Prussia.

Likening the atmosphere with its magnetic spirals of oxygen to the coils of a wire, and the poles of the earth to the ends of the helix used by Professor Von Feilitzsch, we might almost fancy that he was experimenting expressly with the view of throwing light upon the general course of atmospherical circulation.

"If," says he, in his letter to Dr. Faraday, "we observe two such neighboring particles near the external south pole, then will the more near repel a south pole with the intensity s; the more distant will turn to a

north pole with the intensity n', but in such a manner that $n' < s$. But outwardly, these two excited magnetisms act with the difference of their power $s - n'$; but this is in one case *south polar*, consequently of the same kind as the exciting south pole. The contrary will take place near the north pole, so that the *disengaged magnetism distributed over the bar, becomes south polar on that half which is turned to the south pole, but north polar on the other half that is turned to the north pole.* A substance where this takes place is *diamagnetic*, it places itself equatorial.

"When the bar of a magnetic substance is so qualified that the separating action of the molecules on each other must be taken into consideration, then it can become so strong, that the molecules in the middle of the substance are more strongly magnetic than towards the ends. If we observe once more two such particles near the external south pole, the south pole of the nearest will tend to recede by an intensity $\frac{s}{1}$ from this external south pole, but the more distant will turn towards it a north pole of the intensity $\frac{n'}{1}$, but in such a manner that $\frac{n'}{1} < \frac{s}{1}$. Outwardly, the two will act with the intensity $\frac{n'}{1} - \frac{s}{1}$, but this is north polar, therefore of a contrary nature to the exciting south pole. The contrary will take place near the pole, so that the *disengaged magnetism distributed over the bar becomes north polar on the half that is turned to the south pole, but south polar on that half which is turned towards the north pole.* A substance where this takes place is *magnetic*, it places itself *axial*."*

"Applying the former to the theory of Ampère, I was startled because it has hitherto taught only that currents which are parallel and directed in the same way, attract; but if they are parallel and not directed in the same manner, they are repulsive; therefore, that a current moving in the direction of the hands of a watch, in a spiral, produces a south pole on the entrance point in the spiral, but a north pole on the egression point. Hitherto, only such spirals have been constructed, in which the current in every winding shows an equal intensity.

"But I tried to arrange spirals of the following kind: one of them is constructed in such a way, that on two copper wires are soldered, to each of them, fifteen thin wires covered over with silk. The first winding backwards over the copper wire, *i. e.* the first convolution of the helices, beginning at the end, and proceeding towards the centre, is with all the fifteen wires; the second winding is only wound with 14 threads, whilst the fifteenth is carried along the axis, &c.; consequently, every convolution of the fifteen windings has a thread less, and the ends of all the other threads have direction of the axis. The ends of the fifteen threads are soldered in the middle, and the two thick wires, without touching each other, are so bent that they can be suspended in the little cups of the apparatus of Ampère; then a current passing through the spiral, will divide itself in such a manner that it is most strong on the external ends of the spiral, but decreases more and more to the middle. If the windings of the spiral took place in the direction of the hands of a watch, then the end of it, where the current enters, will become a south pole; but a *north pole*, kept parallel to the spiral, *will repel it*, only the final convolution will be attracted, and it represents the disengaged magnetism of the final surface.

* Phil. Mag., Jan. 1851, p. 58.

"A second spiral is wound like that described, only with this difference, that the strongest convolutions are in the middle, and the feeblest near the ends. This spiral will be attracted by the north pole of a magnet over the half in which the current moves at first, or enters, but the other half will be repulsed by it. The third spiral has the winding the same strength over the whole extent; it is indifferent to a magnet pole which is not too near, and only the final convolutions are attracted or repulsed.

"Therefore, it is permitted to enlarge the theory of Ampère in this manner:—

"—If an electric current passes through a spiral in the direction of the hand of a watch, and,

"*a* If the current is more feeble in every winding as it is nearer to the centre of the spiral, then that half is attracted by a south pole in which the current enters, except the first winding.

"*b* But if the current is stronger in every winding as it is nearer to the centre of the spiral, then that half is repulsed by a south pole in which the current enters, including the first winding.

"The contrary will be the case for that half in which the current leaves the helix, and likewise for the north pole of the magnet opposed."*

Attentively considering the experiments of the Professor of Greifswald, we may trace an analogy between his spirals and the spirals which the currents of the wind in "his circuits" describe about the earth. At the south polar calms, the atmospherical spiral is with the hand of the watch, and, as in the case of a spiral, so wound about its helix, the magnetism is south polar; and so *mutatis mutandis* for the regions of north polar calms.

May we not look, therefore, to find about the north and south magnetic poles these atmospherical nodes or calm regions, which I have theoretically pointed out there? In other words, are not the magnetic poles of the earth in those atmospherical nodes, the two standing in the relation of cause and effect, the one to the other?

And have we not a clue already placed in our hands, by which the motion of the circular storms of the northern hemisphere which are said to travel *against*, and those of the southern which are said to travel *with* the hands of a watch, seems to be connected with the like motion of the wind of each hemisphere in its circuit about its pole? and will not this clue, when followed up, lead us into the labyrinths of atmospherical magnetism for the solution of the mystery?

Indeed, so wide for speculation is the field presented by these discoveries, that we may in some respects regard this great globe itself, with its "cups" and spiral wires of air, earth, and water, as an immense "pile" and helix, which, being excited by the natural batteries in the sea and atmosphere of the tropics, excites in turn its oxygen, and imparts to atmospherical matter the properties of magnetism.

Thus, though it be not proved as a mathematical truth, that magnetism is the power which guides the storm from right to left, and from left to right; which conducts the moist and the dry air each in its appointed paths; and which regulated the "wind in his circuits;" yet that it is such a power, is rendered so very probable that the onus is now shifted, and it remains not to prove, but to disprove that such is its agency.

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* Phil. Mag., Jan. 1851, pp. 49, 50.

OF CLOUDS AND THE EQUATORIAL CLOUD-RING.*

During the progress of these investigations, the attention is frequently arrested by proof of the exquisite skill which has been displayed in the construction of the atmospherical machinery of the Earth; in wonder and admiration, we pause to contemplate its beautiful mechanism—its surprising performance.

Among the many striking features which this system of research presents for contemplation, the imagination dwells with peculiar delight upon those which are brought out in tracing the offices which are assigned to the clouds in the terrestrial economy.

One need not go to sea to perceive the grand work which the clouds perform in collecting moisture from the crystal vaults of the sky, in sprinkling it upon the fields, and making the hills glad with showers of rain. Winter and summer, "the clouds drop fatness upon the earth." This part of their office is obvious to all, and I do not propose to consider it now.

But the sailor at sea observes phenomena, and witnesses operations in the terrestrial economy, which tell him that, in the beautiful and exquisite adjustments of the grand machinery of the atmosphere, the clouds have other important offices to perform besides those merely of dispensing showers, of producing the rains, and of weaving mantles of snow for the protection of our fields in winter. As important as is this office, the philosophical mariner is reminded that the clouds have other commandments to fulfil, which, though less obvious, are not, therefore, the less benign or the less worthy of his notice. He beholds them at work in moderating the extremes of heat and cold, and in mitigating climates. At one time, they spread themselves out; they cover the earth as with a mantle; they prevent radiation from its crust, and keep it warm. At another time, they interpose between it and the sun, and screen it from his scorching rays, to protect the tender plants from his heat, the land from the drought. Having performed this office for one place, they are evaporated and given up to the sunbeam and the wind again, to be borne on their wings away to other places which stand in need of like offices.

Familiar with clouds and sunshine, the storm and the calm, and all the phenomena which the lightning and the blast present, the right-minded mariner, as he contemplates "the cloud without rain," ceases to regard it as an empty thing; he perceives that it performs many important offices; he regards it as a great moderator of heat and cold—as a "compensation" in the atmospherical mechanism which makes the performance of the grand machine perfect. Bound in his ship hence to the southern hemisphere, he enters the regions of the N. E. trades, and finds the sky sometimes mottled with clouds, but for the most part clear. Continuing his course towards the line, he finds his thermometer to rise higher and higher as he approaches the equator, until, entering the region of equatorial calms and rains, he feels the weather to become singularly oppressive; he discovers here that the elasticity of feeling which he breathed from the trade-wind air, has forsaken him.

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* Read before the American Association, at its meeting in Albany, New York, August, 1851.

Escaping from this gloomy region, and entering the S. E. trades, his spirits revive, and he turns to his log-book to see what changes are recorded there. He is surprised to find that, notwithstanding the oppressive weather of the rainy latitudes, both his thermometer and barometer stood, while in them, lower than in the clear weather on either side of them; that just before entering and just before leaving the rainy parallels, the mercury of the thermometer and barometer invariably stands higher than it does when within them, even though they include the equator. He has passed a ring of clouds that encircles the earth.

Perceiving this, he is reminded how this cloud-ring, by screening these parallels from the sun's rays, not only promotes the precipitation which takes place within them at certain periods, but how, also, the rains are made to change the places upon which they are to fall; and how, by travelling with the calm belt of the equator up and down the earth, this cloud-ring shifts the surface from which the heating rays of the sun are excluded; and how, by this operation, tone is given to the atmospherical circulation of the world.

In the ransacking of garrets and old sea-chests, to which these researches have given rise, for log-books, one of rare value, kept by a brother officer many years ago, has turned up. It is the journal of the late Commander Arthur Sinclair, kept on board the United States frigate Congress during a cruise to South America, in 1817–18. The picture which he has drawn of the weather under this *equatorial cloud-ring*, is singularly graphic and striking. He encountered this cloud-ring in the month of January, 1818, between the parallel of 4° N. and the equator, and from the longitude of 19° and 23° W. He says of it:—

"This is certainly one of the most unpleasant regions in our globe. A dense, close atmosphere, except for a few hours after a thunderstorm, during which time torrents of rain fall, when the air becomes a little refreshed; but a hot, glowing sun soon heats it again, and but for your awnings, and the little air put in circulation by the continual flapping of the ship's sails, it would be almost insufferable. No person, who has not crossed this region, can form an adequate idea of its unpleasant effects. You feel a degree of lassitude unconquerable, which not even the sea-bathing, which everywhere else proves so salutary and renovating, can dispel. Except when in actual danger of shipwreck, I never spent twelve more disagreeable days in the professional part of my life, than in these calm latitudes.

"I crossed the line on the 17th of January, at 8 A. M., in longitude 21° 20′, and soon found I had surmounted all the difficulties consequent to that event; that the breeze continued to freshen and draw round to S. S. E., bringing with it a clear sky and most heavenly temperature, renovating and refreshing beyond description. Nothing was now to be seen but cheerful countenances, exchanged as by enchantment, from that sleepy sluggishness which had borne us all down for the last two weeks."

In a clear day at the equator, this cloud-ring having slid to the north or south with the calm belt, the rays of the sun pour down upon the crust of the earth and raise its temperature to a scorching heat. The atmosphere dances above it, and the air is seen trembling in ascending and descending columns with busy eagerness to conduct the heat off, and deliver it to the regions aloft, where it is required to give momentum

to the air in its general channels of circulation. The dry season continues; the sun is vertical; and finally the earth becomes parched and dry; the heat accumulates faster than the air can carry it away; the plants begin to wither, and the animals to perish. Then comes the mitigating cloud-ring. The burning rays of the sun are intercepted by it. The place for the absorption and reflection, and the delivery to the atmosphere of the solar heat is changed; it is transferred from the upper surface of the earth to the upper surface of the clouds.

Radiation from the land and the sea below the cloud-belt is thus interrupted, and the excess of heat in the earth is delivered to the air, and by absorption carried up to the clouds, and there delivered to their vapors to prevent excess of precipitation.

In the mean time, the trade-winds north and south are pouring into this cloud-covered receiver, as the calm and rain-belt of the equator may be called, fresh supplies in the shape of ceaseless volumes of heated air loaded to saturation with vapor, which has to rise above and get clear of the clouds before it can commence the process of cooling by radiation. In the mean time, also, the vapors which the trade-winds bring from the north and the south, expanding and growing cooler as they ascend, are being condensed on the lower side of the cloud stratum, and their latent heat is set free, to check precipitation and prevent a flood.

While this process and these operations are going on on the other side of the cloud-ring, one not less important is going on on the upper side. There, from sunrise to sunset, the rays of the sun are pouring down without intermission. Every day, and all day long, they operate with ceaseless activity upon the upper surface of the cloud stratum. When they become too powerful, and convey more heat to the cloud vapors than the cloud vapors can reflect and give off to the air above them; then, with a beautiful elasticity of character, the clouds absorb the surplus heat. They melt away, become invisible, and retain, in a latent and harmless state, until it is wanted at some other place and on some other occasion, the heat thus imparted.

We thus have an insight into the operations which are going on in the equatorial belt of precipitation, and this insight is sufficient to enable us to perceive that exquisite indeed are the arrangements which Nature has provided for supplying this calm-belt with heat, and for pushing the snow-line there, high up above the clouds, in order that the atmosphere may have room to expand, to rise up, overflow, and course back into the channels of its circulation. As the vapor is condensed and formed into drops of rain, a twofold object is accomplished—coming from the cooler regions of the clouds, the rain drops are cooler than the air and earth below. They descend, and by absorption take up the heat which has been accumulating in the earth's crust during the dry season, and which cannot now escape by radiation. Thus this cloud-ring modifies the climate of all places beneath it; overshadowing at different seasons all parallels from 5° S. to 15° N.

In the process of condensation, these rain drops on the other hand have set free a vast quantity of latent heat, which has been gathered up with the vapor from the sea by the trade-winds and brought hither. The caloric thus liberated is taken by the air and carried up aloft still farther to keep, at the proper distance from the earth, the line of perpetual congelation. Were it possible to trace a thermal

curve in the upper regions of the air to represent this line, we should no doubt find it mounting sometimes at the equator, sometimes on this side, and sometimes on that, of it; but always so mounting as to overleap this cloud-ring. This thermal line would not ascend always over the same parallels, it would ascend over those between which this ring happens to be; and the distance of this ring from the equator is regulated according to the seasons.

If we imagine the atmospherical equator to be always where the calm-belt is which separates the N. E. from the S. E. trade-winds, then the loop in the thermal curve, which should represent the line of perpetual congelation in the air, would be always found to stride this equator; and it may be supposed that a thermometer, kept sliding on the surface of the earth so as always to be in the middle of this rain-belt, would show very nearly the same temperature all the year round; and so too would a barometer, the same pressure.

Returning and taking up the train of contemplation as to the office which this belt of clouds, as it encircles the earth, performs in the system of cosmical arrangements, we may see that the cloud-ring and calm zone which it overshadows perform the office both of ventrical and auricle in the immense atmospherical heart, where the heat and the forces which give vitality and power to the system are brought into play—where dynamical strength is gathered, and an impulse given to the air, sufficient to send it thence through its long and tortuous channels of circulation.

Thus this ring, or band, or belt of clouds, is stretched around our planet to regulate the quantity of precipitation in the rain-belt beneath it; to preserve the due quantum of heat on the face of the earth; to adjust the winds; and send out for distribution to the four corners, vapors in proper quantities to make up to each river basin, climate, and season its due quota of sunshine, cloud, and moisture. Like the balance-wheel of a well-constructed chronometer, this cloud-ring affords the grand atmospherical machine the most exquisitely arranged *self-compensation.* If the sun fail in his supply of heat to this region, more of its vapors are condensed, and heat is discharged from its latent storehouses in quantities just sufficient to keep the machine in the most perfect compensation. If, on the other hand, too much heat be found to accompany the rays of the sun as they impinge upon the upper circumference of this belt, then again on that side are the means of self-compensation ready at hand—so much of the cloud surface as may be requisite is then resolved into invisible vapor, in the vessels whereof surplus heat from the sun is stored away and held in the latent state until it is called for; when instantly it is set free and becomes a visible and active agent in the grand design.

That the thermometer stands lower beneath this cloud-belt than it does on either side of it, has not been shown; or if shown, it has not yet been made to appear by actual observation, so far as my researches are concerned; for the observations in my possession have not yet been discussed concerning the temperature of the air. But that the temperature of the air at the surface under this cloud-ring is lower, is a theoretical deduction as susceptible of demonstration as is the rotation of the earth on its axis. It is a well-known fact. Indeed, nature herself has hung a thermometer under this cloud-belt, that is more perfect than any that man can construct, and its indications are not to be mistaken.

Where do the vapors which form this cloud-ring, and which are here condensed and poured down into the sea as rain, come from? They come from the trade-wind regions; under the cloud-ring they rise up; as they rise up, they expand; and as they expand, they grow cool; moreover, it requires no mercurial instrument of human device to satisfy us that the air which brings the vapor for these clouds, cannot take it up and let it down at the same temperature. Precipitation and evaporation are the converse of each other; and the same air cannot precipitate and evaporate, take up and let down water at one and the same temperature. As the temperature of the air is raised, its capacity for receiving and retaining water in the state of vapor is increased; as the temperature of the air is lessened, its capacity for retaining that moisture is diminished. These are physical laws; and, therefore, when we see water dripping down from the atmosphere, we need no instrument to tell us that the elasticity of the vapor so condensed, and falling in drops, is less than was its elasticity when it was taken up from the surface of the ocean as water, and went up into the clouds as vapor.

Hence we infer, that when the vapors of sea-water are condensed, the heat which was necessary to sustain them in the vapor state, and which was borrowed from the ocean, is parted with; and that, therefore, they were subjected in the act of condensation to a lower temperature than they were in the act of evaporation. This is what is going on; ceaseless precipitation under this cloud-ring. Evaporation under it is suspended almost entirely the year round. It is formed by the meeting of the N. E. and S. E. trade-winds. The vapor and the air which they bring with them here ascend; as they ascend, they expand; as they expand, their temperature falls. Hence, we have first a cloud and then precipitation. We know that the trade-winds encircle the earth; that they blow perpetually; that they come from the north and the south, and meet each other near the equator; therefore, that this line of meeting extends around the world; that in it, the air which the trade-winds bring ascends; and that in this ascent clouds are formed. By the rainy seasons of the torrid zone, we can trace this cloud-ring stretched like a girdle round about the earth.

In view of these facts and of these laws, it is useless to consult the thermometer merely to learn whether the atmosphere under this cloud-ring be warmer or cooler than that on either side of it. Our knowledge of the laws of nature tells us that it is cooler.

In like manner, nature has placed a thermometer on the surface of the land and of the water, which tells us that the mean temperature of the top of the earth's crust, whether it be land or water, is higher than the mean temperature of the superincumbent air; and so far as the researches connected with these Charts have gone, and bear upon the subject, they indicate that it is so. Philosophers had already pointed to it as a probability, and suggested it as a truth.

Where the atmosphere meets the land and water, there is the greatest amount of heat on the earth's surface. At this place of meeting, the thermometer in every latitude attains its maximum. If we descend below this place into the ocean, or rise above it into the air, the mercury in the thermometer is observed to fall.

The heating rays of the sun, as they pass through the atmosphere, impart little or none of their

warmth to it. They must first strike the earth itself; the caloric is then absorbed or reflected by the solid and fluid parts of its crust, and given to the air. The land and the water receive the heat from the sun, and impart it to the atmosphere—more subtle than they, it is also more mobile and expansible. The moment that that stratum or layer of the atmospherical coating which envelops the earth, and which happens to be nearest to its crust, receives from it the least accession of heat, that moment it expands, becomes lighter, and flies off with it to the azure vault above. It thus gives place to a cooler layer, which in turn receives from the surface-crust fresh supplies of heat like the other, and conveys it away to the clouds. Thus, while the sun is heating both the land and the water, the atmosphere is receiving heat from them. The sun heats them; and they, the air. But the land and the sea do not give to the atmosphere all the heat they receive from the sun. They radiate off into space a considerable portion of it. Hence, we are entitled to infer that the mean temperature of the upper stratum of earth and water, generally, is higher than the mean temperature of the lower stratum of the air.

For particular localities and seasons there may be exceptions to this rule, as during the long nights of the polar winter, when that portion of the earth receives no heat from the sun's rays, and radiates profusely.

The Ferro Islands, and places similarly situated, may also form exceptions to the rule. These islands are surrounded by the warm waters of the Gulf Stream, and though standing in latitude 62° N., the ponds there are said to remain unfrozen all the winter. These islands probably receive more caloric by conduction from the air than by absorption from the sun's rays, and the air which supplies them with warmth derives it from the waters which have been heated in the inter-tropical regions of the Atlantic.

The belt of equatorial calms and rains encircles the earth; were the clouds which overhang this belt luminous, and could they be seen by an observer from one of the planets, they would present to him an appearance not unlike the rings of Saturn do to us. Such an observer would remark that this cloud-ring of the earth has a motion contrary to that of the axis of our planet itself—that while the earth was revolving rapidly from west to east, he would observe the cloud-ring to go slowly, but only relatively, from east to west. As the winds which bring the cloud vapor to this region of calms rise up with it, the earth is slipping from under it; and thus the cloud-ring, though really moving from west to east with the earth, goes relatively slower than the earth; and would, therefore, appear to require a longer time to complete a revolution.

But unlike the rings of Saturn through the telescope, the outer surface or the upper side to us, of this cloud-ring, would appear exceedingly jagged, rough, and uneven.

The rays of the sun playing upon this peak, and then upon that, of the upper cloud-surface, melt away one set of elevations, and create another set of depressions. The whole stratum is, it may be imagined, in the most turgid state; it is in continued throes when viewed from above; the heat which is liberated from below in the process of condensation, the currents of warm air ascending from the earth, and of cool descending from the sky, all, we may well conceive, tend to keep the upper cloud-surface in a perpetual state of agitation, upheaval, and depression.

Imagine in such a cloud stratum an electrical discharge to take place; the report being caught up by the cloud-ridges above, is passed from peak to peak, and repeated from valley to valley, until the last echo dies away in the mutterings of the distant thunder. How often do we hear the voice of the loud thunder rumbling and rolling away above the cloud surface, like the echo of artillery discharged among the hills.

Hence we perceive or infer that the clouds intercept the progress of sound as well as of light and heat through the atmosphere, and that this upper surface is often like Alpine regions.

It is by trains of reasoning like this, that we are continually reminded of the interest which attaches to the observations which the mariner is called on to make. There is no expression uttered by nature which is unworthy of our most attentive consideration; and mariners by registering in their logs the kind of lightning, whether sheet, forked, or streaked; and the kind of thunder, whether rolling, muttering, or sharp, may be furnishing facts which will throw much light on the features and character of the clouds in different latitudes and seasons.

As an illustration of the value and interest attached to the observations upon "little things," so called, I extract from the abstract log of a very close observer, who is co-operating with me in the collection of materials for these Charts: "In all my observations," writes this excellent and indefatigable seaman, in his abstract log kept for this office—"in all my observations on the tints of tropical flowers, I have found that yellow predominates."

No physical fact is too bald for observation; physical facts are the language of nature, and every expression uttered by her is worthy of our most attentive consideration. And the remark by this observant sailor about the predominance of yellow in tropical flowers, would, as a truism, be regarded with a high degree of interest both by the botanist and chemist.

MORE ABOUT THE RED SEA CURRENTS.

The remarks which I submitted to the American Association at its meeting in Charleston, page 112, and which, since the commencement of these investigations, have been made from time to time concerning the currents of the Red Sea, were based upon the suggestions derived from studying the operations of those agents which nature employs to keep up the oceanic circulation. Those remarks were based on theoretical deductions elaborated out of the fact, that there is a surface current known to be setting through the Straits of Babelmandeb into the Red Sea. Other observations, I had none.

I have attempted on divers occasions to show theoretically, how the surface of the Red Sea must, in consequence of evaporations, be higher at the Straits of Babelmandeb than at the Isthmus of Suez; how it presents an inclined plane to the northwest; how the water in this sea, after it has supplied the demands for vapor (which is fresh, not salt), is salter, and, therefore, heavier than that which is just entering to meet those demands; and how, therefore, the heavier and salter water must escape as an undercurrent through the Straits of Babelmandeb into the open ocean.

I have recently received the ninth volume of the *Transactions* of the Bombay Geographical Society,

from May, 1849, to August, 1850. From it, I learn that the excellent Society of which it is the organ, has especially included in its field of researches, "the determination of the saltness of the ocean, and of the arms and gulfs of the sea."

At p. 38, et seq. of that vol. is a paper by Dr. Buist, on the "Saltness of the Red Sea." That paper fully sustains the position which has already been advanced during these investigations. It contains so much that is valuable upon the subject, being for the most part the result of actual observation, that I take the liberty of extracting quite freely from it.

"Mr. Morris, Chief Engineer of the Ajdaha, had some time ago taken the more certain method of filling a succession of bottles full of water all the way from Suez to Bombay; and these having been placed in the hands of Dr. Giraud, whose assistance, valuable at all times, became doubly valuable from the promptitude, cheerfulness, and alacrity with which it was rendered, had found the following to be the results. They were unexpected, but there was no reason to doubt their accuracy:—

	LATITUDE.	LONGITUDE.	SPECIFIC GRAVITY.	SALINE CONTENTS.
	°	°		1000 parts.
No. 1. Sea at Suez	—	—	1027	41.0
No. 2. Gulf of Suez	27.49	33.44	1026	40.0
No. 3. Red Sea	24.29	36.	1024	39.2
No. 4. do.	20.55	38.18	1026	40.5
No. 5. do.	20.43	40.03	1024	39.8
No. 6. do.	14.34	42.43	1024	39.9
No. 7. do.	12.39	44.45	1023	39.2

"Dr. Giraud gives the following note of the saltness of the sea, from a variety of other localities. From this, it will be seen that the Mediterranean at Marseilles, is of the same saltness as the Red Sea at Suez; while the Atlantic, in the latitude of the Canaries, is $\frac{4}{1000}$ more salt.

Baltic	grs. 20.0	in 1000.
Frith of Forth	" 30.0	"
Boulogne	" 32.0	"
Havre	" 36.0	"
Bayonne	" 38.0	"
Marseilles	" 41.0	"
Atlantic (Canaries) . . .	" 44.0	"

"Following the sinuosities of the coast, the Red Sea shore is more than 4,000 miles in extent from the Straits of Babelmandeb round. Not one drop of water flows in from any of the countries on its shores, and the nearest river to the Red Sea is the Nile, which approaches it at Suez to within eighty miles, but retires on the southward to four or five times this distance; so that, on the average, there seems to be not less than 500 miles of the African side depending on the Red Sea for a supply of vapor. On the Arabian side, the arid expanse is of similarly ample dimensions; and in both cases, when a little rain does fall, at

the interval of years, it is nearly saturated with salt before it reaches the sea. The temperature of the air betwixt Suez and Aden, often rises to 90°, and probably averages little less than 75° day and night, all the year round. The surface of the sea varies in heat from 65° to 85°, and the difference betwixt the wet and dry bulb thermometers often amounts to 25°—in the kamsin or desert winds, to from 30° to 40°; the average evaporation at Aden is about eight feet for the year, though the air on the Arabian promontory is, from April to August, nearly as damp as at Bombay during the open periods of the monsoons.

"Assuming the evaporation of the Red Sea to be no greater than that of Aden, a sheet of water eight feet thick, equal in area to the whole expanse of the sea, will be carried off annually in vapor; or, assuming the Red Sea to be 800 feet in depth at an average—and this most assuredly is more than double the fact—the whole of it would be dried up, were no water to enter from the ocean, in 100 years. The waters of the Red Sea, throughout, contain some four per cent. of salt by weight—or, as salt is a half heavier than water, some 2.7 per cent. in bulk—or, in round numbers, say three per cent. In the course of three thousand years, on the assumptions just made, the Red Sea ought to have been one mass of solid salt."

The annual evaporation at Aden, in the Red Sea, is quoted by Dr. Buist at eight feet. According to the observations of Mr. Laidley, quoted in the same valuable *Transactions*, the annual evaporation at Calcutta is fifteen feet. Between the Cape and Calcutta, it amounts to three feet nine inches for October and November; and in the Bay of Bengal, it was found to exceed an inch a day, or at the rate of thirty feet and upwards the year. At Bombay, it is seventy-two inches.

Dr. Buist also tells us that the dew-point of the winds which blow over the Red Sea is frequently not less than thirty or forty degrees below the temperature of its water.

The evaporation, therefore, which goes on night and day, and all the year, from its waters near Suez, is probably much more than eight feet the year. It is probably not less than eighteen feet; and if, therefore, it took the waters which enter that sea through the Straits of Babelmandeb a year to flow up to the Isthmus of Suez, it is evident that the level of this sea at the isthmus would be eighteen feet below its level at the straits; for, by the supposition, eighteen feet have been taken up into the clouds by evaporation from the surface, and borne away by the winds. And now if we suppose, merely for the convenience of illustration, the waters to be thirty-six feet deep at the straits, the bottom of the sea to be a perfect level thence to Suez, it would require no lead and line, nor chemist, to tell us that the depth of the Red Sea at its head was just eighteen feet, and that the water here had just twice as much salt in it as the water at the strait has. Now the water at the straits could not balance this brine. The brine is the heavier, and out it must flow as an undercurrent, as exemplified by the illustrations with regard to the water and oil in a trough, p. 113.

It probably does not take the water more than sixty days on the average to reach the head of the Red Sea after first entering it. In that case, the annual evaporation being eighteen feet, the difference of level would be three feet, and this estimate is probably not far wrong.

Thus the conditions with regard to the Red Sea, viz: higher level, and an undercurrent at the Straits

of Babelmandeb, are theoretically established, with just as much certainty as we might expect to find salt at the bottom of it were the mouth to be closed and all the water now in it to be evaporated.

With regard to the undercurrent from the Mediterranean, and which undercurrent is caused by similar agencies, an early idea as to its existence was owing to the following circumstances, as given in a paper, "Of the Currents at the Strait's Mouth," by Captain ———, communicated by Dr. Hudson to the Philosophical Society, 1724.

"It is very remarkable," continues that remarkable paper, "that in the year 1712, Mons. du L'Aigle, that fortunate and generous commander of the privateer called the Phœnix, of Marseilles, giving chase near Ceuta Point to a Dutch ship bound to Holland, he came up with her in the middle of the gut between Tariffa and Tangier, and there gave her one broadside, which directly sank her, all her men being saved by Mons. du L'Aigle; and a few days after, the Dutch ship, with her cargo of brandy and oil, arose on the shore near Tangier, which is at least four leagues to the westward of the place where she sunk, and directly against the strength of the current; which has persuaded many men that there is a recurrency in the deep water in the middle of the gut that sets outward to the grand ocean, which this accident very much demonstrates; and, possibly, a great part of the water which runs into the straits returns that way, and along the two coasts before mentioned; otherwise, this ship must of course have been driven towards Ceuta, and so upwards. The water in the gut must be very deep; several of the commanders of our ships of war having attempted to sound it with the longest lines they could contrive, but could never find any bottom."

In 1828, Dr. Wollaston, in a paper before the Philosophical Society, stated that he found the specific gravity of a specimen of sea-water from a depth of 670 fathoms, fifty miles within the straits, to have a "density exceeding that of distilled water by more than four times the usual excess, and accordingly leaves, upon evaporation, more than four times the usual quantity of saline residuum. Hence, it is clear that an undercurrent outward of such denser water, if of equal breadth and depth with the current inward near the surface, would carry out as much salt below as is brought in above, although it moved with less than one-fourth part of the velocity, and would thus prevent a perpetual increase of saltness in the Mediterranean Sea, beyond that existing in the Atlantic."

The Doctor obtained this specimen of sea-water from a captain in the English Navy, who had collected it for Doctor Marcet. Dr. Marcet died before receiving it, and it had remained in the captain's hands some time before it came into those of Wollaston.

It may, therefore, have lost something by evaporation; for it is difficult to conceive that all the river-water and three-fourths of the sea-water which runs into the Mediterranean is evaporated from it, leaving a brine for the undercurrent, having four times as much salt as the water at the surface of the sea usually contains. Very recently, M. Coupvent des Bois has shown, by actual observation, the existence of an outer and undercurrent from the Mediterranean.

These facts, and the statements of the Secretary of the Geographical Society of Bombay, seem to leave no room to doubt as to the existence of an undercurrent from the Red Sea, and as to the cause of the surface current which flows into it. I think it a matter of demonstration.

ON THE GEOLOGICAL AGENCY OF THE WINDS.*

Nature is a whole, and all the departments thereof are intimately connected. If we attempt to study in one of them, we find ourselves tracing clues which lead us off insensibly into others, and, before we are aware, we discover ourselves exploring the chambers of some other department.

The study of drift takes the geologist out to sea, and reminds him that a knowledge of waves, winds, and currents, of navigation and hydrography, are closely and intimately connected with his favorite pursuit.

The astronomer directs his telescope to the most remote star, or to the nearest planet in the sky, and makes an observation upon it. He cannot reduce this observation, nor make any use of it, until he has availed himself of certain principles of optics; until he has consulted the thermometer, gauged the atmosphere, and considered the effect of heat in changing its powers of refraction. In order to adjust the pendulum of his clock to the right length, he has to measure the water of the sea and weigh the earth. He too must therefore go into the study of the tides; he must examine the earth's crust, and consider the matter of which it is composed, from pole to pole, circumference to centre; and in doing this, he finds himself in his researches right alongside of the navigator, the geologist, and the meteorologist, with a host of other good fellows, each one holding by the same thread, and following it up into the same labyrinth—all, it may be, with different objects in view, but nevertheless, where there are stores of knowledge for all, and instruction for each one in particular. And thus, in undertaking to follow the "wind in his circuits" over the ocean, I have found myself standing side by side with the geologist on the land, and with him far away from the sea-shore, engaged in considering some of the phenomena which the inland basins of the earth —those immense indentations on its surface that have no sea-drainage—present for contemplation and study.

Among the most interesting of these, is that of the Dead Sea. Lieutenant Lynch, U. S. Navy, has run a level from that sea to the Mediterranean, and finds the former to be about 1,300 feet below the general sea level of the earth. In seeking to account for this great difference of water level, the geologist examines the neighboring region, and calls to his aid the forces of elevation and depression which are supposed to have resided in the neighborhood; he then points to them as the agents which did the work. They are mighty agents, and they have diversified the surface of the earth with the most towering monuments of their power. But is it necessary to suppose that they resided in the vicinity of this region? May they not have been, if not in this case, at least in the case of other inland basins, as far removed as the other hemisphere? This is a question which I do not pretend to answer definitely. But the inquiry as to the geological agency of the winds in such cases, is a question which my investigations have suggested; and I therefore present it as one which, in accounting for the formation of this or that inland basin, is worthy, at least, of consideration.

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* Read before the American Association at its meeting in Albany, New York, Aug. 1851.

Is there any evidence that the annual amount of precipitation upon the water-shed of the Dead Sea, at some former period, was greater than the annual amount of evaporation from it? If yea, where did the vapor that supplied the excess of that precipitation come from, and what has cut off that supply? The mere depression of the lake bed would not do it.

If there were ever a river from the Dead Sea to the arms of the ocean about it, we may imagine that river to have abounded with falls, as the rivers do which drain the North American lakes into the Atlantic. And if we establish the fact that the Dead Sea did ever send a river to the ocean, we carry along with it the admission that when that sea overflowed into that river, then the water that fell from the clouds over the Dead Sea basin was more than the winds could convert into vapor and carry away again; the river carried off the excess to the ocean.

In the basin of the Dead Sea, in the basin of the Caspian, of the Sea of Aral, and in the other inland basins of Asia, we are entitled to infer that the precipitation and evaporation are at this time exactly equal. Were it not so, the level of these seas would be rising or sinking. If the precipitation were in excess, these seas would be gradually becoming fuller; and if the evaporation were in excess, they would be gradually drying up; but observation does not show, nor history tell us, that either is the case. As far as we know, the level of these seas is as permanent as that of the ocean, and it is difficult to realize the existence of subterranean channels between it and the great ocean. Were there such a channel, the Dead Sea being the lower, it would be the recipient of ocean waters; and we cannot conceive how it should be such a recipient without ultimately rising to the level of its feeder.

It may perhaps be evident that the question suggested by my researches has no bearing upon the Dead Sea; that local elevations and subsidences alone were concerned in placing the level of its waters where it is. But is it probable that, throughout all the geological periods, during all the changes which have taken place in the distribution of land and water surface over the earth, the winds, which in the general channels of circulation pass over the Dead Sea, have alone been unchanged? Throughout all ages, periods, and formations, is it probable that the winds have just brought as much moisture to that sea as they now bring, and have just taken up as much water from it as they now carry off? It is possible. But because the agency of the winds may have had nothing to do in placing the level of the Dead Sea where it is, does it therefore follow that the consideration of this question would be irrelevant in the attempt to account for the level of the water reservoir of other inland basins?

Where does the water, which falls from the clouds upon the valley of the great North American lakes, come from? It goes into the sea, and out of the sea it must come again; else "the sea would be full;" for "all the rivers run into the sea." From what part of the sea, therefore, do the clouds get vapor to make rain of for the lake country?

My researches with regard to the winds, have suggested the probability that the vapor which is condensed into rains for the lake valley, and which the St. Lawrence carries off to the Atlantic Ocean, is evaporated by the S. E. trade-winds of the Pacific Ocean. Suppose this to be the case, and that the winds which bring this vapor, arrive with it in the lake country at a mean dew-point of 50°. This would

make the S. W. winds the rain-winds for the lakes generally, as well as for the Mississippi Valley; they are also, speaking generally, the rain-winds of Europe, and, I have no doubt, of extra-tropical Asia also.

Suppose a certain mountain-range, thousands of miles to the S. W. of the lakes, but across the path of these winds, were to be suddenly elevated, and its crest pushed up into the regions of snow, having a mean temperature of 30° Fahr. The winds, in passing that range, would be subjected to a dew-point of 30°; and, not meeting with any more evaporating surface between such range and the lakes, they would have no longer any moisture to deposit at the supposed lake temperature of 50°; they could not yield the dew-point to anything above 30°. Consequently, the amount of precipitation in the lake country would fall off; the winds which feed the lakes would cease to bring as much water as the lakes now give to the St. Lawrence; that river, and the Niagara, would drain them to the level of their bed; evaporation would be increased, by reason of the dryness of the atmosphere and the want of rain, and the lakes would sink to that level at which, as in the case of the Caspian Sea, the precipitation and evaporation would finally become equal. Thus, our great lakes would remain inland seas at a permanent level; the salt brought from the soil, by the washings of the rivers and rains, would cease to be taken off to the ocean as it now is; and finally, too, the great lakes, in the process of ages, would become first brackish, and then briny. Now suppose the water-basins which hold the lakes to be over a thousand fathoms (6,000 feet) deep. We know they are not nearly so deep; but suppose them to be 6,000 feet deep. The process of evaporation, after the St. Lawrence had gone dry, might go on until one or two thousand feet or more were lost from the surface; and we should then have another instance of the level of an inland water basin being far below the sea level, as in the case of the Dead Sea; or it would become a rainless district, when the lakes themselves would go dry.

Corallines are at work about the Gulf Stream; they have built up the Florida Reefs on one side, and the Bahama Banks on the other. Suppose they should build up a dam across that pass, and obstruct the Gulf Stream; and that, in like manner, they were to connect Cuba with Yucatan, by damming up the Yucatan Pass, so that the waters of the Atlantic should cease to flow into the gulf. What should we have?

The depth of the marine basin which holds the waters of the gulf, is, in the deepest part, about a mile and a half. The officers of the U. S. ship Albany have run a line of deep-sea soundings from west to east across the gulf; the greatest depth they obtained was about 8,000 feet.

We should therefore have, by stopping up the channels between the gulf and the Atlantic, not a sea level in the gulf, but we should have a mean level between evaporation and precipitation. If the former were in excess, the level of the gulf waters would sink down until the surface exposed to the air would be just sufficient to return to the atmosphere, as vapor, the amount of water discharged by the rivers—the Mississippi and others—into the gulf. As the waters were lowered, the extent of evaporating surface would grow less and less, until nature should establish the proper ratio between the ability of the air to take up, and the capacity of the rain to let down. Thus, we might have a sea whose level would be much farther below the water level of the ocean than is the Dead Sea.

There is still another process, besides the two already alluded to, by which the drainage of these inland basins may, through the agency of the winds, have been cut off from the great salt seas; and that is, by the elevation of continents from the bottom of the sea in distant regions of the earth, and the substitution caused thereby of a dry land for a water surface as the source of vapor supply to the winds that blow over the place.

From what part of the ocean, I again ask, comes the vapor that forms the rains that fall on that immense water-shed to which the American lakes give drainage? My investigations have suggested the idea that they come from the trade-wind region of the South Pacific Ocean. Certain it is, that they must come from the sea, and not from the land; for in this view, I do not consider the rain which falls to-day, and is taken up straightway into the clouds to be precipitated again to-morrow; but I consider the excess of the precipitation over the evaporation, which, in this case, is the volume of water discharged by the St. Lawrence into the sea; that is, the amount of water which has to be taken up from the sea again, carried back through the air to the lake country, and precipitated upon it. And I therefore repeat the question: Where, from what portion of the ocean, was the water which is discharged by the St. Lawrence taken up into the air? It must be taken up from some portions where the evaporation is greater than the precipitation; and that is only in the trade-wind region; and it must also be taken up where the mean temperature, or, at any rate, where the mean dew-point is higher than it is in the lake country; for, after moisture gets into the atmosphere, it is only by lowering the dew-point that we can get it out again.

Now suppose that a continent should rise up in that part of the ocean, wherever it may be, that supplies the clouds with the vapor that makes the rain for this lake water-shed. What would be the result? Why, surely, a change of climate in the lake country; an increase of evaporation from it; because a decrease of precipitation upon it, and consequently a diminution of cloudy screens to protect the waters of the lakes from being sucked up by the rays of the sun; and consequently, too, there would follow a low stage for watercourses, and a lowering of the lake level would ensue.

So far, I have used the lakes only hypothetically, that I might the better illustrate the bearings of the question with which I set out, viz: Where have the subsidences and the elevations taken place, that have made an inland basin here and another there? Is the seat of this action near by, or far off; and what have the winds had to do in cutting off the sea-drainage of inland water-sheds?

But in this hypothetical case, with regard to the hydrographical basins of the gulf and lakes, I have confined myself strictly to analogies. Mountain ranges have been upheaved across the course of the winds, and continents have been raised from the bottom of the sea; and, no doubt, the influence of such upheavals has been felt in remote regions by means of the winds, and the effects which a greater or less amount of moisture brought by them would produce.

In the case of the Salt Lake of Utah, we have an example of drainage that has been cut off, and an illustration of the process by which nature equalizes the evaporation and precipitation. To do this, in this instance, she is salting up the basin which received the drainage of this inland water-shed. Here we have

the appearance, I am told, of an old channel by which the water used to flow from this basin to the sea. Supposing there was such a time and such a watercourse, the water returned through it to the ocean was the amount by which the precipitation used to exceed the evaporation over the whole extent of country drained through this, now dry, bed of a river. The winds have had something probably to do with this; they are the agents which used to bring more moisture to this water-shed than they took away; and they are the agents which now carry off from that valley more moisture than is brought to it, and which, therefore, are making a salt bed of places that used to be covered by water. In like manner, there is evidence that the Great American lakes formerly had a drainage with the Gulf of Mexico. Steamers have been actually known, in former years, and in times of freshets, to pass from the Mississippi over into the lakes. At low water, the bed of a dry river can be traced between them. Now the Salt Lake of Utah is to the southward and westward of our northern lake basin; that is the quarter whence the rain winds have been supposed to come. May not the same cause which lessened the precipitation or increased the evaporation in the Salt Lake water-shed, have done the same for the water-shed of the Great American system of lakes?

If the mountains to the west, the Sierra Nevada, stand higher now than they formerly did, and if the winds which fed the Salt Lake valley with precipitation had, as I suppose they have, to pass the summits of the mountains, it is easy to perceive why the winds should not convey as much vapor across them now, as they did when the summit of the ranges was lower and not so cool.

The Andes, in the trade-wind region of South America, stand up so high that the wind, in order to cross them, has to part with all its moisture; and consequently there is, on the other side, a rainless region. Now suppose a range of such mountains as these to be elevated across the track of the winds which supply the lake country with rains; it is easy to perceive how the whole country, watered by the vapor which such winds bring, would be converted into a rainless region.

I have used these hypothetical cases to illustrate a position which any philosopher, who considers the geological agency of the winds, may with propriety consult, when he is told of an inland basin, the water level of which it is evident was once higher than it now is; and that position is, that, though the evidences of a higher water level be unmistakable and conclusive, it does not follow, therefore, that there has been a subsidence of the lake basin itself, or an upheaval of the water-shed drained by it.

The cause which has produced this change of water level, instead of being local and near, may be remote; it may have its seat in the obstructions which have been interposed in some other quarter of the world; which obstructions may prevent the winds from taking up, or from bearing off, their wonted supplies of moisture for the region whose water level has been lowered.

I am not prepared to maintain that the water level of our great system of lakes has been changed by any such process; though I do not think it improbable. Nor am I prepared to ascribe the change in the Salt Lake of Utah *wholly* to obstructions, near or remote, which have prevented the winds from bringing as many and as copious rain-clouds as they at some remote period were wont to bring to this valley; though in this case it appears obvious that the precipitation has diminished, and the evaporation has

increased; and it is not easily perceived how a mere subsidence of the lake basin would change the rate of evaporation, or alter the amount of precipitation there.

Having, therefore, I hope, made clear the meaning of the question proposed, by showing the manner in which winds may become important geological agents; and having explained how the upheaving of a mountain range in one part of the world may, through the winds, affect climates and produce geological phenomena in another, I return to the Dead Sea, and the great inland basins of Asia, and ask how far is it possible for the elevation of the South American continent, and the upheaval of its mountains, to have had any effect upon the water level of those seas? There are indications that they all once had a higher water level than they now have; and that formerly the amount of precipitation was greater than it now is; then what has become of the sources of vapor? What has diminished its supply? Its supply would be diminished by the substitution of dry land, in those parts of the ocean which used to supply that vapor; or the quantity of vapor deposited in the hydrographical basins of those seas, would have been lessened, if a snow-capped range of mountains had been elevated across the path of these winds, and between the places where they were supplied with vapor, and these basins.

A chain of evidence, which it would be difficult to set aside, can be introduced, if required, to show that the vapor which supplies the extra-tropical regions of the north with rains, comes, in all probability, from the trade-wind regions of the southern hemisphere.

The prevailing winds of the temperate zones blow towards the poles; they are going from warmer to colder climates. Consequently, their capacity for moisture increases with their temperature; and they must precipitate, on their way from warmer to colder regions, more water than they can take up again.

The prevailing winds of the torrid zone blow towards the equator; they are going from colder to warmer climates. Their capacity for moisture is therefore on the increase; and they therefore must evaporate, from this zone, more water than they precipitate upon it again.

All the great rivers lie in the northern hemisphere. With more land and less water, its total amount of precipitation is nevertheless greater than that of the southern hemisphere.

The evaporating surface of sea-water, exposed to the action of the southeast trade-winds, exceeds several times, in extent, that upon which the northeast trade-winds are known to play. The southeast trade-winds, when they arrive at the belt of equatorial calms, charged with vapor from the sea, should, when they rise up and come over into this hemisphere, take, in consequence of the earth's diurnal motion, a direction to the northeast. This is the direction which the rains of the Mississippi Valley indicate, and which the microscope of Ehrenberg has proved that the southeast trade-winds do take; for, in a northeasterly direction from the great river basins of equatorial America, and in the vicinity of the Cape de Verde Islands, at Lyons and Genoa, in Malta and the Tyrol, showers of the so-called sirocco dust are known to occur. That celebrated microscopist has examined, with the utmost care, specimens of this dust; and in every specimen that has come to his notice during the period of sixteen years, he has recognized the same organisms, the same forms in them all; and he traces the *locus* of the great majority of them to the trade-wind regions of South America.

Now, if it be true that the trade-winds from that part of the world take up there the water which is to be rained in the extra-tropical north, the path ascribed to the southeast trades of Africa and America, after they descend and become the prevailing southwest winds of the northern hemisphere, should pass over a region of less precipitation, generally, than they would do, if, while performing the office of southeast trades, they had blown over water instead of land. The southeast trade-winds, with their load of vapor, whether great or small, take, after ascending in the equatorial calms, a northeasterly direction; they continue to flow in the upper regions of the air, in that direction, until they cross the tropic of Cancer. The places of least rain, then, between this tropic and the pole, should be precisely those places which depend for their rains upon the vapor which the winds that blow over southeast trade-wind Africa and America convey.

Now, if we could trace the path of these winds through the extra-tropical regions of the northern hemisphere, we should be able to identify it by the foot-prints of the clouds; for the path of the winds which depend for their moisture upon such sources of supply as the dry land of Central South America and Africa, cannot lie through a country that is watered well.

It is a remarkable coincidence, at least, that the countries in the extra-tropical regions of the north, that are situated to the northeast of the southeast trade-winds of South Africa and America; that the countries with us, over which theory makes these winds to blow, include all the great deserts of Asia, and the districts of least precipitation in Europe.*

The hyetographic map of Europe, in Johnston's beautiful *Physical Atlas*, places the region of least precipitation between these two lines. See Plate IV.

It would seem that nature, as if to reclaim this "lee" land from the desert, had stationed by the wayside of these winds a succession of inland seas to serve them as relays, for supplying with moisture this thirsty air. There is the Mediterranean Sea, the Caspian Sea, and the Sea of Aral, all of which are situated exactly in this direction; as though these sheets of water were designed, in the grand system of aqueous arrangements, to supply with fresh vapor, winds that had already left rain enough behind them to make an Amazon and an Oronoco of.

The Andes were once covered by the sea; for their tops are now crowned with the remains of marine

* Let any one take a map of Mercator's projection, and on it draw lines from the tropic of Cancer towards the north, to represent the probable route and direction which the trade-winds of the two southern continents take, in their general channels of circulation over the northern continents. The country between these two lines is the country which, in the general system of atmospherical circulation, lies under the lee of southeast trade-wind Africa and America. And to see where this country is, we have first to ascertain where those two points on the equator are, between which the southeast trade-winds cross, after having traversed the greatest extent of land surface in South America; and then from these points to project lines in the direction which these winds are supposed to take, after rising up in the equatorial calms. These two points will be, one near the mouth of the Amazon, the other not far from the Gallapagos Islands; the part of the equator between them is the part crossed by the southeast trades, after having traversed the greatest extent of land from whose surface the supplies of moisture are most scanty. A line from the Gallapagos through Florence in Italy, another from the mouth of the Amazon through Aleppo in Holy Land (Plate IV.), would, after passing the tropic of Cancer, mark upon the surface of the earth the route of these winds; this is that "lee country," which, if such be the system of atmospherical circulation, ought to be scantily supplied with rains.

animals. When they and their continent were submerged—admitting that Europe in general outline was then as it now is—it cannot be supposed, if the circulation of vapor were then such as it is supposed now to be, that the climates of that part of the old world which is under the lee of those mountains, were then as scantily supplied with moisture as they now are. When the sea covered South America, the winds had nearly all the waters, which now make the Amazon, to bring away with them, and to distribute among the countries situated along the route ascribed to them.

Is there any evidence that the basin which holds the Caspian Sea has been more copiously watered than it is now? There is evidence in favor of the probability that it has been; for portions of that sea have retired, and left salt beds behind.

If ever the Caspian Sea exposed a larger surface for evaporation than it now does; if the precipitation in that valley ever exceeded the evaporation from it, as it does in all valleys drained into the open sea; then there must have been a change of hygrometrical condition there. And admitting the vapor-springs for that valley to be situated in the direction supposed, the rising up of a continent from the bottom of the sea, or the upheaval of a range of mountains in certain parts of America, Africa, or Spain, across the route of the winds which brought the rain for Caspian water-shed, might have been sufficient to rob them of the moisture which they were wont to carry away and precipitate upon this great inland basin. See how the Andes have made Atacama a desert, and of Western Peru a rainless country; these regions have been made rainless simply by the rising up of a mountain range between them and the vapor springs in the ocean which feed with moisture the winds that blow over these now rainless regions.

That part of Asia, then, which is under the lee of southern trade-wind Africa, lies to the north of the tropic of Cancer, and between two lines, the one passing through Cape Palmas and Medina, the other through Aden and Delhi. Being extended to the equator, they will include that part of it which is crossed by the continental southeast trade-winds of Africa, after they have traversed the greatest extent of land surface. Plate IV.

The range which lies between the two lines that represent the course of the American winds with their vapors, and the two lines which represent the course of the African winds with their vapors, is the range which is under the lee of winds that have for the most part traversed water surface, or the ocean, in their circuit as southeast trade-winds. But a bare inspection of Plate IV. will show that the southeast trade winds which cross the equator between long. 15° and 50° W., and which are supposed to blow over into this hemisphere between these two ranges, have traversed land as well as water; and the Trade-wind Chart shows that it is precisely those winds, which in the summer and fall are converted into southwest monsoons for supplying the whole extent of Guinea with rains to make rivers of. Those winds, therefore, it would seem, leave much of their moisture behind them, and pass along to their channels in the grand system of circulation, for the most part as dry winds. Moreover, it is not to be supposed that the channels through which the winds blow, that cross the equator at the several places named, are as sharply defined in nature as the lines suggested, or as Plate IV. would represent them to be.

The whole region of the extra-tropical old world, that is included within the ranges marked, is the

region which has most land to windward of it in the southern hemisphere. Now, it is a curious *coincidence* at least, that all the great extra-tropical deserts of the earth, with those regions in Europe and Asia which have the least amount of precipitation upon them, should lie within this range. That they are situated under the lee of the southern continents, and have but little rain, may be a coincidence, I admit; but that these deserts of the Old World are placed where they are, is no coincidence, no accident: they are placed where they are, and as they are, by design; and in being so placed, it was intended that they should subserve some grand purpose in the terrestrial economy. Let us see, therefore, if we can discover any marks of that design—any of the purposes of such an arrangement—and trace any connection between that arrangement and the supposition which I maintain, as to the place where the winds that blow over those regions derive their vapors.

It will be remarked at once that all the inland seas of Asia, and all those of Europe, except the semi-freshwater gulfs of the north, are within this range. The Persian Gulf and the Red Sea, the Mediterranean, the Black, and the Caspian, all fall within it. And why are they planted there? Why are they arranged to the northeast and southwest under this lee, and in the very direction in which theory makes this breadth of thirsty winds to prevail? Clearly and obviously, one of the purposes in the Divine economy was, that they might replenish with vapor the winds which are almost vaporless when they arrive at these regions in the general system of circulation. And why should these winds be almost vaporless? They are almost vaporless, because their route in the general system of circulation is such, that they are not brought into contact with a water surface from which the needful supplies of vapor are to be had; or, being obtained, the supplies have since been taken away by the cool tops of mountain ranges over which these winds have had to pass.

In the Mediterranean, the evaporation is greater than the precipitation. Upon the Red Sea, there never falls a drop of rain; it is all evaporation. Are we not, therefore, entitled to regard the Red Sea as a make-weight thrown in to regulate the proportion of cloud and sunshine, and to dispense rain to certain parts of the earth in due season and in proper quantities? Have we not, in these two facts, evidence conclusive, that the winds which blow over these two seas, come, for the most part, from a dry country, from regions which contain few or no pools to furnish supplies of vapor?

Indeed, so scantily supplied with vapor are the winds which pass in the general channels of circulation over the water-shed and sea-basin of the Mediterranean, that they take up there more water as vapor than they deposit. But throwing out of the question what is taken up from the surface of the Mediterranean itself, these winds deposit more water on the water-shed whose drainage leads into that sea, than they take up from it again. The excess is to be found in the rivers which discharge into the Mediterranean; but so thirsty are the winds which blow across the bosom of that sea, that they not only take up again all the water that those rivers pour into it, but they are supposed by philosophers to create a demand for an immense current from the Atlantic to supply the waste.

It is estimated that three* times as much water as the Mediterranean receives from its rivers, is evapo-

* *Vide* Article "Physical Geography," Encyclopædia Britannica.

rated from its surface. This may be an over-estimate; but the fact that the evaporation from it is in excess of the precipitation, is made obvious by the current which the Atlantic sends into it through the Straits of Gibraltar; and the difference, we may rest assured, whether it be much or little, is carried off to modify climate elsewhere; to refresh with showers, and make fruitful, some other part of the earth.

The great inland basin of Asia, in which are Aral and the Caspian Seas, is situated on the route which in this hypothesis I have made these thirsty winds from southeast trade-wind Africa and America to take; and so scant of vapor are these winds when they arrive in this basin, that they have no moisture to leave behind; just as much as they pour down, they take up again and carry off. The level of the Caspian Sea is as permanent as that of the whole ocean. We know that the volume of water returned by the rivers, the rains, and the dews, into the whole ocean, is exactly equal to the volume which the whole ocean gives back to the atmosphere; as far as our knowledge extends, the level of each of these two seas is as permanent as that of the great ocean itself. Therefore, the volume of water discharged by rivers, the rains, and the dews into these two seas, is exactly equal to the volume which these two seas give back as vapor to the atmosphere.

These winds, therefore, do not begin permanently to lay down their load of moisture, be it great or small, until they cross the Oural Mountains. On the steppes of Issam, after they have supplied the Amazon and the other great equatorial rivers of the south, we find them first beginning to lay down more moisture than they take up again. In the Obi, the Yenesi, and the Lena, is to be found the volume which contains the expression for the load of water which these winds have brought from the southern hemisphere, from the Mediterranean, and the Red Sea; for in these almost hyperborean river basins do we find the first instance in which, throughout the entire range assigned these winds, they have, after supplying the Amazon, &c., left more water behind them than they have taken up again and carried off. The low temperatures of Siberian Asia are quite sufficient to extract from these winds the remnants of vapor which the cool mountain tops and mighty rivers of the southern hemisphere have left in them.

Here I may be permitted to pause, that I may call attention to the remarkable coincidence, and admire the marks of design, the beautiful and exquisite adjustments that we see here provided, to insure the perfect workings of the great atmospherical machine. This coincidence—may I not call it cause and effect? —is between the hygrometrical conditions of all the countries within, and the hygrometrical conditions of all the countries without, the range included within the lines which I have drawn (Plate IV.), to represent the route in this hemisphere, of the southeast trade-winds *after* they have blown their course over the land in South Africa and America. Both to the right and left of this range, are countries included between the same parallels in which it is; yet these countries all receive more water from the atmosphere than they give back to it again; they all have rivers running into the sea. On the one hand, there is in Europe, the Rhine, the Elbe, and all the great rivers that empty into the Atlantic; on the other hand, there are in Asia, the Ganges, and all the great rivers of China; and in North America, in the latitude of the Caspian Sea, is our great system of freshwater lakes; all of these receive from the atmosphere immense volumes of water, and pour it back into the sea in streams the most magnificent.

It is remarkable that none of these copiously supplied water-sheds have, to the southwest of them in the trade-wind regions of the southern hemisphere, any considerable body of land; they are, all of them, under the lee of evaporating surfaces, of ocean waters in the trade-wind regions of the south. Only those countries in the extra-tropical north, which I have described as lying under the lee of trade-wind South America and Africa, are scantily supplied with rains. Pray examine Plate IV. in this connection.

The surface of the Caspian Sea is about equal to that of our lakes; in it, evaporation is just equal to the precipitation. Our lakes are between the same parallels, and about the same distance from the western coast of America that the Caspian is from the western coast of Europe; and yet the waters discharged by the St. Lawrence give us an idea of how greatly the precipitation upon it is in excess of the evaporation. To windward of the lakes, and in the trade-wind regions of the southern hemisphere, is no land; but to windward of the Caspian Sea, and in the trade-wind region of the southern hemisphere, there is land. Therefore, supposing the course of the vapor-distributing winds to be such as I maintain it to be, ought they not to carry more water from the ocean to the American lakes, than it is possible for them to carry from the land—from the interior of South Africa and America—to the valley of the Caspian Sea?

In like manner, extra-tropical New Holland and South Africa have each land—not water—to the windward of them in the trade-wind regions of the northern hemisphere, where, according to this hypothesis, the vapor for their rains ought to be taken up: they are both countries of little rain; but extra-tropical South America has, in the trade-wind region to windward of it in the northern hemisphere, a great extent of ocean, and the amount of precipitation in extra-tropical South America is wonderful. The coincidence, therefore, is remarkable, that the countries in the extra-tropical regions of this hemisphere, which lie to the northeast of large districts of land in the trade-wind regions of the other hemisphere, should be scantily supplied with rains; and likewise that those so situated in the extra-tropical south, with regard to land in the trade-wind region of the north, should be scantily supplied with rains.

Having thus remarked upon the coincidence, let us turn to the evidences of design, and contemplate the beautiful harmony displayed in the arrangement of the land and water, as we find them along this conjectural "wind-road." Plate IV.

Those who admit design among terrestrial adaptations, or have studied the economy of cosmical arrangements, will not be loth to grant that by design the atmosphere keeps in circulation a certain amount of moisture; that the waters of which this moisture is made are supplied by the aqueous surface of the earth, and that it is to be returned to the seas again through rivers and the process of precipitation; that a permanent increase or decrease of the quantity of water thus put and kept in circulation by the winds would be followed by a corresponding change of hygrometrical conditions, which would draw after it permanent changes of climate; and that permanent changes of climate would involve the ultimate well-being of myriads of organisms, both in the vegetable and animal kingdoms.

The quantity of moisture that the atmosphere keeps in circulation is, no doubt, just that quantity which is best suited to the well-being, and most adapted to the proper development of the vegetable and animal kingdoms; and that quantity is dependent upon the arrangement and the proportions that we see

in nature between the land and the water—between mountain and desert, river and sea. If the seas and evaporating surfaces were changed, and removed from the places they occupy, to other places, the principal places of precipitation probably would also be changed: whole families of plants would wither and die for want of cloud and sunshine, dry and wet, in proper proportions and in due season; and, with the blight of plants, whole tribes of animals would also perish. Under such a chance arrangement, man would no longer be able to rely upon the early and the latter rain, or to count with certainty upon the rains being sent in due season for seed-time and harvest. And that the rain will be sent in due season, we are assured from on high; and when we recollect who it is that "sendeth" it, we feel the conviction strong within us, that He that sendeth the rain, has the winds for his messengers; and that they may do his bidding, the land and the sea were arranged, both as to position and relative proportions, where they are, and as they are.

It should be borne in mind that the southeast trade-winds, after they rise up at the equator, have to overleap the northeast trade-winds. Consequently, they do not touch the earth until near the tropic of Cancer (see the bearded arrows, Plate IV.)—more frequently to the north than to the south of it; but for a part of every year, the place where these vaulting southeast trades first strike the earth, after leaving the other hemisphere, is very near this tropic. On the equatorial side of it, be it remembered, the northeast trade-winds blow; on the polar side, what was the southeast trades, and what is now the prevailing southwesterly winds of our hemisphere, prevail. Now examine Plate IV., and it will be seen that the upper half of the Red Sea is north of the tropic of Cancer; the lower half, is to the south of it; that the latter is within the northeast trade-wind region; the former, in the region where the southwest passage winds are the prevailing winds.

The River Tigris is probably evaporated from the upper half of this sea by these winds; while the northeast trade-winds take up from the lower half those vapors which feed the Nile with rain, and which the clouds deliver to the cold demands of the Mountains of the Moon. Thus, there are two "wind-roads" crossing this sea: to the windward of it, each wind-path is through a rainless region; to the leeward there is, in each case, a river to cross.

The Persian Gulf lies for the most part in the track of the southwest winds; to the windward of the Persian Gulf is a desert; to the leeward, the River Indus. This is the way in which theory would require the vapor from the Red Sea and Persian Gulf to be conveyed; and this is the direction in which we find indications that it is conveyed. For to leeward do we find, in each case, a river, telling to us, by signs not to be mistaken, that it receives more water from the clouds than it gives back to the winds.

Is it not a curious circumstance that the winds which travel the road suggested from the southern hemisphere, should, when they touched the earth, on the polar side of the tropic of Cancer, be so thirsty, more thirsty, much more, than those which travel on either side of their path, and which are supposed to have come from southern seas, not from southern lands?

The Mediterranean has to give those winds three times as much vapor as it receives from them; the Red Sea gives them as much as they will take, and receives nothing back in return; the Persian Gulf also

gives more than it receives. What becomes of the rest? Doubtless it is given to the winds, that they may bear it off to distant regions, and make lands fruitful, that but for these sources of supply would be almost rainless, if not entirely arid, waste, and barren.

These seas and arms of the ocean now present themselves to the mind as counterpoises in the great hygrometical machinery of the earth. As sheets of water placed where they are, to balance the land in the trade-wind region of South America, and South Africa, they now present themselves. When the foundations of the earth were laid, we know who it was that "measured the waters in the hollow of his hand, and meted out the heavens with a span, and comprehended the dust of the earth in a measure, and weighed the mountains in scales, and the hills in a balance."

Here, then, we see harmony in the winds, design in the mountains, order in the sea, arrangement in the dust. Here are signs of beauty and works of grandeur; and we may now fancy that, in this exquisite system of adaptations and compensations, we can almost behold, in the Red and Mediterranean Seas, the very waters that were held in the hollow of the Almighty hand, when he weighed the Andes and balanced the hills of Africa in his comprehensive scales.

In that great inland basin of Asia which holds the Caspian Sea, and embraces an arrear of one million and a half of geographical square miles of land, we see the water surface so exquisitely adjusted, that it is just sufficient, and no more, to return to the atmosphere as vapor, exactly as much moisture as the atmosphere lends in rain to the rivers of that basin.

Thus we may regard the Mediterranean, the Red Sea, and Persian Gulf as relays, distributed along the route of these thirsty winds from the continents of the other hemisphere, to supply them with vapors, or to restore to them that which they have left behind to feed the sources of the Amazon, the Niger, and the Congo.

In contemplating the office of the winds in the distribution of moisture over the earth, we may liken them to messengers that are heavily tasked, being laden with as much as they can bear. The load of water given to them to carry away from the sea into the recesses of the most distant mountains, becomes too heavy, and there it is precipitated as mountain torrents. There is then a change of temperature; the atmosphere is invigorated; and straightway the winds commence to lift up their load again; taking, as before, a large portion of that which they had just let down to rest. Thus:—

A change occurs in the sublime economy, by which to-day the winds are relieved of their load in one part of the valley of the west; they precipitate and pass on. To-morrow fresh air arrives; and it commences straightway to take up this load again—to evaporate from leaf, twig, and soil all the moisture it can find, and to bear it off to make rains for the lake country or some other land.

The change of temperature from day to day accomplishes important ends in the grand arrangement for giving circulation to moisture and rains to the earth. According to the beautiful series of observations, which, at my request, a brother officer* conducted upon the habits of the Mississippi River as it passes

* Robert A. Marr, U. S. N.

Memphis in Tennessee, it appears that only about one-sixth of the water that is rained in that valley reaches the ocean through that river. The other five-sixths are taken up again into the air, and are carried off in the general channels of circulation to supply other systems of lake and river basins. But these five-sixths come from the seas; the clouds let them down in the Mississippi Valley to rest, but the winds take them up again; and so they may be taken up and let down many times before they reach the sea again; for from the sea they originally came, and to the sea they are ultimately bound.

The hypothesis that the winds from South Africa and America do take the course through Europe and Asia which I have marked out for them (Plate IV.) is supported by so many coincidences, to say the least, that we are entitled to regard it as probably correct, until a train of coincidences as striking can be adduced to show that such is not the case.

Returning once more to a consideration of the geological agency of the winds in accounting for the depression of the Dead Sea, we now see the fact most strikingly brought out before us, that if the Straits of Gibraltar were to be barred up, so that no water could pass through them, we should have a great depression of water level in the Mediterranean. Three times as much water is evaporated from that sea as is returned to it through the rivers. A portion of water evaporated from it is probably rained down and returned to it through the rivers; but—supposing it to be barred up—as the demand upon it for vapor would exceed the supply by rains and rivers, it would commence to dry up. As it sinks down, the area exposed for evaporation would decrease, and the supplies to the rivers would diminish, until finally there would be established between the evaporation and precipitation an equilibrium, as in the Dead and Caspian Seas; but, for aught we know, the water level of the Mediterranean might, before this equilibrium were attained, have reached a stage far below that of the Dead Sea level.

The Lake Tadjura is now in the act of attaining such an equilibrium—there r connected with it the remains of a channel by which the water ran into the sea; but the surface of th lake is now 500 feet below the sea level, and it is salting up. If not in the Dead Sea, do we not, in the valley of this lake, find outcropping some reason for the question: What have the winds had to do with the phenomena before us?

The winds, in this sense, are geological agents of great power. It is not impossible but that they may afford us the means of comparing, directly, geological events which had taken place in one hemisphere, with geological events in another: *e. g.* the tops of the Andes were once at the bottom of the sea. Which is the oldest formation, that of the Dead Sea, or the Andes? If the former be the older, then the climate of the Dead Sea must have been hygrometrically very different from what it now is.

In regarding the winds as geological agents, we can no longer consider them as the type of instability. We rather behold them now in the light of ancient and faithful chroniclers, which, upon being rightly consulted, will reveal to us truths which nature has written upon their wings in characters as legible and enduring as she has ever engraved the history of geological events upon the tablet of the rock.

The waters of Lake Titicaca, which receives the drainage of the great inland basin of the Andes, are only brackish, not salt. Hence, we may infer that this lake has not been standing long enough to become brine, like the waters of the Dead Sea; consequently, it belongs to a more recent period. On the other

hand, it will also be interesting to hear that my friend, Captain Lynch, informs me that, in his exploration of the Dead Sea, he saw what he took to be the dry bed of a river that once flowed from it. And thus we have two more links, stout and strong, to add to the circumstantial evidence going to sustain the testimony of this strange and fickle witness which I have called up from the sea to testify in this presence concerning the works of nature, and to tell us which be the older—the Andes, watching the stars with their hoary heads; or the Dead Sea, sleeping upon its ancient beds of crystal salt.

ON THE SALTNESS OF THE SEA.

In order to comprehend aright the currents of the sea, and to study with advantage the system of oceanic circulation, it is necessary to understand the effects produced by the salts of the sea upon the equilibrium of its waters; for wherever equilibrium be destroyed, whether in the air or water, it is restored by motion; and motion among fluid particles gives rise to currents, which, in turn, constitute circulation. The question is often asked, "Why is the sea salt?" I think it can be shown that the circulation of the ocean depends, in a great measure, upon the salts of sea-water.

As a general rule, the sea is nearly of a uniform degree of saltness, and the constituents of sea-water are as constant in their properties and as uniform in their proportions as are the components of the atmosphere.

We sometimes come across arms of the sea, or places in the ocean, where we find the water more salt or less salt than sea-water is generally; but this circumstance is due to local causes of easy explanation. For instance: When we come to an arm of the sea, as the Red Sea, upon which it never rains, and from which the atmosphere is continually abstracting, by evaporation, fresh water from the salt, we may naturally expect to find a greater proportion of salt in the sea-water that remains than we do near the mouth of some great river, as the Amazon; or in the regions of constant precipitation, or other parts, where it rains more than it evaporates; and though therefore we do not find sea-water from all parts of the ocean actually of the same degree of saltness, yet we do find, as in the case of the Red Sea, sea-water that is continually giving off to evaporation fresh water in large quantities; nevertheless, for such water, there is a degree and a very moderate degree of saltness which is a maximum; and we moreover find that though the constituents of sea-water, like those of the atmosphere, are not for every place invariably the same as to their proportions, yet they are the same or nearly the same as to their character.

When, therefore, we take into consideration the fact that, as a general rule, sea-water is, with the exception above stated, everywhere and always the same, we find grounds on which to base the conjecture that the ocean has its system of circulation which is probably as complete and not less wonderful than is the circulation of blood through our system.

In order to investigate the currents of the sea, and to catch a glimpse of the laws by which the circulation of its waters is governed, hypothesis, in the present meagre state of absolute knowledge with regard to the subject, seems to be as necessary to progress as is a corner-stone to a building. To make progress

with such investigations, we want something to build upon. In the absence of facts, we are sometimes permitted to suppose them; only, in making the selection of the various hypotheses which are suggested, we are bound to prefer that one to which the greatest number of phenomena will be reconciled. When we have found, tried, and offered such an one, we are entitled to claim for it a respectful consideration at least, until we discover it leading us into some palpable absurdity; or until some other hypothesis be suggested which will account equally well, but for a greater number of phenomena. Then, as honest searchers after truth, we should be ready to give up the former, adopt the latter, and to try it until some other better than either of the two be offered.

With this understanding, I venture to offer an hypothesis with regard to the agency of the salts or solid matter of the sea in imparting dynamical force to the waters of the ocean in their system of circulation, and to suggest that one of the purposes which in the grand design it was probably intended to accomplish by having the sea salt, and not fresh, was to impart to its waters the forces and the powers necessary to make their circulation complete.

In the first place, we do but conjecture when we say that there is a set of currents in the sea, and a system of circulation in the sea, by which its waters are conveyed from place to place, with regularity, certainty, and order. But this conjecture appears to be founded on reason; for if we take a sample of water which shall fairly represent, in the proportion of its constituents, the average water of the Pacific Ocean, and analyze it—and if we do the same by a similar sample from the Atlantic, we shall find the analysis of the one to resemble that of the other as closely as though the two samples had been taken from the same bottle after having been well shaken. How then shall we account for this, unless upon the supposition that sea-water from one part of the world is in the process of time brought into contact and mixed up with sea-water from all other parts of the world? Agents, therefore, it would seem, are at work, which shake up the waters of the sea as though they were in a bottle, and which, in the course of time, mingle those that are in one part of the ocean with those that are in another, as thoroughly and completely as it is possible for man to do by shaking them in a vessel of his own construction.

This fact as to uniformity of components, appears to call for the hypothesis that sea-water, which to-day is in any part of the ocean, will, in the process of time, be found in another part the most remote. It must, therefore, be carried about by currents; and as those currents have their offices to perform in the terrestrial economy, they probably do not flow by chance, but in obedience to physical laws; they no doubt, therefore, maintain the order and preserve the harmony which characterize every department of God's handiwork, upon the threshold of which man has yet been permitted to stand, to observe, or to comprehend.

And thus, by a process of reasoning which is perfectly philosophical, we are led still farther to conjecture that there are regular and certain, if not appointed channels, through which the water travels from one part of the ocean to another, and that those channels belong to an arrangement which may make, and, for aught we know to the contrary, which does make the system of oceanic circulation as complete, as perfect, and as harmonious as is that of the atmosphere or the blood. Every drop of water in the sea is as

obedient to law and order, as are the members of the heavenly host in the remotest region of space. For, when the morning stars sang together, "the waves also lifted up their voice" in the Almighty anthem; and doubtless, therefore, the harmony in the depths of the ocean is in tune with that which comes from the spheres above. We cannot doubt it. For, were it not so, were there no channels of circulation from one ocean to another; and if, accordingly, the waters of the Atlantic were confined to the Atlantic, or if the waters of the arms and seas of the Atlantic were confined to these arms and seas, and had no channels of circulation by which they could pass out into the ocean, and traverse different latitudes and climates, then the waters of these arms and seas would, as to their constituents, become, in the process of time, very different from the sea-waters in other parts of the world.

For instance, take the Red Sea and the Mediterranean by way of illustration; upon the Red Sea there is no precipitation. It is in a rainless region; not a river runs down it; not a brook empties into it; therefore, there is no process by which the salts and washings of the earth which are taken up and held in solution by rain or river water, can be brought down into the Red Sea. The air takes up from it in the process of evaporation fresh water, leaving behind all the solid matter which the sea there holds in solution.

On the other hand, numerous rivers discharge into the Mediterranean; some of which are filtered through soils, and among minerals which yield one kind of salts or soluble matter; another river runs through a limestone or volcanic region of country, and brings down in solution solid matter; it may be common salt, sulphate or carbonate of lime, magnesia, soda, potash, or iron; either or all may be in its waters. Still, the constituents of sea-water from the Mediterranean, and of sea-water from the Red Sea, are quite the same. But the waters of the Dead Sea have no connection with those of the ocean: they are cut off from its channels of circulation; and are therefore quite different, as to their components, from any arm, frith, or gulf of the broad ocean.*

How, therefore, shall we account for this sameness of compound, but upon the supposition of a general system of circulation in the ocean, by which, in the process of time, water from one part is conveyed to another part the most remote, and by which a general interchange and commingling of the waters take place?

In like manner, the constituents of the atmosphere, whether it be analyzed at the equator or the poles, are the same. By cutting off and shutting up from the general channels of circulation any portion of sea-

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* "The solid constituents of sea-water amount to about 3½ per cent. of its weight, or nearly half an ounce to the pound. Its saltness may be considered as a necessary result of the present order of things. Rivers which are constantly flowing into the ocean, contain salts, varying in amount from 10 to 50 and even 100 grains per gallon. They are chiefly common salt, sulphate and carbonate of lime, magnesia, soda, potash, and iron; and these are found to constitute the distinguishing characteristics of sea-water. The water which evaporates from the sea is nearly pure, containing but very minute traces of salts. Falling as rain upon the land, it washes the soil, percolates through the rocky layers, and becomes charged with saline substances which are borne seaward by the returning currents. The ocean, therefore, is the great depository of everything that water can dissolve and carry down from the surface of the continents; and, as there is no channel for their escape, they of course consequently accumulate."—(*Yeomans's Chemistry.*)

"The case of the sea," says Fowner, "is but a magnified representation of what occurs in every lake into which rivers flow, but from which there is no outlet except by evaporation. Such a lake is invariably a salt lake. It is impossible that it can be otherwise; and it is curious to observe that this condition disappears when an artificial outlet is produced for the waters."

water, as in the Dead Sea, or of atmospheric air, as in mines or wells, we can easily fill either with gases or other matter that shall very much affect its character and alter the proportion of its constituents.

The principal agents that are supposed to be concerned in giving circulation to the atmosphere, and in preserving the ratio among its components, are light, heat, electricity, and perhaps magnetism; but as far as the motive power is concerned, or that agency by which the atmosphere that may now be within the tropics, is wafted to the poles, heat and electricity are supposed to be the chief among them.

But with regard to the sea, it is not known what office is performed by electricity and magnetism, in giving dynamical force to the system of oceanic circulation. The chief motive power from which marine currents derive their velocity, has been ascribed to heat; but a close study of the agents concerned, has suggested that an important—nay, a powerful and active agency in the system of oceanic circulation is derived, through the instrumentality of the winds, of marine plants and animals, from the salts of the sea-water. They give the ocean great dynamical force.

Let us, for the sake of illustration and explanation, suppose the sea in all its parts—in its depths, and at the surface, at the equator, and about the poles—to be of one uniform temperature, and to be all of fresh water. In this case, there would be nothing of heat to disturb its equilibrium, and there would be no motive power to beget currents, or to set the water in motion by reason of the difference of specific gravity due to water at different densities and temperatures.

As yet, we have not taken into account, in this supposition, the effects of the winds and of evaporation in begetting currents.

Let us, therefore, take them into account; and first the winds. The winds by their force create partial surface currents, and agitate the waters to a certain depth, and thus would give rise to a feeble and partial aqueous circulation in the supposed sea of fresh water with a supposed uniform temperature.

This, then, is one of the sources whence power is given to the system of oceanic circulation; but, though a feeble one, it is one which exists in reality, and, therefore, need not be regarded as hypothetical.

Let us next call in evaporation and precipitation, that we may examine the effects of another and a more powerful agent. Suppose the evaporation to commence from this imaginary freshwater ocean, and to go on as it does from the seas as they are. In those regions, as in the trade-wind regions, where evaporation is in excess of precipitation, the general level of this supposed sea would be altered, and, immediately, as much water as is carried off by evaporation would commence to flow in from north and south towards the trade-wind or evaporating region, to restore the level.

On the other hand, the winds have taken this vapor, borne it off to the extra-tropical regions and precipitated it, we will suppose, where precipitation is in excess of evaporation. Here is another alteration of sea level by elevation instead of by depression; and hence we have the motive power for a surface current from each pole towards the equator, the object of which is only to supply the demand for evaporation in the trade-wind regions—demand for evaporation being taken here to mean the difference between evaporation and precipitation, or the quantity of water that is taken up into the air, and carried off, in the form of vapor, to other parts as before, from the trade-wind region.

So far, we only derive from evaporation and precipitation over the supposed freshwater sea, a slight surface current towards the equator, and, of course, we have the forces for but a partial oceanic circulation.

The motive power of such a current would be gravitation, acting upon an inclined plane.

So far in the progress of illustration we have apparent counteraction; for we have, on one hand, the sea level lowered in the equatorial regions by evaporation, and raised by the expansive force of heat on the other; we have also the sea-level of the polar regions raised on one hand by precipitation, and lowered on the other by the contraction due the diminution of temperature there. But this counteraction is only apparent; for the increase of temperature about the equatorial, and the decrease of it about the polar regions, can only produce a certain effect, which, like the effect of the centripetal force upon the figure of the earth, in elevating the sea-level at the equator, becomes nearly a constant, and which, like every other constant in nature, is compensated; whereas, the process of evaporation and precipitation being continued, the difference of level created by these in different parts of the ocean, is accumulative and not constant. It therefore remains for currents to restore.

We have now traced from their principles of action the effect of two agents, which, in a sea of fresh water, would tend to create currents, and to beget a system of aqueous circulation; but a set of currents and a system of circulation, which, it is readily perceived, would be quite different from those which we find in the salt sea. One of these agents would be employed in restoring, by means of one or more polar currents, the water that is taken from one part of the ocean by evaporation, and deposited in another by precipitation. The other agent would be employed in restoring, by the forces due difference of specific gravity, the equilibrium, which has been disturbed by heating, and of course expanding, the waters of the torrid zone on one hand, and by cooling, and consequently contracting, those of the frigid zone on the other. This agency would, if it were not modified by others, find expression in a system of currents and counter currents, or rather in a set of surface currents of warm and light water, from the equator towards the poles, and in another set of undercurrents of cooler, dense, and heavy water, from the poles towards the equator.

Such, keeping out of view the influence of the winds, which we may suppose would be the same whether the sea were salt or fresh, would be the system of oceanic circulation were the sea all of fresh water. But fresh water, in cooling, begins to expand near the temperature of 40°, and expands more and more till it reaches the freezing point, and ceases to be fluid. This law of expansion by cooling, would impart a peculiar feature to the system of oceanic circulation were the waters all fresh. Water at the temperature of 40° would be at its maximum of density. Raise or lower the temperature from that, and the water would expand; of course, then, it would grow lighter, and ascend to the surface. Therefore, when the warm waters of the torrid zone, by flowing north, and cooling down to 40°, for instance, should meet the cold current coming from the polar basin with a temperature of 34°, the current from the equator being of denser water, would sink, and the current from the frigid zone would then appear as a surface current until the temperature should rise to 40°, for example. Here the current from the equator would be 50°, we may suppose, and there would be another node in the system of freshwater circulation; for here, at

this latter place of meeting, the current from the polar regions, which all along had been of the lighter water, and therefore on the surface, would now become the heavier, disappear from the surface, sink, and continue its course as an undercurrent.

If this train of reasoning be good, we may infer that, in a system of oceanic circulation, the dynamical force to be derived from difference of temperature, where the waters are all fresh, would be quite feeble. And that, were the sea not salt, we should probably have no such current in it as the Gulf Stream.

So far we have been reasoning hypothetically, to show what would be the chief agents exclusive of the winds in disturbing the equilibrium of the ocean, were its waters fresh and not salt. And whatever disturbs equilibrium there, may be regarded as the *primum mobile* in the system of marine currents.

Let us now proceed another step in the process of explaining and illustrating the effect of the salts of the sea in the system of oceanic circulation. To this end, let us suppose this imaginary ocean of fresh water suddenly to become that which we have, viz: an ocean of salt water, which contracts as its temperature is lowered, till it reaches 28° or therabout.

Let evaporation now commence in the trade-wind region, as it was supposed to do in the case of the freshwater seas, and as it actually goes on in nature—and what takes place? Why, a lowering of the sea-level as before. But as the vapor of salt water is fresh, or nearly so, fresh water only is taken up from the ocean; that which remains behind is therefore more salt. Thus, while the level is lowered in the salt sea, the equilibrium is destroyed because of the saltness of the water; for the water that remains after the evaporation takes place, is, on account of the solid matter held in solution, specifically heavier than it was before any portion of it was converted into vapor.

The vapor is taken from the surface water; the surface water thereby becomes more salt, and consequently heavier; it therefore sinks; and hence we have, due to the salts of the sea, a vertical circulation, viz: a descent of heavier—because salter and cooler—water from the surface, and an ascent of water that is lighter—because it is not so salt—from the depths below.

This vapor, then, which is taken up from the evaporating regions—by which is meant those regions where the evaporation is greater than the precipitation—is carried by the winds through their channels of circulation and poured back into the ocean where the regions of precipitation are;—and by the regions of precipitation, I mean those parts of the ocean, as in the polar basins, where the ocean receives more fresh water in the shape of rain, snow, &c., than it returns to the atmosphere in the shape of vapor.

In the precipitating regions, therefore, the level is destroyed, as before explained, by elevation; and in the evaporating regions, by depression; which, as already stated, gives rise to a system of surface currents moved by gravity alone from the poles towards the equator.

But we are now considering the effects of evaporation and precipitation in giving impulse to the circulation of the ocean where its waters are salt.

The fresh water that has been taken from the evaporating regions is deposited upon those of precipitation, which, for illustration merely, we will locate in the north polar basin. Among the sources of supply of fresh water for this basin, we must include not only the precipitation which takes place over the basin

itself, but also the amount of fresh water discharged into it by the rivers of the great hydrographical basins of Arctic Europe, Asia, and America.

This fresh water, being emptied into the Polar Sea, and agitated by the winds, becomes mixed with the salt; but as the agitation of the sea by the winds extends to no great depth, it is only the upper layer of salt water, and that to a moderate depth, which becomes mixed with the fresh. The specific gravity of this upper layer, therefore, is diminished just as much as the specific gravity of the sea-water in the evaporating regions was increased. And thus we have a surface current of saltish water from the poles towards the equator, and an undercurrent of water, salter and heavier, from the equator towards the poles. This undercurrent supplies in a great measure the salt which the upper current, freighted with fresh water from the clouds and rivers, carries back.

Thus it is to the salts of the sea, that we owe that feature in the system of oceanic circulation which causes an undercurrent to flow from the Mediterranean into the Atlantic, and another from the Red Sea into the Indian Ocean. And it is evident, since neither of these seas is salting up—that just as much, or nearly just as much salt as the undercurrent brings out, just so much must the upper currents carry in.

We now begin to perceive what a powerful impulse is derived from the salts of the sea, in giving effective and active circulation to its waters.

Hence, we infer that the currents of the sea, by reason of its saltness, attain their maximum of volume and velocity. Hence, too, we infer that the transportation of warm water from the equator towards the frozen regions of the poles, and of cold water from the frigid towards the torrid zone, is facilitated; and consequently here, in the saltness of the sea, have we not an agent by which climates are mitigated—by which they are softened and rendered much more salubrious than it would be possible for them to be, were the waters of the ocean deprived of this property of saltness?

If these inferences as to the influence of the salts upon the currents of the sea be correct, the same cause which produces an undercurrent from the Mediterranean, and an undercurrent from the Red Sea into the ocean, should produce an undercurrent from the ocean into the north polar basin—it being supposed merely, for the present, that there is a surface current through Davis's Straits, always setting out of the Polar Sea. In each case, the hypothesis with regard to the part performed by the salt, in giving vigor to the system of oceanic circulation, requires that, counter to the surface current of water with less salt, there should be an undercurrent of water with more salt in it.

That such is the case with regard both to the Mediterranean and the Red Sea, has been amply shown in other parts of this work, and abundantly proved by other observers.

That there is a constant current setting out of the Arctic Ocean through Davis's and other straits thereabout, which connects it with the Atlantic Ocean, is generally admitted. Lieut. De Haven, U. S. N., when in command of the American expedition in search of Sir John Franklin, was frozen up with his vessels in the main channel of Wellington Straits; and during the nine months that he was so frozen, his vessels, holding their place in the ice, were drifted with it bodily for more than a thousand miles towards the south.

The ice in which they were bound was of sea-water, and the currents by which they were drifted were of sea-water—only, it may be supposed, the latter were not quite so salt as the sea-water generally is.

Then, since there is salt always flowing out of the north polar basin, there must be salt always flowing into it; else, it would either become fresh or the whole Atlantic Ocean would be finally silted up with salt.

It might be supposed, were there no evidence to the contrary, that this salt was supplied to the polar seas from the Atlantic around North Cape, and from the Pacific through Behring's Straits, and through no other channels.

But fortunately Arctic voyagers, who have cruised in the direction of Davis's Straits, have afforded us proof positive as to the fact of this other source for supplying the polar seas with salt. They tell us of an undercurrent setting from the Atlantic towards the polar basin. They describe huge icebergs with tops reaching high up in the air, and of course the bases of which extend far down into the depths of the ocean, ripping and tearing their way, with terrific force and awful violence, through the surface ice or against a surface current.

Passed Midshipman S. P. Griffin, who commanded the brig Rescue, in the American searching expedition after Sir John Franklin, informs me that on one occasion the two vessels were endeavoring to warp up to the northward in or near Wellington Channel, against a strong surface current, which of course was setting to the south; and that while so engaged an iceberg, with its top many feet above the water, came "drifting up," from the south, and passed by them "like a shot," although they were stemming a surface current against both the berg and themselves. Such was the force and velocity of the undercurrent, that it carried the berg to the northward faster than the crew could warp the vessel against a surface but counter current.

Capt. Duncan, Master of the English whale ship Dundee, says, at page 76 of his interesting little narrative:—

"*Dec.* 18 (1826).—It was awful to behold the immense icebergs working away to the northeast from us, and not one drop of water to be seen; they were working themselves right through the middle of the ice."

And again at page 92, &c.:—

"*Feb.* 23.—Latitude 68° 37′ N.; longitude about 63° W.

"The dreadful apprehensions that assailed us yesterday, by the near approach of the iceberg, were this day most awfully verified. About 3 P. M., the iceberg came in contact with our floe, and in less than one minute it broke the ice; we were frozen in quite close to the shore; the floe was shivered to pieces for several miles, causing an explosion like an earthquake, or one hundred pieces of heavy ordnance fired at the same moment. The iceberg, with awful but majestic grandeur (in height and dimensions resembling a vast mountain), came almost up to our stern, and every one expected it would have run over the ship. * *

"The iceberg, as has been before observed, came up very near to the stern of our ship; the intermediate space between the berg and the vessel was filled with masses of heavy ice, which, though they had been previously broken by the immense weight of the berg, were again formed into a compact body by its press-

ure. The berg was drifting at the rate of about four knots, and by its force on the mass of ice, was pushing the ship before her, as it appeared, to inevitable destruction."

"*Feb.* 24.—The iceberg still in sight, but driving away fast to the N. E."

"*Feb.* 25.—The iceberg that so lately threatened our destruction, had driven completely out of sight to the N. E. from us."—*Arctic Regions; Voyage to Davis's Strait, by Dorea Duncan, Master of the Ship Dundee,* 1826, 1827.

Now then whence, unless from the difference of specific gravity due sea-water of different degrees of saltness, can we derive a locomotive power with force sufficient to give such tremendous masses of ice such a velocity?

What is the temperature of this undercurrent? Be that what it may, it is probably above the freezing point of sea-water. Suppose it to be at 36°. Break through the ice in the northern seas, and the temperature of the water is always 28°. At least, Lieut. De Haven so found it in his long imprisonment, and it may be supposed that as it was with him, so it generally is. Assuming, then, the water of the surface current which runs out with the ice to be all at 28°, we observe that it is not unreasonable to suppose that the water of the undercurrent, inasmuch as it comes from the south, and therefore from warmer latitudes, is probably not so cold; and if it be not so cold, its temperature before it comes out again must be reduced to 28°, or whatever be the average temperature of the outer but surface current.

Moreover, if it be true, as some philosophers have suggested, that there is in the depths of the ocean a line from the equator to the poles, along which the water is of the same temperature all the way, then the question may be asked: Should we not have in the depths of the ocean, a sort of isothermal floor, as it were, on the upper side of which all the changes of the temperature are due to agents acting from above, and on the lower side of which the changes, if any, are due to agents acting from below?

This under polar current water then, as it rises to the top, and is brought to the surface by the agitation of the sea in the Arctic regions, gives out its surplus heat and warms the atmosphere there till the temperature of this warm undercurrent water is lowered to the requisite degree for going out on the surface. Hence the water-sky of those regions.

And the heat that it loses in falling from its normal temperature, be that what it may, till it reaches the temperature of 28°, is so much caloric set free in the polar regions, to temper the air and mitigate the climate there. Now is not this one of those modifications of climate, which may be fairly traced back to the effect of the saltness of the sea in giving energy to its circulation?

Moreover, if there be a deep sea in the polar basin, which serves as a receptacle for the waters brought into it by this undercurrent, which, because it comes from towards the equatorial regions, comes from a milder climate, and is, therefore, warmer, we can easily imagine why there might be an open sea in the polar regions—why Lieut. De Haven, in his instructions, was directed to look for it; and why both he and Captain Penny, of one of the English searching vessels, found it there.

And in accounting for this polynia, we see that its existence is not only consistent with the hypothesis with which we set out touching a perfect system of oceanic circulation, but that it may be ascribed, in a

great degree at least, if not wholly, to the effect produced by the salts of the sea upon the mobility and circulation of its waters.

Here, then, is an office which the sea performs in the economy of the universe by virtue of its saltness, and which it could not perform were its waters altogether fresh. And thus philosophers have a clue placed in their hands which will probably guide them to one of the many hidden reasons that are embraced in the true answer to the question, "Why is the sea salt?"

But we find in sea-water other matter besides common salt. Lime is dissolved by the rains and the rivers, and emptied in vast quantities into the ocean. Out of it, coral islands and coral reefs of great extent—marl beds, shell banks, and infusorial deposits of large dimensions, have been constructed by the inhabitants of the deep.

These creatures are endowed with the power of secreting, apparently for their own purposes, only solid matter, which the waters of the sea hold in solution. But this power was given to them that they also might fulfil the part assigned them in the economy of the universe. For to them, probably, has been allotted the important office of assisting in giving circulation to the ocean, and of helping to regulate the climates of the earth.

The better to comprehend how such creatures may influence currents and climates, let us suppose the ocean to be perfectly at rest—that throughout, it is in a state of complete equilibrium—that, with the exception of those tenants of the deep which have the power of extracting from it the solid matter held in solution, there is no agent in nature capable of distributing that equilibrium—and that all these fish, &c., have suspended their secretions in order that this state of a perfect aqueous equilibrium and repose throughout the sea, might be attained.

In this state of things—the waters of the sea being in perfect equilibrium—a single mollusk or coralline, we will suppose, commences his secretions, and abstracts from the sea-water solid matter for his shell. In that act, this animal has destroyed the equilibrium of the whole ocean; for the specific gravity of that portion of water from which this solid matter has been abstracted is altered. Having lost a portion of its solid contents, it has become specifically lighter than it was before; it must, therefore, give place to the pressure which the heavier water exerts to push it aside and occupy its place, and it must consequently travel about and mingle with the waters of the other parts of the ocean until its proportion of solid matter is returned to it, and until it attains the exact degree of specific gravity due sea-water generally.

How much solid matter does the whole host of marine plants and animals abstract from sea-water daily? Is it a thousand pounds, or a thousand millions of tons? No one can say. But, whatever be its weight, it is so much of the power of gravity applied to the dynamical forces of the ocean. And this power is derived from the salts of the sea, through the agency of sea-shells and other marine animals, that of themselves scarcely possess the power of locomotion. Yet they have power to put the whole sea in motion, from the equator to the poles, from the surface to the bottom.

Those powerful and strange equatorial currents, which navigators tell us they encounter in the Pacific Ocean—to what are they due? Coming from sources unknown, they are lost in the midst of the ocean.

They appear to originate in the open sea, and in the open sea to terminate. How far may they be due to the derangement of equilibrium arising from the change of specific gravity caused by the secretions of the myriads of marine animals that are continually at work in those parts of the ocean? These abstract from sea-water solid matter enough to build continents of.

Thus, when we consider the salts of the sea in one point of view, we see the winds and the marine animals operating upon the waters, and in certain parts of the ocean deriving from the solid contents of the same, those very principles of antagonistic forces which hold the earth in its orbit, and preserve the harmonies of the universe.

The sea-breeze and the sea-shell, in performing their appointed offices, act in such a way as to give rise to a reciprocating motion in the waters; thus they impart to the ocean dynamical forces for its circulation.

The sea-breeze plays upon the surface; it converts only fresh water into vapor, and leaves the solid matter behind. The surface water thus becomes specifically heavier, and sinks. On the other hand, the little marine architect below, as he works upon his coral edifice at the bottom, abstracts from the water there a portion of its solid contents; it, therefore, becomes specifically lighter, and up it goes, ascending to the top with increased velocity, to take the place of the descending column, which, by the action of the winds, has been sent down loaded with fresh food and materials for the busy little mason in the depths below.

Seeing then that the inhabitants of the sea with their powers of secretion are competent to exercise at least some degree of influence in disturbing equilibrium—are not these creatures entitled to be regarded as agents which have their offices to perform in the system of oceanic circulation? It is immaterial how great or how small that influence may be supposed to be; for, be it great or small, we may rest assured it is not a chance influence, but it is an influence exercised—if exercised at all—by design, and according to the commandment of him whose "voice the winds and the sea obey." Thus God speaks through sea-shells to the ocean.

It may, therefore, be supposed that the arrangements in the economy of nature are such as to require that the various kinds of marine animals, whose secretions are calculated to alter the specific gravity of sea-water, to destroy its equilibrium, to beget currents in the ocean, and to control its circulation, should be distributed according to order.

Upon this supposition—the like of which nature warrants throughout her whole domain—we may conceive how the marine animals of which we have been speaking, assist also to regulate climates and to adjust the temperature of certain latitudes. For instance, let us suppose the waters in a certain part of the torrid zone to be 70°, but by reason of the fresh water which has been taken from them in a state of vapor, and consequently by reason of the proportionate increase of salts, these waters are heavier than waters that may be cooler but not so salt. This being the case, the tendency would be for this warm but salt and heavy water to flow off as an undercurrent towards the polar or some other regions of lighter water.

Such an undercurrent, by reason of the limited conducting powers of water for heat, would preserve

its high temperature for a length of time, and for great distances—cooling, of course, somewhat by the way.

This undercurrent may be freighted with heat to temper some hyperborean region, or to soften some extra-tropical climate; for we know that such is among the effects of marine currents. At starting, it might have been, if you please, so loaded with solid matter that, though its temperature were 70°, yet, by reason of the quantity of such matter held in solution, its specific gravity might have been greater than that of extra-tropical sea-water generally at 28°.

Notwithstanding this, it may be brought into contact, by the way, with those kinds and quantities of marine organisms that shall abstract solid matter enough to reduce its specific gravity, and instead of leaving it greater than common sea-water at 28°, to make it less than common sea-water at 40°; consequently, in such a case this warm sea-water, when it comes to the cold latitudes, would be brought to the surface through the instrumentality of shell-fish and various other tribes that dwell far down in the depths of the ocean. Thus, we perceive that these creatures, though they are regarded as being so low in the scale of creation, may, nevertheless, be regarded as agents of much importance in the terrestrial economy; for we perceive that they are capable of spreading over certain parts of the ocean those benign mantles of warmth which temper the winds, and modify, more or less, all the marine climates of the earth.

The makers of nice astronomical instruments, when they have put the different parts of their machinery together, and set it to work, find, as in the chronometer, for instance, that it is subject in its performance to many irregularities and imperfections. That in one state of things, there is expansion, and in another state contraction among cogs, springs, and wheels with an increase or diminution of rate. This defect, the makers have sought to overcome; and with a beautiful display of ingenuity, they have attached to the works of the instrument a contrivance which has had the effect of correcting these irregularities, by counteracting the tendency of the instrument to change its performance with the changing influences of temperature.

This contrivance is called a *compensation;* and a chronometer that is well regulated, and properly compensated, will perform its office with certainty, and preserve its rate under all the vicissitudes of heat and cold to which it may be exposed.

So, too, in the clock-work of the ocean and the machinery of the universe; order and regularity are maintained by a system of compensations. A celestial body as it revolves around its sun, flies off under the influence of centrifugal force; but immediately the forces of compensation begin to act; the planet is brought back to its elliptical path, and held in the orbit for which its mass, its motions, and its distance were adjusted. Its compensation is perfect.

So, too, with the salts and the shells of the sea in the machinery of the ocean; from them are derived principles of compensation the most perfect; through their agency the undue effects of heat and cold, of storm and rain in disturbing the equilibrium, and producing thereby currents in the sea, are compensated, regulated, and controlled.

The dews, the rains, and the rivers are continually dissolving certain minerals of the earth, and carry-

ing them off to the sea. This is an accumulating process; and if it were not *compensated*, the sea would finally become as the Dead Sea is, saturated with salt, and, therefore, unsuitable for the habitation of many fish of the sea.

The sea-shells and marine insects afford the required *compensation*. As the salts are emptied into the sea, these creatures secrete them again and pile them up in solid masses, to serve as the bases of islands and continents, to be in the process of ages upheaved into dry land, and then again dissolved by the dews and rains, and washed by the rivers away into the sea.

Darwin, many years ago,* during one of those moments of inspiration which enabled him to foreshadow the steamboat and the locomotive, told philosophers whence came the salts of the sea.

In every department of nature there is to be found this self-adjusting principle—this beautiful and exquisite system of *compensation*, by which the operations of the grand machinery of the universe are maintained in the most perfect order.

Thus, we behold sea-shells and animalculæ in a new light. May we not now cease to regard them as beings which have little or nothing to do in maintaining the harmonies of creation? On the contrary, do we not see in them the principles of the most admirable compensation in the system of oceanic circulation? We may even regard them as regulators, to some extent, of climates in parts of the earth far removed from their presence. There is something suggestive, both of the grand and beautiful, in the idea that, while the insects of the sea are building up their coral islands in the perpetual summer of the tropics, they are

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* Gnomes! You then taught transuding dews to pass,
Through time-fall'n woods, and root-inwove morass
Age after age; and with filtration fine
Dispart from earths and sulphurs and saline.
Hence with diffusive salt old ocean steeps
His emerald shallows, and his sapphire deeps.
Oft in wide lakes, around their warmer brim,
In hollow pyramids the crystals swim;
Or, fused by earth-born fires in cubic blocks,
Shoot their white forms, and harden into rocks.
Thus caverned round in Cracow's mighty mines,
With crystal walls, a gorgeous city shines;
Scooped in the briny rock, long straits extend
Their hoary course, and glittering domes ascend;
Down the bright steeps, emerging into day,
Impetuous fountains burst their headlong way,
O'er milk-white vales in ivory channels spread,
And wandering, seek their subterraneous bed,
Formed in pellucid salt with chisel nice,
The pale lamp glimmering through the sculptured ice;
With wide reverted eyes fair Lotta stands,
And spreads to heaven, in vain, her glassy hands;
Cold dews condense upon her pearly breast,
And the big tear rolls lucid down her vest.

also engaged in dispensing warmth to distant parts of the earth, and in mitigating the severe cold of the polar winter.

Surely an hypothesis which, being followed out, suggests so much design, such perfect order and arrrangement, and so many beauties for contemplation and admiration as does this, which, for the want of a better, I have ventured to offer with regard to the solid matter of the sea-water, its salts and its shells; surely such an hypothesis, though it be not based entirely on the results of actual observation, cannot be regarded as wholly vain, or as altogether profitless.

THE OPEN SEA IN THE ARCTIC OCEAN.

As a supplement to this chapter, I may be excused for introducing Lieut. De Haven's Report after his return from the Arctic Ocean in search of Sir John Franklin and his companions. The instructions under which he went, and the source whence those instructions were in a measure drawn, make us acquainted with a few facts that throw some light upon the circulation of the ocean, so far as the salts of the sea are concerned in imparting dynamical forces to it.

His instructions, based entirely upon theory and the convictions of the mind in the correctness of its reasoning and powers of deduction, pointed him to an open sea, in the midst of the ice, and he found it there.

In the instructions which issued from the Navy Department for his guidance during that expedition, stress was laid upon an open sea to the northward and westward of Wellington Channel.

"There are other facts," he was told in these instructions, "elicited by Lieut. Maury in the course of his investigations touching the winds and currents of the ocean, which go also to confirm the opinion that, beyond the icy-barrier which is generally met in the Arctic Ocean, there is a polynia or sea free from ice."

Moreover, Lieut. De Haven was reminded in these instructions that it was needless to repeat to him the reasons for asserting so confidently the existence of this open sea; because, said his instructions, "you have assisted in those investigations at the National Observatory, and are doubtless aware of the circumstances which authorize this conclusion."

These circumstances are detailed in the following letter, which was then on the files of the Department, and which had been written soon after the American whalers had been first invited to seek information concerning the missing expedition.

Lieutenant Maury to Commodore Warrington.

NATIONAL OBSERVATORY,

Washington, July 16, 1849.

SIR: I have had under consideration the subject-matter of Walter R. Jones's letter to the President of the United States, and in compliance with your request, beg leave to state in reply thereto:—

That the best information with regard to Behring's Straits, and the sea into which they lead, is to be

found in the English and Russian Charts of the Arctic Seas; though Captain Roys, who, in the whale ship Superior, cruised there in the summer of last year, reports that these charts contain many errors. Captain Roys could not determine the amount of these errors; he merely ascertained that there were errors in the best and latest Russian charts.

It cannot be expected that vessels like Mr. Jones's, whose more immediate object is the pursuit of fish, will—as daring and adventurous as our whalemen are known to be—attempt to penetrate into the Frozen Ocean farther than the open sea will admit, or their game may entice them.

The limits of the region of packed ice are variable. In 1827, the southern edge of the packed ice was found to commence about latitude 70° N., longitude 169° W., and to extend thence, in a N. E. by E. course, at least as far as longitude 160° W.

Sir John Franklin and his companions, to whom Mr. Jones wishes to carry relief, are in the unknown parts of the sea; and, therefore, the information to be furnished, with regard to a well-conducted search for him, must consist necessarily and chiefly of deductions and generalizations derived from the best received theories and opinions with regard to the climatology of those regions.

In the first place, it seems to be an admitted fact that there is a current setting north, through Behring's Straits into the Frozen Ocean. Captain Roys found it setting at the rate of from 70 to 100 miles a day. This is probably a constant current, though it may be supposed it runs fastest in summer. The water which it bears along is, of course, supplied from the China Seas; coming from the equatorial regions, it is, therefore, warmer water than that of the Arctic Ocean, into which it flows.

The physical forces that operate upon this current to give it motion, require that it should pursue, after entering the straits, a northeasterly course; so Captain Roys found it. The edge of the packed ice there (already alluded to) seems also to confirm the opinion that such is the course of this current. If so, the water thermometer will tell, and Mr. Jones's ships will be assured of the fact, by the existence of a polynia stretching up in that direction.

How far such an iceless sea will be found to extend to the eastward, should its existence be established, observations can alone determine. But, as a guide, I beg to send the accompanying chart, on which Passed Midshipman Gibbon has, at my request, projected the isothermal curves of 5° and 10°, from *Johnson's Physical Atlas.*

These curves are, according to Sir David Brewster, probably lemniscates; and as it is conjectured that there are two poles of maximum cold, viz: one in latitude 80° N. and longitude 100° W., and the other in latitude 80° N. and longitude 95° E., the mean temperature of the former, which is the American pole, is, according to Sir David Brewster, 3½° below zero of Fahrenheit, while that of the other, or Siberian pole, is 1° above zero of the same scale.

The line of packed ice is probably a curve, depending for its form partly upon isothermal lines, and partly upon the eddies caused by the meeting of the various currents in the Arctic Ocean.

Supposing two such poles to exist in nature, the isothermal lines about them would be re-entering curves, the exact form of which, however, cannot be determined without the aid of further observations.

But, according to this theory, the mean temperature of the north pole itself will differ not much from the mean temperature of latitude 70° N.

In entering into Behring's Straits, and following up the coast of West Georgia, the whalers may make the icy barrier perhaps about 160° W., between latitude 70° and 72° N. In this position they will find themselves, in a straight line, not more than a thousand miles from Wellington Straits on the Atlantic shores of America, and not much more than half that distance from Bank's Land. To the N. E. of this land are the Parry Islands; to the north of those the sea is by some thought to be again polynial, or free from ice.

In the Arctic Ocean, the prevailing winds are from the westward; so that a vessel under canvas, entering it through Behring's Straits, would have probably a better chance of making her way through, than one which enters on this side and to leeward, and which, therefore, would have occasionally to turn to windward, and, for much of her time, to contend against adverse currents.*

To a vessel entering Behring's Straits, the current would also be favorable, for there *must* be currents in that sea to supply those which come down from Baffin's Bay into the Atlantic.

These currents would materially assist the navigator in his progress eastward through the Arctic Seas, but they would retard him, to the same extent, in his progress west through the same seas.

You are aware that there is a current from Baffin's Bay, through Davis's Straits; this is a powerful current, and it moves an immense volume of water. A current as powerful must run into that bay from some other quarter.

Laden with icebergs, this Baffin's Bay current meets the Gulf Stream near the Grand Banks, where it is bifurcated. One fork continues as an undercurrent towards the Caribbean Sea, and the other, pursuing its course to the south, is felt as an inshore current along the coast of the United States as far down as Florida. There is no counter-current to this,† running back from the Atlantic through Davis's Straits.

Wrangle's polynia, to the north of Siberia, if it exist, probably owes its freedom from ice to the warm waters of the Gulf Stream, which run between Spitzbergen and the North Cape into the Arctic Ocean. That such is the course of the Gulf Stream is clearly indicated by a thermal chart which is now in process of construction at this office, by Lieutenant Guantt. This chart shows that the waters of the Atlantic, in latitude 68° N. above Ireland, are some degrees warmer than they are near the shore off Cape Hatteras, in latitude 36° N. The difference in temperature for the spring is 8° or 10° of Fahrenheit.

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* H. B. M. ship Investigator, Commander McClure—I hope to have the pleasure soon of calling him captain—has demonstrated the correctness of this opinion. He entered Behring's Straits in the summer of 1850, and intelligence has just been received from him (October, 1853), *via* Baffin's Bay and Davis's Straits, by which we learn that he was almost within striking distance of Wellington Channel. His dispatches bear date April 10, 1853. He was then in the Bay of Mercy, whence he had communicated with the officers of H. B. M. ship Herald, that entered the Frozen Ocean from the east.

† Counter-current to this; unless it be an undercurrent, as has since been proved.—M.

Seeing, therefore, that the waters from the Gulf of Mexico run into the Arctic Ocean to the north of Europe; that the waters of the larger rivers both of Europe, Asia, and America—such as the Dwina, the Petchora, the Obi, the Yenesei and Lena, the Mackenzie's River, the rivers of Back, the Copper Mine, and others—empty into the same ocean; that waters from the Pacific flow into it through Behring's Straits; that there is no reflux from it through any of these channels, but that there is a powerful ice-bearing current running from it through Davis's Straits; seeing all this, we are led reasonably to infer, not only that there is a sea not frozen, somewhere between Behring's Straits and Baffin's Bay, but that the course of the current in that sea is such as has already been indicated, viz: from west to east.

The fact that these currents, which run into the Arctic Ocean and out of Baffin's Bay, do exist, and that they are perpetual, leads us also to infer that a portion of the water of the Arctic Ocean is always in motion; that the currents within that sea are as constant as those which run into it, and out again from it; and that, therefore, a portion of that sea is always in a fluid state.

Without meaning, however, to commit myself as to the perpetual existence of Wrangle's open sea, I think there is reasonable ground for supposing that, after entering Behring's Straits, and passing the first icy barrier, an open sea may still be found to the north of that barrier.

It will be for the masters of whale ships themselves, to judge as to the expediency of passing this barrier when they come to it, provided they find an opening. If they do find an opening, and venture through it, they will probably be rewarded for their intrepidity by the discovery of whales in great numbers.

The kind of whales (Right) found there delight in cold water; their *habitat* is never in warm. The discovery has been made here, by the investigations which Lieut. Herndon is conducting with regard to the habits of the Right whale, that this fish never crosses the equator;—that the Right whale of the southern hemisphere is quite a different animal from the Right whale of the northern hemisphere.

The latter is of a darker complexion and much larger. Now if the species of whales that are found in Behring's Straits be found also off the shores of Greenland—and the whalemen will probably be able to say (and they have since informed me that they are identical, Jan. 1850); we shall have another link in the chain of circumstantial evidence going to prove that there is, at times, at least, an open water communication between the Straits of Behring and Davis.

But if Mr. Jones and his associates mean to be in good earnest in their humane efforts, and were to send their ships into Behring's Straits for the sole object of finding Sir John Franklin, or a passage through into the Atlantic, they will probably accomplish one or both.

I have great faith in American enterprise and energy; with proper means that sea may be traversed, and the fate of that expedition may be determined; at least there is reasonable grounds for the opinion that an expedition properly fitted, and skilfully conducted, would be crowned with success, and would cover itself and its projectors with much honor.

Such an expedition should consist of at least three vessels—viz: one sailer and two steamers, all prepared especially for that service.

The sail ship should be large enough to hold the provisions for the expedition for two or three years,

and coals also for the steamers during their few weeks of active work in the summer. A store-ship should accompany them to Behring's Straits, and there filling them up, leave them for the season and return.

Their course would then be to proceed on until their progress should be interrupted by the ice. Here they would select some safe place of anchorage or rendezvous for the ship; thus moored, she would serve as a place of refuge, and at the same time as a provision wagon. From her, the steamers would fit out an expedition of a few weeks at a time, and until they should succeed in finding an opening through it. Should they succeed in finding such an opening, they would probably have a clean sea thence until they should reach the icy barrier on this side; success in finding a channel-way through this barrier would bring them out into the Atlantic Ocean.

The steamers, of course, should be properly constructed, and provided with ice-breakers or saws, by which they could, in case of emergency, cut their way out through the ice, as well as a way for their provision ship.

The steamers for such service need not be large. Mr. Jones does not propose sending an expedition exclusively in search of Sir John Franklin; therefore those remarks do not apply to his case. But Mr. Jones, and his associates, are evidently gentlemen of humane disposition and noble impulses; therefore, I have ventured to make these suggestions, feeling assured that they would be received as they are meant, and only for what they are worth.

The Huntsville, and the Alice,* of course, will not fail to be provided with faithful interpreters, and through them they will be sure to make diligent inquiries among the natives for intelligence of Sir John and his expedition. The Indians should be induced by presents, or the promise of rewards, to examine the coast line, and to inquire from tribe to tribe as to when and where he was last, if ever, seen.

Doubtless these two private ships and their crews, will in the proposed voyage render a gratifying and acceptable service to the people of Christendom.

Should it be desired, another Chart, the duplicate of the one herewith sent, can be prepared at this office, so that each vessel may have one of the same kind. There are also other charts here, relating to Behring's Straits and Arctic America, which, if so authorized, I shall be glad to put at the disposal of the masters of the Huntsville and Alice.

P. S.—In the haste in which this letter has been necessarily prepared, in consequence of being about to leave the city on a tour of duty, many points have been either wholly omitted or but slightly attended to. Among the most important of these, is a suggestion concerning a depot of coals and provisions near Wellington Straits, or some other suitable place this side, to which the steamers might look for supplies, in the event of passing the icy barrier after entering Behring's Straits; and the other is concerning those causes which operate to form an icy barrier around the polynia.

The line of ice is probably placed near the meeting of the various currents within the Arctic Ocean. Whenever two currents meet in the ocean, there is a belt of still, or of comparatively still water, within

* Two whaling vessels belonging to him.—M.

which belts are deposited the floating bodies and silt that are borne by the currents. Hence, we find bars at the mouth of all our rivers which empty directly into the sea. The Banks of Newfoundland owe their existence to this cause. The floating matter that is borne along by the Gulf Stream, and which is prevented from settling at the bottom by the rapidity of the current, is met near these banks by the cold current from Davis's Straits. In the still water, near the line of junction between those two currents, this drift matter has time to settle, and consequently there is a deposit there of sediment;—in like manner, the icebergs which bring down rocks, gravel, and sands, begin here to melt and to make deposits also.

And where there is on the sea drift or floating matter, such as sea-weed, &c., we can see the line of eddy by the manner in which that matter is arranged.

Taking the case of the line of packed ice in the Arctic Ocean, and referring to the Chart, it will be perceived that this line, from the neighborhood of Behring's Straits, runs up in a northwesterly direction, and that it probably lies along the line in which the currents from the rivers of Europe and Asia, probably many times the volume of the Mississippi, meet the current around the North Cape from the Gulf of Mexico.

Again, after passing Behring's Straits, and feeling the effect of that powerful current, this line bends up in a northeasterly direction.

The process may be supposed to be this: the ice which is forced in the current through Behring's Straits, and in the general current farther north towards Baffin's Bay, is broken to pieces by the agitation of the sea. These pieces are gradually sloughed off from either current, and arranged in the eddy between the two currents, as we see drift-wood, &c., arranged by the side of counter-currents in rivers and other sheets of water. The spray now dashes upon these blocks of ice, they become frozen and cemented together, until by gradual accession they form a compact and immense mass of packed ice, for that is the term applied by seamen. This mass, therefore, is probably not very broad. It may, after attaining a certain height, be broken through, either by the pressure of the current whose course it has arrested, or by the violence of the winds, or the waves, or by all these forces acting together; so it is very probable that the sea within this barrier will be found free or nearly free from floe ice—and comparatively smooth, for the barrier of ice will serve for a breakwater, or like a coral reef, will shelter it from the winds and protect it from the forces of the swell on the outside.

Should a steamer, therefore, by Behring's Straits, succeed in passing through the first barrier of ice, she would probably have the water so smooth that, after a few days' steaming, she would find herself up with the icy barrier that would block her way into Wellington's or some other of the straits that lead out into Baffin's Bay.

Extracts from the Instructions issued by the Hon. Wm. A. Graham, Secretary of the Navy, to Lieut. De Haven, commanding the Grinnell Expedition in search of Sir John Franklin.

You will, therefore, use all diligence and make every exertion to this end; paying attention as you go to the subjects of scientific inquiry only so far as the same may not interfere with the main object of the expedition.

Having passed Barrow's Strait, you will turn your attention northward to Wellington Channel, and westward to Cape Walker, and be governed by circumstances as to the course you will take. Accordingly, you will exercise your own discretion, after seeing the condition of the ice, sea, and weather, whether the two vessels shall here separate, one for Cape Walker and the other for Wellington Strait; or, whether they shall both proceed together for one place or the other.

Should you find it impossible, on account of the ice, to get through Barrow's Strait, you will then turn your attention to Jones's Sound and Smith's Sound. Finding these closed or impracticable, and failing of all traces of the missing expedition, the season will be too far advanced for any other attempts, and you will return to New York.

Acquaint, before sailing, and from time to time during the cruise, Passed Midshipman Griffin, fully with all your plans and intentions; and before you sail from New York appoint a place of rendezvous; change it as often as circumstances may render a change desirable; but always have a place of rendezvous fixed upon; so that, in case the two vessels of the expedition may at any time become separated, each may know where to look for the other.

Nearly the entire Arctic front of the continent has been scoured without finding any traces of the missing ships. It is useless for you to go there, or to re-examine any other place where search has already been made. You will, therefore, confine your attention to the routes already indicated.

The point of maximum cold is said to be in the vicinity of the Parry Islands. To the north and west of these, there is probably a comparatively open sea in summer, and therefore a milder climate.

This opinion seems to be sustained by the fact that beasts and fowls are seen migrating over the ice from the mouth of Mackenzie River and its neighboring shores to the north. These dumb creatures are probably led by their wise instincts to seek a more genial climate upon the borders of the supposed more open sea.

There are other facts elicited by Lieut. Maury, in the course of his investigations touching the winds and currents of the ocean, which go also to confirm the opinion that, beyond the icy barrier which is generally met within the Arctic Ocean, there is a polynia, or sea free from ice. You have assisted in these investigations at the National Observatory, and are doubtless aware of the circumstances which authorize this conclusion. It is therefore needless to repeat them.

This supposed open sea and warmer region, to the north and west of the Parry Islands, are unexplored. Should you succeed in finding an opening there, either after having cleared Wellington Strait or after having cleared the Parry Islands by a northwesterly course from Cape Walker, enter as far as it in your judgment

may be prudent to enter; and search every headland, promontory, and conspicuous point, for signs and records of the missing party, taking particular care yourself to avail yourself of every opportunity for leaving, as you go, records and signs to tell of your welfare, progress, and intentions. For this purpose you will erect flagstaffs, make piles of stones or other marks in conspicuous places, with a bottle or barreca at the base containing your letters.

Should the two vessels be separated, you will direct Passed Midshipman Griffin to do likewise. Avail yourself of every opportunity, either by the Esquimaux, or otherwise, to let the Department hear from you; and in every communication be particular as to your future plans and intended route.

If by any chance you should penetrate so far beyond the icy barrier as to make it in your judgment more prudent to push on than to put back, you will do so, and put yourself in communication with any of the U. S. naval forces or officers of the Government, serving in the waters of the Pacific, according to your necessities and opportunities. These officers will be instructed to afford you every facility possible to enable you to reach the western coast of the United States in September.

In the event of your falling in with any of the British searching parties, you will offer them any assistance of which they may stand in need, and which it may be in your power to give. Offer also to make them acquainted with your intended route and plans, and be ready to afford them every information of which you may have become possessed with regard to the object of your search.

In case your country should be involved in war during your absence on this service, you will on no account commit, or suffer any one on the expedition to commit any, the least, act of hostility against the enemy, of whatever nation he may be.

Notwithstanding the direction towards which you have been recommended to carry your examination, you may, on arriving out upon the field of operation, find that by departing from them your search would be more effectual. The Department has every confidence in your judgment, and relies implicitly upon your discretion; and should it appear during the voyage, that, by directing your attention to the points not mentioned in this letter, traces of the absent explorers would probably be found, you will not fail to examine such points.

But you will on no account uselessly hazard the safety of the vessels under your command, or unnecessarily expose to danger the officers and men committed to your charge.

Unless circumstances should favor you by enabling you to penetrate, before the ice begins to make, far into the unexplored regions, or to discover recent traces of the missing ships and their gallant crews, or unless you should gain a position from which you could commence operations in the season of 1851, with decided advantage, you will endeavor not to be caught in the ice during the coming winter; but after having completed your examinations, make your escape and return to New York in the fall.

You are especially enjoined not to spend, if it can be avoided, more than one winter in the Arctic regions.

Wishing you and your gallant companions all success in your noble enterprise, and with the trust in God, that he will take you and them in his holy keeping.

I am, &c.

Lieut. De Haven's Report.

U. S. BRIG ADVANCE,

New York, October 4, 1851.

SIR: I have the honor to submit the following as the proceedings of the squadron under my command, subsequent to the 22d of August, 1850, up to which time the Department is already advised of its movements.

On the 23d of August we approached Port Leopold, but the necessity of a detention here to search for information was precluded by our falling in with the English yacht Prince Albert, Commander Forsyth, R. N. He informed us that the harbor was still filled with ice, so as to render it inaccessible to vessels. A boat, however, had been sent in, but no traces of the missing expedition were found.

We now stood over for the north shore, passing to the eastward of Leopold Island, threading our way through much heavy stream ice. Barrow's Straits, to the westward, presented one mass of heavy and closely packed ice, extending close into the coast of North Somerset. On the north shore we found open water, reaching to the westward as far as Beechy Island.

At noon on the 25th, we were off Cape Riley, where the vessel was hove to, and a boat sent ashore to examine a cairn erected in a conspicuous position. It was found to contain a record of H. B. M.'s ship Assistance, deposited the day before. Another record informed us that our consort had visited the cape at the same time with the Assistance.

Fragments of painted wood and preserved meat-tins were picked up on the low point of the cape. There were also other indications that it had been the camping-ground of some civilized travelling or hunting party; our speculations at once connected them with the object of our search.

While making our researches on shore, the vessel was set by a strong current near the point, where, becoming hampered by some masses of ice, she took the ground. Every effort was made to get her off, but the falling tide soon left her "hard and fast." We now lightened her of all weighty articles about deck, and prepared to renew our efforts when the tide should rise. This took place about midnight, when she was hauled off without apparent injury.

The Prince Albert approached us while aground, and Commander Forsyth tendered his assistance; it was not, however, required. Soon after, the Rescue came in sight from around Beechy Island, and making us out in our predicament, hove to in the offing and sent a boat in. She had been up Wellington Channel as far as Point Innes. The condition of the ice prevented her from reaching Cape Hotham (the appointed place of rendezvous), so she had returned in search of us.

On the 26th, with a light breeze, we passed Beechy Island, and ran through a narrow lead to the north. Immediately above Point Innes, the ice of Wellington Channel was fixed and unbroken from shore to shore, and had every indication of having so remained for at least two or three years. It was generally about eight feet thick, and the sharp angular hummocks—peculiar to recently formed ice—had been rounded down to gentle hillocks, by the action of the weather for several seasons. Farther progress

to the north was out of the question. To the west, however, along the edge of the fixed ice, a lead presented itself, with a freshening wind from the southeast. We ran into it; but at half-way across the channel, our headway was arrested by the closing ice. A few miles beyond this two of the English vessels (one a steamer) were dangerously beset. I deemed it prudent to return to Point Innes, under the lee of which the vessels might hold to in security until a favorable change should take place.

On Point Innes, distinct traces of an encampment were found, together with many relics similar to those found at Cape Riley. Captain Penny (whose squadron we met here) picked up a piece of paper containing the name of one of the officers of Franklin's expedition, written in pencil; thus proving, beyond a doubt, that some of his party had encamped here; but when, or under what circumstances, it was difficult to say. The preserved meat-cans, moreover, bore the name of the person who had supplied his ships with that article.

On Point Innes we also found the remains of an Esquimaux hut, but it had evidently been abandoned for many years. No recent traces of this people were found on any of the shores of Lancaster Sound, that we visited. The weather becoming more favorable, we retraced our steps as far as Beechy Island, in order to make more minute investigations in that quarter. The vessels were made fast to the land-ice on the northwest side of the island, on the 27th of August. The schooner Felix, Captain Sir John Ross, R. N., and the squadron under Captain Penny, joined us at this point. Consulting with these gentlemen, a joint search was instituted along the adjacent shore, in all directions. In a short time, one of Captain Penny's men returned, and reported that he had discovered *several graves*. On examination, his report proved to be correct. Three well-made graves were found, with painted head-boards of wood; the inscriptions on which were as follows:—

1.—"Sacred to the memory of W. Braine, K. M., H. M. S. Erebus; died April 3, 1846, aged 32 years. 'Choose you this day whom ye will serve.'"

2.—"Sacred to the memory of John Hartwell, A. B., H. M. S. Erebus, aged 23 years. 'Thus saith the Lord of Hosts; consider your ways.'"

3.—"Sacred to the memory of Jno. Torrington, who departed this life January 1, A. D. 1846, on board H. M. ship Terror, aged 20."

Near the graves were also other unmistakable evidences of the missing expedition having passed its first winter here. They consisted of innumerable scraps of old rope and canvas; the block on which stood the *armorer's anvil*, with many pieces of coal and iron around it; the outlines of several tents, or houses, supposed to have been the sites of the observatory, and erections for sheltering the mechanics. The chips and shavings of the carpenter still remained.

A short distance from this was found a large number of preserved meat-tins, all having the same labels as those found at Point Innes.

From all these indications, the inference could not fail to be arrived at, that the Erebus and Terror had made this their *first* winter-quarters after leaving England. The spot was admirably chosen for the security of the ships, as well as for their early escape the following season. Everything, too, went to prove

that up to this point the expedition was well organized, and that the vessels had not received any material injury.

Early in the morning of the 28th of August, H. B. M. ship Resolute, Captain Austin, with her steam tender, arrived from the eastward. Renewed efforts were made by all parties to discover some written notice, which, according to his instructions, Sir John Franklin ought to have deposited at this place in some conspicuous position. A cairn of stones erected on the highest part of the island was discovered. A most thorough search with crows and picks was instituted at and about it, in the presence of all hands. This search was continued for several days, but not the slightest vestige of a record could be found. The graves were not opened nor disturbed.

Capt. Sir John Ross had towed out from England a small vessel of about 12 tons. He proposed leaving her at this point, to fall back upon in case of disaster to any of the searching vessels. Our contribution to supply her was three barrels of provisions.

From the most elevated part of Beechy Island (about 800 feet high), an extensive view was had both to the north and west. No open water could be seen in either direction.

On the 29th of August we cast off from Beechy Island and joined our consort at the edge of the fixed ice, near Point Jones.

Acting Master S. P. Griffin, commander of the Rescue, had just returned from a searching excursion along shore, on which he had been dispatched 48 hours before. Midshipman Lovell and four men composed his party. He reports that, pursuing carefully his route to the northward, he came upon a partially overturned cairn of large dimensions, on the beach a few miles south of Cape Bowden. Upon strict examination, it appeared to have been erected as a place of deposit for provisions. No clue could be found within it or around, as to the persons who built it; neither could its age be arrived at. At 2 P. M. of the 28th, he reached Cape Bowden without further discovery. Erecting a cairn containing the information which would be useful to a distressed party, he commenced his journey back.

Until the 3d of September we were detained at this point by the closing in of the ice from the southward, occasioned by strong S. E. winds accompanied with thick weather and snow. On this day, the packed ice moved off from the edge of the fixed ice, leaving a practicable lead to the west, into which we at once stood. At midnight, when about two-thirds of the way across the channel, the closing ice arrested our progress. We were in some danger from heavy masses coming against us, but both vessels passed the night uninjured. In the evening of the 4th we were able to make a few miles more westing, and the following day we reached Barlow's Inlet. The ice being impracticable to the southward, we secured the vessels at its entrance. The Assistance, and her steam tender, were seen off Cape Hotham, behind which they disappeared in the course of the day.

Barlow's Inlet would afford a good shelter for vessels in case of necessity, but it would require some cutting to get in or out. The ice of last winter still remained in it unbroken.

A fresh breeze from the north on the 8th, caused the ice in the channel to set to the southward. It

still remained, however, closely packed on Cape Hotham. On the 9th, in the morning, the wind shifted to the westward; an opening appeared, and we at once got under way.

Passing Cape Hotham, a lead was seen along the south side of Cornwallis Island, into which, with a head wind, we worked slowly, our progress being much impeded by bay ice; indeed, it brought us to a dead stand more than once. The following day we reached Griffith's Island, passing the southern point of which, the English searching vessels were descried made fast to the ice at a few miles' distance. The western lead closing at this point, we were compelled to make fast also.

The ice here was so very unfavorable for making further progress, and the season was so far advanced, that it became necessary to take further movements into serious consideration. A consultation was held with the commander of the Rescue, and after reviewing carefully all the circumstances attending our position, it was judged that we had not gained a point from which we could commence operations in the season of 1851 with decided advantages. Therefore, agreeably to my instructions, I felt it an imperative duty to extricate the vessels from the ice and return to the United States.

The state of the weather prevented our acting immediately upon this decision.

September 11, wind from the eastward, with fog and snow, we were kept stationary; much bay ice forming; thermometer 26°. Early on the morning of the 12th, the wind changed to the N. W. and increased rapidly to a heavy gale, which, carrying off the ice, brought with it clouds of drift snow.

The Rescue was blown from her ice anchors, and went adrift so suddenly that a boat and two of her men were left behind; she got under sail, but the wind was too strong for her to regain the ice. The driving snow soon hid her from us. The Advance came near meeting the same fate; the edge of the floe kept breaking away, and it was with much difficulty that other ice anchors could be planted further in, to hold on by.

The thermometer fell to 8°; mean for the 24 hours, 14°.

On the morning of the 13th, the wind having moderated sufficiently, we got under way, and, working our way through some streams of ice, arrived in a few hours at Griffith's Island, under the lee of which we found our consort made fast to the shore, where she had taken shelter in the gale, her crew having suffered a good deal from the inclemency of the weather. In bringing to, under the lee of the island, she had the misfortune to spring her rudder, so that, on joining us, it was with much difficulty she could steer. To insure her safety and more rapid progress, she was taken in tow by the Advance, when she bore up with a fine breeze from the westward. Off Cape Martyr, we left the English squadron, under Capt. Austin.

About ten miles farther to the west, the two vessels under Capt. Penny, and that under Sir John Ross, were seen secured near the land. At 8 P. M. we had advanced as far as Cape Hotham. Thence, as far as the increasing darkness of the night enabled us to see, there was nothing to obstruct our progress except the bay ice. This, with a good breeze, would not have impeded us much; but, unfortunately, the wind, when it was most required, failed us. The snow, with which the surface of the water was covered, rapidly cemented and formed a tenacious crust, through which it was impossible, with all our appliances, to force the vessels. At 8 P. M. they came to a dead stand, some ten miles to the east of Barlow's Inlet.

The following day the wind hauled to the southward, from which quarter it lasted till the 19th. During this period the young ice was broken, its edges squeezed up into hummocks, and one floe overrun by another till it all assumed the appearance of heavy ice. The vessels received some heavy nips from it, but they sustained them without injury. Whenever a pool of water made its appearance, every effort was made to reach it, in hopes it would lead us into Beechy Island, or some other place where the vessels might be placed in security for the winter.

The winter set in unusually early, and the severity with which it commenced, forbade all hope of our being able to return this season; and I now became anxious to attain a point in the neighborhood, from whence, by means of land parties in the spring, a goodly extent of Wellington Channel might be examined.

In the mean time, under the influence of the south wind, we were being set up the channel. On the 18th, we were above Cape Bowden, the most northern point seen on this shore by Parry. The land on both shores was seen much farther, and tended considerably to the west of north. To account for this drift, the fixed ice of Wellington Channel, which we had observed in passing to the westward, must have been broken up, and driven to the southward by the heavy gale of the 12th.

On the 19th, the wind veered to the north, which gave us a southerly set, forcing us in at the same time, with the western shore. This did not last long, for the next day the wind hauled again to the south, and blew fresh, bringing the ice in upon us with much pressure. At midnight it broke up all around us, so that we had work to maintain the Advance in a safe position, and keep her from being separated from her consort, which was immovably fixed in the centre of a large floe.

We continued to drift slowly to the N. N. W. until the 22d, when our progress appeared to be arrested by a small, low island which was discovered in that direction, about seven miles distant. A channel of three or four miles in width separated it from Corwallis Island. This latter island, tending N. W. from our position, terminated abruptly in an elevated cape, to which I have given the name of Manning, after a warm personal friend, and ardent supporter of the expedition. Between Cornwallis Island and some distant high land visible in the north, appeared a wide channel leading to the westward. A dark, misty-looking cloud which hung over it (technically termed "frost-smoke"), was indicative of much open water in that direction.

This was the direction to which my instructions, referring to the investigations at the National Observatory, concerning the winds and currents of the ocean, directed me to look for open water.

Nor was the open water the only indication that presented itself in confirmation of this theoretical conjecture as to a milder climate in that direction. As we entered Wellington Channel, the signs of animal life became more abundant; and Captain Penny, commander of one of the English expeditions, who afterwards penetrated on sledges much farther towards the region of the frost-smoke than it was possible for us to do in our vessels, reported that he actually arrived on the borders of this open sea.

Thus these admirably drawn instructions, deriving arguments from an enlarged and comprehensive system of physical research, not only pointed with emphasis to an unknown open sea, into which Franklin

had probably found his way, but directed me to search for traces of his expedition in the very channel, at the entrance of which, it is now ascertained, he had passed his first winter.

The direction in which search, with most chances of success, is now to be made for the missing expedition, or for traces of it, is no doubt in the direction which is so clearly pointed out in my instructions.

To the channel which appeared to lead into the open sea, over which the cloud of frost-smoke hung as a sign, I have given the name of Maury, after the distinguished gentleman at the head of our National Observatory, whose theory with regard to an open sea to the north is likely to be realized through this channel. To the large mass of land visible between N. W. to N. N. E. I gave the name of Grinnell, in honor of the head and heart of the man in whose philanthropic mind originated the idea of this expedition, and to whose munificence it owes its existence.

To a remarkable peak bearing N. N. E. from us, distant about forty miles, was given the name of Mount Franklin. An inlet or harbor, immediately to the north of Cape Bowden, was discovered by the commander of the Rescue, in his land excursion from Point Innes, on the 27th of August, and has received the name of Griffin Inlet. The small island mentioned before, was called Murdaugh's Island, after the acting master of the Advance.

The eastern shore of Wellington Channel appeared to run nearly parallel with the western; but it became quite low, and being covered with snow, could not be distinguished with certainty, so that its continuity with the high land to the north was not ascertained.

Some small pools of open water appearing near us, an attempt was made to get the vessels into them. The Advance was moved about fifty yards, but our combined efforts were of no avail in extricating the Rescue from her icy cradle. A change of wind not only closed the ice up again, but threatened to give us a severe nip. We unshipped her rudder, and placed it out of harm's way.

September 23d was an uncomfortable day; the wind was from the N. E. with snow. From an early hour in the morning, the floe began to be pressed together with so much force, that their edges were thrown up in immense ridges of rugged hummocks. The Advance was heavily nipped between two floes, and the ice was piled up so high above the rail on the starboard side, as to threaten to come on board, and sink us with its weight. All hands were occupied in keeping it out. The pressure and commotion did not cease till near midnight, when we were very glad to have a respite from our labors and fears. The next day we were threatened with a similar scene, but it fortunately ceased in a short time.

For the remainder of September and until the 4th of October, the vessels drifted but little. The winds were very light; the thermometer fell to minus 12°, and ice formed over the few pools in sight, sufficiently strong to travel upon.

We were now strongly impressed with the belief that the ice had become fixed for the winter, and that we should be able to send out travelling parties from this advanced position for the examination of the land to the northward. Stimulated by this fair prospect, another attempt was made to reach the shore in order to establish a depot of provisions at, or near Cape Manning, which would materially facilitate the

progress of our parties in the spring, but the ice was still found to be detached from the shore, and a narrow lane of water cut us off from it.

During this interval of comparative quiet, preliminary measures were taken for heating the Advance, and increasing her quarters so as to accommodate the officers and crews of both vessels. No stoves had as yet been used in either vessel; indeed, they could not well be put up without placing a large quantity of stores and fuel upon the ice. The attempt was made to do this, but a sudden crash in the floe where it appeared strongest, causing the loss of several tons of coal, convinced us that it was not yet safe to do so. It was not till the 20th of October that we got fires below. Ten days later the housing-cloth was put over, and the officers and crew of the Rescue ordered on board the Advance for the winter. Room was found on the deck of the Rescue for many of the provisions removed from the hold of this vessel; still, a large quantity had to be placed on the ice.

The absence of fires below had caused much discomfort to all hands ever since the beginning of September; not so much from the low temperature as from the accumulation of moisture, by condensation, which congealed as the temperature decreased, and covered the wood-work of our apartments with ice. This state of things soon began to work its effect upon the health of the crews; several cases of scurvy appeared among them; and notwithstanding the indefatigable attention and active treament resorted to by the medical officers, it could not be eradicated; its progress, however, was checked.

All through October and November we were drifted to and fro by the changing wind, but never passed out of Wellington Channel. On the first of November, the new ice had attained the thickness of thirty-seven inches; still, frequent breaks would occur in it, often in fearful proximity to the vessels. Hummocks, consisting of massive granite-like blocks, would be thrown up to the height of twenty, and even thirty feet. This action in the ice was accompanied with a variety of sounds impossible to be described; but when heard, never failed to carry a feeling of awe into the stoutest hearts. In the stillness of an arctic night they would be heard several miles; and often was the rest of all hands disturbed by them.

To guard against the worst that could happen to us, the destruction of the vessels, the boats were prepared, and sledges built. Thirty days' provisions were placed in them for all hands, together with tents and blanket bags for sleeping in. Besides this, each man and officer had his knapsack, containing an extra suit of clothes. These were all kept in readiness for use at a moment's notice.

For the sake of wholesome exercise, as well as to inure the people to ice travelling, frequent excursions were made with our laden sledges. The officers usually took the lead at the drag-ropes, and they, as well as the men, underwent the labor of surmounting the rugged hummocks with great cheerfulness and zeal. Notwithstanding the low temperature, all hands usually returned in a profuse perspiration. We had also other sources of exercise and amusement, such as the foot-ball, skating, sliding, and racing, with theatrical representations on holidays and national anniversaries. These amusements were continued throughout the winter, and contributed very materially to the cheerfulness and general good health of all hands.

The drift had set us gradually to the southeast until we were about five miles to the southwest of

Beechy Island. In this position we remained comparatively stationary about a week. We once more began to entertain a hope that we had become fixed for the winter, but it proved a vain one; for on the last day of November a strong wind from the westward set in, with thick snowy weather. This wind created an immediate movement in the ice; several fractures took place near us, and many heavy hummocks were thrown up. The floe in which our vessels were imbedded was being rapidly encroached upon, so that we were in momentary fear of the ice breaking from around them, and that they would be once more broken out, and left to the tender mercies of the crushing floes.

On the following day (the first of December), the weather cleared off, and the few hours of twilight which we had about noon enabled us to get a glimpse of the land. As well as we could make it out, we appeared to be off Gascoigne Inlet.

We were now clear of Wellington Channel, and in the fair way of Lancaster Sound, to be set either up or down at the mercy of the prevailing winds and currents. We were not long left in doubt as to the direction we had to pursue. The winds prevailed from the westward, and our drift was steady and rapid towards the mouth of the sound.

The prospect before us was now anything but cheering. We were deprived of our last fond hope—that of becoming fixed in some position whence operations could be carried on by means of travelling parties in the spring. The vessels were being fast set out of the region of research.

Nor was this our only source of uneasiness. The line of our drift was from two to five miles from the north shore; and whenever the moving ice met with any of the capes, or projecting points of land, the obstruction would cause fractures in it, extending off to, and far beyond us.

Cape Hurd was the first and most prominent point; we were but two miles from it on the 3d of December. Nearly all day the ice was both seen and heard to be in constant motion at no great distance from us. In the evening, a crack in our floe took place not more than twenty-five yards ahead of the Advance. It opened in the course of the evening to the width of one hundred yards.

No farther disturbance took place until noon of the 5th, when we were somewhat startled by the familiar and unmistakable sound of ice grinding against the side of the ship. Going on deck, I perceived that another crack had taken place along the length of the vessel. It did not open more than a foot; this, however, was sufficient to liberate the vessel, and she rose several inches bodily, having become more buoyant since she was frozen in. The following day, in the evening, the crack opened several yards, leaving the sides of the Advance entirely free, and she was once more supported by, and rode in her own element. We were not, however, by any means in a pleasant situation. The floes were considerably broken in all directions around us, and one crack had taken place between the two vessels. The Rescue was not disturbed in her bed of ice.

December 7, at 8 A. M., the crack in which we were had opened and formed a lane of water 50 feet wide, communicating ahead, at the distance of 60 feet, with ice of about one foot in thickness, which had formed since the 3d. The vessel was secured to the largest floe near us, that on which our spare stores were deposited. At noon the ice was again in motion, and began to close, affording us the pleasant pros-

pect of an inevitable "nip" between two floes of the heaviest kind. In a short time the prominent points took our sides on the starboard, just about the main rigging, and on the port, under the counter, and at the fore rigging, thus bringing three points of pressure, in such a position that it must have proved fatal to a larger or less strengthened vessel.

The Advance, however, stood it bravely. After trembling and groaning in every joint, the ice passed under and raised her about two and a half feet; she was let down again for a moment, and then her stern was raised about five feet; her bow, being unsupported, was depressed almost as much. In this uncomfortable position we remained. The wind blew a gale from the eastward, and the ice all round was in dreadful commotion, excepting, fortunately, that in immediate contact with us. The commotion in the ice continued all through the night, and we were in momentary expectation of witnessing the destruction of both vessels. The easterly gale had set in some two or three miles to the west.

As soon as it was light enough to see on the 9th, it was discovered that the heavy ice in which the Rescue had been imbedded for so long a time, was entirely broken up, and piled around her in massive hummocks. On her pumps being sounded, I was gratified to learn that she remained tight, notwithstanding the immense straining and pressure that she must have endured.

During this period of trial, as well as in all former and subsequent ones, I could not avoid being struck with the calmness and decision of the officers, as well as the subordination and good conduct of the men, without an exception. Each one knew the imminence of the peril that surrounded us, and was prepared to abide it with a stout heart. There was no noise, no confusion. I did not detect, even in the moments when the destruction of the vessels seemed inevitable, a single desponding look among the whole crew; on the contrary, each one seemed resolved to do his whole duty, and everything went on cheerily and bravely.

For my own part, I had become quite an invalid—so much so, as to prevent my taking an active part in the duties of the vessel, as I had always done, or even from incurring the exposure necessary to proper exercise. However, I felt no apprehension that the vessel would not be properly taken care of, for I had perfect confidence in the officers, one and all, by whom I was surrounded. I knew them to be equal to any emergency; but I felt under special obligations to the gallant commander of the Rescue, for the efficient aid which he rendered me. With the kindest consideration and the most cheerful alacrity, he volunteered to perform the executive duties during the winter, and relieve me from everything that might tend in the least to retard my recovery.

During the remainder of December, the ice remained quiet immediately around us, and the breaks were all strongly cemented by new ice. In our neighborhood, however, cracks were daily visible. Our drift to the eastward averaged nearly six miles per day, so that on the last of the month we were at the entrance of the sound; Cape Osborn bearing north from us.

January, 1851. On passing out of the sound, and opening Baffin's Bay to the northward, was seen a dark horizon, indicating much open water in that direction.

On the 11th, a crack took place between us and the Rescue, passing close under our stern. It opened

and formed a lane of water eighty feet wide. In the afternoon the floes began to move; the lane of water was closed up, and the edges of the ice coming in contact with much pressure, threatened the demolition of the narrow space which separated us from the line of fracture; fortunately, the floes again separated and assumed a motion by which the Rescue passed from our stern to the port bow, and increased her distance from us to seven hundred yards, where she came to a stand. Our stores that were on the ice were on the same side of the crack as the Rescue, and of course were carried with her.

The following day the ice remained quiet; but soon after midnight on the 13th, a gale having sprung up from the westward, it once more got into violent motion; young ice in the crack near our stern was soon broken up; the edges of the thick ice came in contact, and a fearful pressure took place, forcing up a line of hummocks which approached within ten feet of our stern. The vessel tumbled and complained a great deal. At last the floe broke up around us into many pieces and became detached from the sides of the vessel. This scene of frightful commotion lasted until 4 A. M. Every moment I expected the vessel would be crushed or overwhelmed by the massive ice forced up far above our bulwarks. The Rescue, being further removed on the other side of the crack from the line of crushing, and being firmly imbedded in heavy ice, I was in hopes would remain undisturbed; but this was not the case; for, on sending to her, as soon as it was light enough to see, the floe was found to be broken away entirely up to her bows, and then formed into such high hummocks, that her bowsprit was broken off, together with her head, and all the light wood-work about it. Had the action of the ice continued much longer, she must have been destroyed.

We had the misfortune to find that sad havoc had been made among the stores and provisions left on the ice; a few barrels were recovered, but a large number were crushed and had disappeared.

On the morning of the 14th, there was again some motion in the floes; that on the port side moved off from the vessel two or three feet, and there became stationary. This left the vessel entirely detached from the ice round the water-line, and it was expected she would once more resume an upright position. In this, however, we were disappointed, for she remained with her stern elevated and a considerable list to starboard, being held in this uncomfortable position by the heavy masses which had been forced under her bottom. She retained this position until she finally broke out in the spring.

We were now fully launched into Baffin's Bay, and our line of drift began to be more southerly, assuming a direction nearly parallel with the western shore of the bay at a distance of from forty to seventy miles from it.

After an absence of eighty-seven days, the sun, on the 29th of January, raised his whole diameter above the southern horizon and remained visible more than an hour. All hands, on seeing an old friend again, gave vent to their delight in three hearty cheers.

The length of the days now went on increasing rapidly, but no warmth was yet experienced from the sun's rays; on the contrary the cold became more intense. Mercury was congealed for several days in February; also in March; which did not occur at any other period of the winter. A very low temperature was invariably accompanied with clear and calm weather, so that our coldest days were perhaps the most

pleasant. In the absence of wind, we could take exercise in the open air without feeling any inconvenience from the cold. But with a strong wind blowing, it was dangerous to be exposed to its chilling blasts for any length of time, even when the thermometer indicated a comparatively moderate degree of temperature.

The ice around the vessel soon became again cemented and fixed, and no other rupture was experienced until it finally broke up in the spring and allowed us to escape. Still, we kept driving to the southward along with the whole mass. Open lanes of water were visible at all times from aloft; sometimes they would be formed within a mile or two of us.

Norwhales, seals, and dovekeys, were seen in them. Our sportsmen were not expert enough to procure any except a few of the latter, although they were indefatigable in their exertions to do so. Bears would be frequently seen prowling about, but only two were killed during the winter; others were wounded, but made their escape. A few of us thought their flesh very palatable and wholesome, but the majority utterly rejected it. The flesh of the seal, when it could be obtained, was received with more favor.

As the season advanced, the cases of scurvy became more numerous; yet they were all kept under control by the unwearied attention and skilful treatment of the medical officers. My thanks are due to them, especially to passed assistant Surgeon Kane, the senior medical officer of the expedition. I often had occasion to consult him concerning the hygiene of the crew, and it is in a great measure owing to the advice which he gave and the expedients which he recommended, that the expedition was enabled to return without the loss of a man.

By the latter part of February, the ice had become sufficiently thick to enable us to dig a trench around the stern of the Rescue, deep enough to ascertain the extent of the injury she had received in the gale at Griffith's Island. It was not found to be material; the upper gudgeon alone had been wrenched from the stern-post; it was adjusted and the rudder repaired and made ready for shipping when it should be required. A new bowsprit was also made for her out of the few spare spars that we had left, and everything made sea-worthy in both vessels before the breaking up of the ice.

On the first of April, a hole was cut in some ice that had been forming since our first besetment, in September; it was found to have attained the thickness of seven feet two inches.

In this month (April), the amelioration in the temperature became quite sensible. All hands were kept at work cutting and sawing the ice from around the vessels, in order to allow them to float once more. With the Rescue, they succeeded, after much labor, in attaining this object; but around the stern of the Advance, the ice was so thick that our thirteen-feet saw was too short to pass through it. Her bows and sides, as far aft as the gangways, were liberated.

After making some alterations in the Rescue for the better accommodation of her crew, fires having been lighted on board of her for several days previous, to remove the ice and dampness which had accumulated during the winter, both officers and crew were transferred to her on the 24th of April. The stores of this vessel which had been taken out were restowed, the housing-cloth taken off, and the vessel made in every respect ready for sea. There was little prospect, however, of our being able to reach this

desired element very soon. The nearest water was a narrow lane more than two miles distant, and to cut through the ice which intervened would have been next to impossible. Beyond this lane, from the mast-head, nothing but interminable floes could be seen. It was thought best to wait in patience and allow nature to work for us; she alone could effectually break up and dissolve the icy chains with which she had bound us.

In May, the noonday sun began to have some effect upon the snow which had covered the ice; the surface of the floes became watery and difficult to walk over; still, the dissolution was so slow, in comparison with the mass to be dissolved, that it must have taken us a long period to have become liberated from this cause alone. More was expected from our southerly drift, which still continued, and must soon carry us into a milder climate and open sea.

On the 19th of May, the land about Cape Searle was made out, the first we had seen since passing Cape Walter Bathurst, about the 20th of January. A few days later we were off Cape Walsingham, and on the 29th passed out of the Arctic zone.

June 5th, a moderate breeze from S. E. with pleasant weather; thermometer up to 40° at noon, and altogether quite a warm and melting day. During the morning, a peculiar crackling sound was heard on the floe; I was inclined to impute it to the settling of the snow-drifts, as they were acted upon by the sun; but in the afternoon, at about five o'clock, the puzzle was solved very lucidly, and to the exceeding satisfaction of all hands. A crack in the floe took place between us and the Rescue, and in a few minutes thereafter the whole of the immense field in which we had been imbedded for so many months was rent in all directions, leaving not a piece exceeding 100 yards in diameter. This rupture was not accompanied with any noise.

The Rescue was entirely liberated; the Advance only partially; the ice in which her after-part was imbedded, still adhered to her from the main chains aft, keeping her stern elevated in its unsightly position. The pack (as it may now be called) became quite loose; and but for our pertinacious friend acting as an immense drag upon us, we might have made some headway in any desired direction. All our efforts were now turned to getting rid of it. With saws, axes, and crow-bars, the people went to work with a right good will, and after hard labor for forty-eight hours succeeded. The vessel was again afloat, and she righted. The joy of all hands vented itself spontaneously in three hearty cheers. The after-part of the false keel was gone, being carried away by the ice. The loss of it, however, I was glad to perceive, did not materially affect the sailing or working qualities of the vessel. The rudders were shipped, and we once more were ready to move, as efficient as the day we left New York.

Steering to the S. E. and working slowly through the loose but heavy pack, on the 9th we parted from the Rescue, in a dense fog, she taking a different lead from the one the Advance was pursuing.

On the morning of the 10th, with a fresh breeze from the north, under a press of sail, we forced a way into an open and clear sea, in latitude 65° 30′, about 35 miles from the spot in which we were liberated.

The wind, which in the ice was merely fresh, proved to be in clear water a gale, with a heavy sea run-

ning. Through this we labored until the next morning, when it moderated. The coast of Greenland was in sight.

Our course was now directed for the Whale Fish Islands (the place of rendezvous appointed for our consort), which we reached on the 16th; not, however, without having some difficulty in getting through the unusual number of bergs which lined the coast. In an encounter with one, we lost a studding-sail boom.

I had two objects in visiting these islands—that of verifying our chronometers, and to recruit our somewhat debilitated crews. The latter object, I learned on arriving, could be much better attained, and the former quite as well, at Lively, on Disco Island, for which place I bore up, leaving orders for the Rescue to follow us. We arrived on the 17th, and the Rescue joined us the day after.

The crews were indulged with a run on shore every day that we remained, which they enjoyed exceedingly after their tedious winter's confinement. This recreation, together with a few vegetables of an antiscorbutic character that were obtained, was of much benefit to them. There were no fresh provisions to be had here at this season of the year. Fortunately, one of the Royal Danish Company's vessels arrived from Copenhagen while we remained, and from her we obtained a few articles that we stood much in need of. The Company's store was nearly exhausted, but what remained was kindly placed at our disposal.

On the 22d, our crews being much invigorated by their exercise on *terra firma*, and the few still afflicted with scurvy being in a state of convalescence, we got under way with the intention of prosecuting the object of the expedition for one season more at least.

From the statements made to us at Lively, the last winter had been an extraordinary one. The winds had prevailed to an unusual degree from the N. W., and the ice was not at any time fixed. The whaling fleet had passed to the northward some time previous to our arrival.

On the 24th, we met with some obstruction from the ice off Hare Island, and on the following day our progress was completely arrested by it at Stovöe Island. In seeking for a passage, we got beset in the pack on a lee shore, near to which we were carried by the drifting ice, and narrowly escaped being driven on the rocks. After getting out of this difficulty, we availed ourselves of every opening in the ice, and worked slowly to the northward near the shore.

On the 1st of July, we were off the Danish port and settlement of Pröven; and as the condition of the ice rendered farther progress at present impossible, we went in and anchored, to wait for a change.

Here, again, some scurvy grass was collected, and the men allowed to run on shore.

On the 3d, we got under way, and ran out to look at the ice; but finding it still closely packed, returned to our anchorage.

On the 6th, the accounts from our look-out on a hill near us were more favorable. Again we got under way, and finding the "pack" somewhat loose, succeeded in making some headway through it. The following day we got into clear water, and fell in with two English whaling vessels, the Pacific and the Jane. To their gentlemanly and considerate commanders, we are much indebted for the supplies furnished

us, consisting of potatoes, turnips, and other articles most acceptable to people in our condition. Much interesting news was also gained from them respecting important events which had occurred since we had left home.

Their statement as to the condition of the ice to the northward, was anything but flattering to our prospects. They had considered it so very unfavorable, as to abandon the attempt to push through Melville Bay, and were now on their way to the southward.

On the 8th, we communicated with the settlement of Uppernavik. The next day two more English vessels were passed on their way to the southward. At the same time, the McLellan, of New London, the only American whaler in Baffin's Bay, was descried, also standing south. On communicating with her, we were rejoiced to find letters and papers from home, transmitted by the kindness of Mr Grinnell.

We remained by the McLellan several hours, in order to close our letters and dispatch them by her. Several articles that we stood much in need of were purchased from her.

On the 10th, the Baffin Island, being in sight to the north, we met the remainder of the whaling fleet returning. They confirmed the accounts given us by the Pacific and the Jane, in regard to the unfavorable condition of the ice for an early passage through Melville Bay. The following are the names of the vessels communicated with, viz: Joseph Green, of Peterhead; Alexander, of Dundee; Advice, of do.; Princess Charlotte, of do.; Horn, of do.; Anne, of Hull; Regalia, of Kirkaldy; Chieftain, of do.; and Lord Gambier, of———. My notes are unfortunately at fault as to the names of their enterprising and warm-hearted commanders, each of whom vied with the other in showering upon us such articles as they knew we must be in want of, consisting of potatoes, turnips, fresh beef, &c. My proposition to compensate them they would not entertain for a moment, and I take this occasion of making public acknowledgment of the valuable aid rendered us; to which, no doubt, much of our subsequent good health is owing.

On the 11th, in attempting to run between the Baffin Islands, the Advance grounded on a rocky shoal. The Rescue barely escaped the same fate by hauling by the wind, on discovering our mishap. Fortunately there was a large grounded berg near, to which our hawsers could be taken for hauling off, which we succeeded in doing after twenty-four hours' hard work. The vessel had not apparently received any injury; but a few days later, another piece of her false keel came off, supposed to have been loosened on this occasion.

The ice to the north of these islands was too closely packed to be penetrated, and the prevalence of southerly winds afforded but little prospect of a speedy opening.

On the 16th, the searching yacht Prince Albert succeeded in reaching near to our position, after having been in sight for several days. Mr. Kennedy, her commander, came on board and brought us letters.

The berth in which our vessels were made fast at this place, was alongside of the low tongue of an immense berg, which, by accurate measurement, towered up to the height of 245 feet above the water-level. It was aground in 96 fathoms water, thus making the whole distance from top to bottom 821 feet; its di-

ameter at the water-line I estimated at 1,500 feet. We saw many bergs equally as large as this, and some much larger; but this was the only one that we had so good an opportunity of measuring with accuracy.

On the 17th, the ice opened a little, and we got under way. Hence, till the 27th, with almost incessant work, by watching every opening, we continued to make a few miles each day, the Prince Albert keeping company with us. On this day, while running through a narrow lead, the ice closed suddenly. The Advance was caught in a tight place, and pretty severely nipped. We managed to unship the rudder; but before it could be secured, the crushing ice carried it under; we had lines fast to it, however, and after the action of the ice ceased, it was extricated without injury. The Rescue and Prince Albert, although near us, were in better berths, and escaped the severe nip which the Advance received. We were closely beset in this position, and utterly unable to move until the 4th of August, when, the ice slacking a little, we succeeded in getting hold of the land-ice, one mile farther to the north. The Prince Albert was still in the "pack," a mile or two to the southward of us. Mr. Kennedy informed me that it was his intention to abandon this route, and return to the southward as soon as his vessel could be extricated from her present position, in the hope of finding the ice more practicable in that direction. Some letters and papers that he had brought out for the other English searching vessels, he placed on board of us; unfortunately we were never able to deliver them.

We lost sight of the Prince Albert on the 13th. For our own part, there was no possibility of moving in any direction. The berth we had taken up under the impression that it was a good and safe one, proved a "regular trap;" for the drift pack not only set in upon us, but innumerable bergs came drifting along from the southward, and stopped near our position, forming a perfect wall around us, at not more than from 200 to 400 yards' distance. Many unsuccessful attempts were made to get out. The winds were light, and all motion in the ice had apparently ceased. The young ice, too, began to form rapidly, and was only prevented from cementing permanently together the broken masses around us, by the frequent undulations occasioned by the overturning or falling to pieces of the neighboring bergs.

My anxiety daily increased at the prospect of being compelled to spend another winter in a similar, if not a worse situation than was that of the last.

On the 18th, the ice was somewhat looser; we immediately took advantage of it, and managed to find an opening between two large bergs sufficiently wide to admit the passage of the vessels. Outside of the bergs, we had open water enough to work in.

We stood to the N. W., but the lead closing in the distance, and the ice appearing as unfavorable as ever, I did not deem it prudent to run the risk of their besetment again, at this late period of the season. And considering that, even if successful in crossing the pack, it would be too late to hope to attain a point on the route of search as far as we had been last year, therefore, in obedience to that clause in my instructions, which says: "You are especially enjoined not to spend, if it can be avoided, more than one winter in the Arctic regions," with sad hearts that our labors had served to throw so little light upon the object of our search, it was resolved to give it up, and return to the United States.

We therefore retraced our steps to the southward. The ice that had so much impeded our progress

upward, had entirely disappeared. We touched for refreshments by the way, at some of the settlements on the coast of Greenland, where we were most kindly and hospitably received by the Danish authorities.

Leaving Holsteinberg, on the 6th of September, for New York, the two vessels were separated in a gale to the southward of Cape Farewell. The Advance arrived on the 30th ultimo, and the Rescue on the 7th inst., with grateful hearts from all on board to a kind and superintending Providence for our safe deliverance from danger, shipwreck, and disaster, during so perilous a voyage.

I have the honor to be, sir, your obedient servant,

EDWIN J. DE HAVEN,

Lieutenant Commanding Arctic Expedition.

To the Hon. WILLIAM A. GRAHAM,

Secretary of the Navy, Washington.

P. S.—The Chart, with my track, and which also shows the discoveries of the expedition, has been deposited in the Hydrographical Office.

I have thought these documents possessed interest, perhaps value enough, in their bearings upon this open sea, which now appears to be attracting so much attention, to entitle them to a place here. At any rate, I hope they will not be considered as altogether out of place in such a work as this.

PHYSICAL GEOGRAPHY OF THE SEA.

By an act of Congress, approved March 3, 1849, the Secretary of the Navy was authorized to assist me in the undertaking to investigate the phenomena of the winds and the waves, to find short routes, and to discover matters of importance to Commerce and Navigation. The following is the Joint Resolution which expressed the wishes of Congress in the matter:—

"SECTION 2. *And be it further enacted*, That the Secretary of the Navy be directed to detail three suitable vessels of the Navy in testing new routes, and perfecting the discoveries made by Lieut. Maury in the course of his investigations of the winds and currents of the ocean; and to cause the vessels of the Navy to co-operate in procuring materials for such investigations, in so far as said co-operation may not be incompatible with the public interest: *Provided*, That the same can be accomplished without any additional expense."

Under the authority of this act, but two vessels have been sent out upon this service, viz: the schooner Taney, Lieut. J. C. Walsh commanding, in 1849; and the brig Dolphin.

The Taney unfortunately proving unseaworthy after reaching Porto Praya, was compelled, much to the regret of Lieut. Walsh and his associates, to abandon this interesting service, and return in a crippled condition to the United States.

A full account of what was done on board of that vessel has been given at page 165, *et seq.* of the 5th editicn of this work. It is unnecessary, therefore, to repeat it here.

Subsequent experience, and farther investigation, have tended to confirm me in the opinion, that the great sounding of 5,700 fathoms made with wire by Lieut. Walsh from on board that vessel, in latitude 31° 59′, N., longitude 58° 43′ W., is no true indication as to the real depth of the ocean at that place.

No other soundings have been made in the same spot, though some very reliable ones with twine have been made at no great distance from it; and the result shows conclusively, that in that vicinity, the depth of the ocean is not near so great as 5,000 fathoms. Indeed, I think that there is now reason for believing that the North Atlantic Ocean, at least, is nowhere much, if any, over 27,000 feet—4,500 fathoms—in depth.

The grounds upon which this opinion is founded, may be inferred from an examination of Plate XIV.; they are based on the deep-sea soundings made on board the Dolphin, under Lieut. Commanding S. P. Lee, in 1851–2, and under Lieut. Commanding O. H. Berryman, in 1852–3; together with the light which the labors of these two officers and others engaged in the business have cast upon the subject.

The precise character of the service upon which the Taney and the Dolphin have been engaged, may be learned from the following instructions, which were issued by the Navy Department for the former, and which, being varied only as the occasions required, were repeated both to Lieut. S. P. Lee and to Lieut. O. H. Berryman, of the Dolphin:—

"The object of the service upon which the Taney has been detailed, is to make observations upon the winds and currents of the sea, and to collect other facts in connection with the *Wind and Current Charts* of Lieut. Maury, and which are of practical importance to the safe navigation of the seas, or to the study of the phenomena of the ocean. This is an important service. It is a service which requires patient and laborious observations from the officers intrusted with it.

"A faithful record of every phenomenon observed, with a full statement of all the circumstances as to time, place, &c., connected with it, is of great importance.

"It is expected, therefore, that you and the officers of the Taney, will bestow upon the duty which has been assigned yourself and them, because of a peculiar fitness therefor, the utmost diligence and the most assiduous attention.

"The subjects of observation which will command your particular attention, are:—

"1. The force and direction of the wind, the hourly state of the weather, and all the meteorological conditions connected therewith—as thermal, dynamical, barometrical, and the like.

"2. The force and set of currents, their depth and width, their temperature, and the position of their edges or limits.

"3. Hourly observations upon the temperature of the surface water.

"4. Frequent observations upon the temperature of the ocean at various depths.

"5. Deep-sea soundings.

"6. Vigias, and all dangers about which there are doubts, either as to existence or position.

"7. Transparency and saltness, or the specific gravity of sea-water, in the different parts of the ocean.

"You will determine the specific gravity of the water, either by one of the hydrometers, or the specific gravity bottle furnished for the purpose.

"You will keep an abstract of your log as per form. It is believed that the form itself is sufficiently explicit as to what is wanted for the abstract, a copy of which you will send to Lieut. Maury, as often as you have an opportunity, returning the original to him when you arrive in the United States.

"You will make it a rule, the better to ascertain rate of currents and fix their limits, to determine, by observation, the variation of the compass and your position in the forenoon, in the afternoon, and at night, as well as at noon, whenever the weather will permit; and after allowing for lee-way, heave of the sea, variation of the compass, and the false steerage, you will call the difference between the place of the vessel as established by observation, and as established by *dead reckoning*, current, and so to enter it in the abstract.

"You will also try in calms, and as often as convenient, both for surface and undercurrents, in the usual way, by lowering boats, letting down weights, &c.

"For longitude by chronometer at night, the planets, or the largest of the fixed stars are the best objects to be observed when the horizon is good—the Mer. Alt. of the moon may be used for latitude at night, or in the fore or afternoon, according to its age.

"Note, in its proper column, not only the portion of cloudy sky, 10 being entirely overcast, and 0 clear; but state also the direction or directions in which the clouds are moving, with the kinds of clouds, as Nimb. Cum., Cirrus Stratus, &c.

"In taking temperature of surface water, a fresh bucket should be drawn up each time, the thermometer plunged into it immediately, held there for several minutes, and *read while the bulb is in the water.*

"For the purpose of ascertaining the existence of undercurrents, you will sound at intervals, at the least, of every 30 miles, with 100 fathoms line, if there be as much depth, attaching to the line two thermometers, one near the lead, and the other 50 fathoms from it. In case you have no thermometers suitable, or should lose them, then you will attach two hollow non-conducting cylinders with valves opening upward, in the place of the thermometers, haul the line up briskly, and try quickly the temperature of the water brought up in the cylinders.

"In case you should find an undercurrent, you will endeavor to ascertain its limits and set with all the accuracy possible. For rate and direction, a block of wood, or a barrega loaded just to sinking, and suspended at any required depth by a small float just sufficient to keep it from sinking further, will, perhaps, be the best means.

"The determination of the rate and set of undercurrents is an operation which is so modified by the weather and other circumstances, that it must of necessity be left, in a great measure, to the judgment and mental resources of the operators. The officers of the Taney will, perhaps, have abundant opportunity to display their ingenuity with regard to the subject. The lead used in sounding for temperatures should be painted white, and the distance at which it disappears going down and reappears coming up should be entered in fathoms in the transparency column.

"The Taney will be provided with the means of sounding at great depths. It is desirable to reach the bottom at every attempt, for the depth of the ocean is an important element towards a perfect understanding of the tides, their laws of motion, the course and form of the tidal wave and the like.

"At the distance of every two hundred miles across the ocean, soundings must be made all the way, both going and returning, with the view to reach the bottom and determine the depth of the sea. The Taney has been provided with the necessary apparatus therefor. In each case the lead must be armed, the specimens of the bottom which it may bring up must be preserved in a bottle, with a label attached showing the date, place, and the depth. The time selected for these soundings should be calm weather, when the sea is smooth, and when there is a likelihood of its so continuing for several hours at least. In hauling up the sounding-line from great depths, care should be taken to prevent the lead from having too great an upward motion, lest, by turning around, it should twist the line in two. Therefore, in hauling it up, frequent pauses should be made to allow the line to untwist. It is desirable, also, to have specimens of water from the greatest depths.

"In going across the Atlantic, and in looking after the vigias and doubtful dangers to which your attention will also be called, it will be most convenient for you to take up your position for deep-sea soundings in the calm regions known as the "horse latitudes," which, in the month of October, will be found between the parallels of 24° and 25° N., according to longitude; you will see the limits of this calm belt sufficiently marked and developed on series B, of Maury's *Wind and Current Charts*, with copies of which the Taney will be supplied.

"A series of accurate barometrical observations in this belt of calms will be of exceeding interest and value. It is one of the nodes in the general system of the atmospherical circulation of the earth. Here the winds from the polar meet, in the upper regions, those from the equatorial calms, and they so nearly balance each other as to produce almost a perpetual calm. We may then look under this meeting of opposing winds for an accumulation of atmosphere, and consequently for an increased barometrical pressure; and from this increase of pressure, accurately determined, may be derived an expression to show the total amount or value of those physical forces which are exerted to put and keep the trade-winds in motion. You will therefore be diligent with the barometer in those regions, and in all others; taking care, when it is mounted on board, to note, in the abstract log, its distance from the level of the sea.

"The 'vigias,' and dangers of doubtful existence or position which you will look after, are Ashton's Rock, about latitude 35° 50′ N., longitude 71° 48′ W., said to be eight feet above the water, and to have been seen in 1824. False Bermudas, about latitude 32° 37′ N., longitude 58° 37′ W. They are rocks, said to be frequently mistaken for the Bermudas; they are laid down in a part of the ocean but little frequented.

Nye's Rock	31°	15′	N. Lat.	Long.	55°	41′	W.
Van Kuelen's Vigia	31	40	"	"	38	10	"
Josyna Rock	31	45	"	"	23	40	"
Steen's Ground	32	30	"	"	21	15	"

"You will touch at one of the Canaries for water. Without unnecessary delay, you will proceed thence towards the Cape Verdes; examining, as you go, the position of Mary's Rock, Bom Felix Shoal,

the Bonetta Rocks, and the reef to the west of them, marked on Maury's Chart as doubtful with regard to position.

"The route, so far as it has been indicated to you, will take you through the Sargasso Sea. You will be careful to try the depth, and the temperature of the water of that sea, and to note the latitude and longitude of its edges where you cross it.

"Besides the regular series of deep-sea soundings, you are requested to make frequent use of the lead (deep-sea) in the vicinity of all 'vigias' and 'rocks' that are supposed to lie in your way; for, if they exist, you will probably find shoaler water in their vicinity.

"After completing this service, you will put into Port Praya for water and provisions. Filling up with these, and allowing your crew and officers a few days to refresh, you will again put to sea; standing to the southward, and examining as you go Warley's Shoal and French Shoal of 1796; the supposed places of both of which are marked on the Charts of Lieut. Maury.

"From the last-named shoal you will proceed to a supposed submarine volcanic region of considerable extent, between the equator and 3° south latitude, and between 15° and 25° west longitude. Through all parts of the ocean you will continue as you go, the regular series of observations as to winds, currents, temperatures, soundings, &c., as per form of abstract log.

"In passing the region of equatorial calms, you will again cross one of those atmospherical nodes under which nice barometrical observations become of exceeding interest.

"After having satisfied yourself as to the characteristics with regard to depth and bottom in that part of the ocean just alluded to as probably volcanic, you will proceed to make Cape St. Roque, bestowing unremitted attention to the soundings and temperatures as you go.

"There seems to be reason to suppose that an undercurrent of warm water has its genesis in this part of the ocean; soundings and deep-sea temperatures across the Southern Atlantic may throw some light upon this important question.

"Arriving off Cape St. Roque, and having put into some convenient port of Brazil for water, if necessary, you will proceed to make a zigzag course along the coast to the northward, for the purpose of investigating the currents, thence to the mouth of the Amazon. You will make stretches off from the coast, of one hundred miles, or as far as it may be necessary, in order to cross and define the system of currents and counter-currents that are supposed to prevail there, and a correct knowledge of which is so essential to the speedy and safe navigation of that part of the ocean.

"Having satisfied yourself as to those currents, you will proceed homeward by the following route: from the equator in long. 37° W., draw a straight line to Cape Charles. This line will lay nearly in the middle of a strip of the ocean about 300 miles broad, and which is remarkable for the temperature of its water. You will sail a zigzag course through this strip, crossing it at least four times on your way home, and passing the line which you are directed to draw, at least two hundred miles on either side, and taking deep-sea soundings before you put about to recross it again. Should you discover anything remarkable as to the depth of the sea within this region, you will push the discovery to a conclusion.

"It is expected that you will return to the United States some time in the month of April next.

"As the service on which you are engaged has for its object the making of observations and the collecting of facts *at sea*, you will keep the sea during your absence as long as practicable.

"It is not expected that you will at all times be able to carry on, without interruption, the series of observations as here laid down for you. It is supposed that they will be interrupted from time to time by the weather and other circumstances. Much, therefore, must be left to your discretion; you understand the nature of the service which is required, and are in possession of the views of the Department on the subject. The Department therefore commits the service to you, feeling assured that you will in all cases exercise a sound discretion, and so meet its just expectations."

Lieut. Lee's cruise was from the United States over to the Cape de Verde Islands, thence southwardly into the supposed volcanic region about the equator, in which he found deep water, and no volcanic indications, thence to the Rocas on the coast of Brazil. This dangerous shoal, which lies hard by the track of vessels bound by the new route to Rio, he carefully surveyed. The Chart was published in the preceding edition of this work. He then looked into the Amazon, and returned home, continuing his examinations for vigias, temperatures, and currents, to the windward of the West India Islands, but without being able to run the zigzag line of deep-sea soundings to Cape Charles.

The cruise was a laborious one. He, his officers and crew, were most diligent in their endeavors to carry out his instructions; and they performed the service upon which they were sent in a highly creditable and satisfactory manner.

As thorough search as wind and weather would permit, was made for the vigias that were supposed to lie within their cruising ground. Lieut. Lee has prepared a Chart to show the track of the Dolphin, and the radius of vision while searching for these dangers.

So, also, the course of the winds, the force and set of the currents, the drift, the temperature of the sea, both at and below the surface, as well as its depth and transparency, the variation of the compass, and conditions of the atmosphere, were subjects of constant and careful observation.

The complete results of Lieut. Lee's labors in the Dolphin will not probably be ready for this edition.

When Lieut. Lee returned from this service, his health was so impaired as to make a respite from the sea and such labors desirable. Accordingly, when the Dolphin was again ready for this service, she was placed under the command of Lieut. O. H. Berryman.

Lieut. Berryman put to sea upon this interesting service in September, 1852, from New York. His instructions required him to examine for vigias, and make a series of highly important observations in that part of the ocean, through which the routes to Europe run. He was, however, overtaken by a severe gale of wind, which forced him to go into Lisbon for repairs.

Thence he returned to Norfolk by the southern route. Notwithstanding these misfortunes, many valuable and interesting results have inured to commerce and navigation from this cruise.

The brig having been again repaired, sailed from Norfolk in May, 1853, to complete the examination of the northern route to Europe. This time she was more successful. He, and the officers with him, availing themselves of the experience acquired during the former voyage, completed the examination of several

shoals and vigias which they were required to search out; during which service, a line of deep-sea soundings was run entirely across the Atlantic from the shores of the United States to Rockall, off Ireland, and thence to Fayal; from Fayal, down to the Cape de Verde Islands, thence by a zigzag course crossing and recrossing the parallel of 25° S. to the neighborhood of the West Indies, and so home again, passing to the windward of those islands.

This zigzag line of soundings, with those made by Lee of the Dolphin, and Rogers Taylor of the Albany, Capt. Platt, in the Gulf of Mexico, enables us for the first time to present with any considerable degree of satisfaction, a vertical section or profile view of the bottom of the Atlantic from one side to the other.

Commencing on the table-lands of Mexico, this line enters the Gulf of Mexico; thence crossing the Peninsula of Yucatan and passing over Cuba and Hayti, it traverses the Atlantic Ocean a little to the south of east, cutting, before reaching the coast of Africa, the Cape de Verde Islands. This section is indicated in Plate XV. Fig. A.

Already have the Taney and the Dolphin, notwithstanding the many mishaps that befell them, and notwithstanding the difficulties, not to say disadvantages, with which their officers have had to contend, enabled the hydrographer to clear his chart of many false dangers, which impede navigation to a greater extent than they would, had they been real, instead of imaginary, as the labors of these officers have for the first time, in many instances, satisfactorily proved.

The officers engaged upon this service have acquitted themselves of the duty thus assigned them in a manner creditable in the highest degree to themselves as well as to the profession to which they belong.

Before the Taney was condemned as unseaworthy, Lieutenant Walsh had an opportunity of examining the localities assigned to no less than seven of these great commercial hindrances. Lieutenants Lee and Berryman performed this duty in so thorough a manner as completely to establish the non-existence of no less than thirty of these dangers. Upon the faith of Walsh's work, we have erased:—

Ashton Rock, lat. 33° 49′ N.; long. 71° 41′ W. Said to have been discovered by Captain Guy in 1824. Lieutenant Walsh searched for it six days, sounding with from 100 to 800 fathoms line, no bottom.

False Bermuda, lat. 32° 30′ N.; long. 58° 40′ W. Name of discoverer not given. It was searched for eight days, the vessel sounding the while from 100 to 800 fathoms line out, and no bottom.

Nye's Shoal, lat. 31° 15′ N.; long. 55° 50′ W. Said to have been seen in 1826 by Captain Nye. The Taney cruised about this place for eight days, also sounding as above without any traces of the shoal, or bottom.

Vankeulen's Vigia, lat. 31° 40′ N.; long. 38° 20′ W. Quoted in the charts, but upon what authority does not appear. Lieut. Walsh reports a thorough, but fruitless search for it.

Josyna Rock, lat. 31° 40′ N.; long. 23° 45′ W. First seen in 1697, and again in 1805. This place was searched over with from 100 to 800 fathoms line out, without finding either bottom or rock.

So also were *Steen Ground*, lat. 32° 30′ N.; long. 21° 15′ W., and *Mary's Rock*, lat. 19° 45′ N., long. 20°

44′ W., both quoted in the charts, and the places of both given, although search was made without finding traces of either.

"Not one of them," says Lieut. Walsh, "was found, nor any indication of their existence; on the contrary, every evidence to disprove it. Our various tracks over and about their reported positions, covering the extent of 1½ degrees of longitude and 40 miles of latitude, with the many and deep soundings, from 100 to 800 fathoms, without gettting bottom, will be found sufficient, I trust, to satisfy navigators that they have no existence—or, at least, that those parts of the ocean in which they have been reported to exist, are free from all dangers. To the first three mentioned we gave the most thorough search; to Ashton Rock, six days time; to the False Bermudas eight days; to Nye's Rock, likewise, eight days. All our tracks were by daylight, as the schooner was always hove to at night, while engaged in these explorations. A slight discoloration of water was noticed in the region assigned to Mary's Rock, but no soundings could be got with 500 fathoms. This rock had been previously searched for with like results, by the U. S. Exploring Expedition, Captain Wilkes; and by H. M. S. Levin, Captain Bartholomew. Ashton Rock is placed in a most frequented part of the ocean; there is not a day that some vessel does not pass in the vicinity, and nothing has been seen of it since the first and only report of it in the year 1824. This fact alone should disprove it, independent of our search. I find Mr. Blunt has erased it from his Chart of the North Atlantic, as also the False Bermudas, Vankeulen's Vigia, Steen Ground, and Mary's Rock. There are sufficient real dangers in the Atlantic; these imaginary ones should not disfigure the charts; they only serve to harass navigators, turn vessels from their routes, and thus injure commerce. The reports of them by merchant vessels, which seldom take time to examine the appearance of such dangers, can be readily explained. Floating wrecks, large trees, carcasses of whales, &c., presenting all the appearance of reefs, have deceived experienced seaman."

The Dolphin, Lieut. Commanding S. P. Lee, sailed from Sandy Hook, October 8, 1850. After having been 71 days at sea, Lieut Lee, in an official dispatch from Porto Praya, December 20, 1850, reported that he had made good search for the following-named vigias, without finding the least trace of any of them, viz:—

Potomac Sounding, lat. 38° 10′ N.; long. 67° 26′ W.; on the authority of Capt. Smith, of the ship Potomac. Lieut. Lee sounded with 400 fathoms of line, but obtained no bottom. Lieut. Berryman, in 1853, made a thorough search for this *shoal*, and got bottom at 2,750 fathoms.

Field's Vigia, lat. 37° 31′ N.; long. 66° 00′ W. Reported by the master of the schooner Little Mary. Lieut. Lee made a good search for this vigia. Many soundings were made, one near it of 1,175 fathoms, and one over its position of 500 fathoms, without finding bottom.

Amfitrite Breakers, lat. 35° 40′ N.; long. 65° 58′ W. Reported to exist by the master of a Spanish merchant ship, the Amfitrite, in 1846. Five days were occupied by Lieut. Lee, in searching for them; he passed over their position, October 25, 1851, sounding with 1,000 fathoms, and no bottom.

Dyet's Rock, lat. 32° 46′ N.; long. 60° 6′ W. Reported as having been seen in 1845, by Robert Dyet, master of the English barque Catharine Green. Seven days were employed by Lieut. Lee in an unsuc-

cessful search for this rock. Soundings were made at 550 over, and 800 fathoms near its position, without obtaining bottom.

Vigia of 1827, lat. 31° 17′ N.; long. 53° 22′ W. The authority for this vigia, is the Admiralty Chart of June, 1851. No appearance of danger was seen by Lieut. Lee; soundings were made, but no bottom obtained with 500 fathoms line.

False Bermudas, lat. 32° 30′ N.; long. 58° 50′ W. The authority for this danger is "one Louis Duhal, in a Corsair," and Francis Keeling, of a Post-Office packet, in 1810; several days were employed by Lieut. Lee in searching for this danger; soundings were made with 350 fathoms of line, and no bottom obtained.

Gandarias's Rocks, lat. 25° 30′ N.; long. 37° 45′ W. Reported in 1842, by Captain Gandarias, of the Spanish merchant ship Dolores Ygarte. Lieut. Lee cruised about their position for four days, without finding any traces of their existence; soundings were frequently made, and bottom was probably obtained at 1,720 fathoms.

Gombaud's Rock, lat. 23° 15′ N.; long. 32° 25′ W. Reported by Gombaud, in 1764. Search and soundings were made for it during two days. Bottom was obtained at 2,200 fathoms.

Emily's Rock and Shoal, lat. 16° 59′ N.; long. 21° 30′ W. This rock and shoal rest upon the authority of the master of the brig Emily, of London. Lieut. Lee saw no indications of their existence, and he obtained bottom at 1,580 fathoms, near the alleged place of their existence, over which a line of soundings had been run.

French Shoal, lat. 4° 15′ N.; long. 19° 20′ W. Reported by French East India ships, in 1796. It was unsuccessfully searched for in 1838, by the U. S. Ex. Expedition. Lieut. Lee obtained bottom over their reported place, with 2,550 fathoms of line.

Krusenstern's Volcano, lat. 2° 31′ S.; long. 20° 44′ W. Admiral Krusenstern, 1806. Soundings made and bottom reached with 3,550 fathoms of line, by Lieut. Lee, in its immediate location. A fruitless search was also made for it by the Ex. Expedition in 1838.

Triton's Shoal, lat. 0° 32′ S.; long. 17° 46′ W. Reported by Captain Proudfoot, of the ship Triton, 1816; Lieut. Lee obtained bottom over its alleged position, at a depth of 2,840 fathoms.

Bouvet's Sandy Island, lat. 0° 23′ S.; long. 19° 10′ W. Reported by Captain Bouvet in 1761. After a careful search and sounding with 1,500 fathoms of line without reaching bottom, Lieut. Lee could discover no appearance of shoals or dangers.

Aquila Reef, lat. 0° 22′ S.; long. 21° 6′ W. Reported by Captain John Taylor in 1831. Lieut. Lee sounded over its position with 1,960 fathoms; no indications of dangers were seen thereabouts.

Le Pacifique Shoal, lat. 0° 42′ S.; long. 22° 47′ W. Reported by Captain Bofils, of the French frigate Pacifique. Lieut. Lee saw no appearance of danger, nor experienced any shock; no bottom was obtained near its position, with 2,125 fathoms.

Crown Reef, lat. 0° 57′ S.; long. 23° 19′ W. Barque Crown, of Liverpool. When near its alleged position, Lieut. Lee sounded with 1,500 fathoms line, and when on it, with 1,100 fathoms, without finding bottom by either attempt; he saw no indications of a reef in this vicinity.

Vigia south of Fernando Noronha, lat. 4° 43′ S.; long. 32° 43′ W. Laid down in the Admiralty Chart of 1836. Lieut. Lee sounded from a boat, on the position assigned this vigia, with 1,250 fathoms of line, without getting bottom.

Blaesdale's Coral Reef, lat. 0° 57′ N.; long. 41° 6′ W. By Captain Blaesdale, in 1819. Four days were occupied by Lieut. Lee in searching for this reef; soundings at regular and brief intervals were made, and bottom obtained over its position, at a depth of 2,980 fathoms.

Voette's Bank, lat. 15° 00′ N.; long. 49° 00′ W. On the authority of Joachim Voette, date not given. Lieut. Lee made a good search for this bank, sounding over its assigned position with 250 fathoms, without finding bottom.

Galleons's Bank, lat. 15° 56′ N.; long. 49° 40′ W. By the pilots of the Spanish Galleons, in 1730. Lieut. Lee sounded over its alleged position with 560 fathoms, and he made three similar soundings near it, without finding bottom.

Martin's Reef, lat. 16° 42′ N.; long. 58° 53′ W. First discovered in 1742, and seen in 1816, 1823, and 1842, in different positions. Two days were spent by Lieut. Lee in searching for this bank; he made many soundings, one of 3,200 fathoms, without finding bottom. No indications of dangers were seen in its alleged vicinity.

Mourand's Bank, lat. 24° 34′ N.; long. 65° 10′ W. On the authority of Mourand, in 1773, Lieut. Lee searched for this bank five days. Soundings were often made over its assigned position; no bottom was had at 1,000 fathoms; no indications of danger were seen after a most thorough search.

Shoals, Rocks, Vigias, &c., searched for by U. S. brig Dolphin (Lieut. Commanding O. H. Berryman), in 1852 *and* 1853.

Daraith's Rock, lat. 40° 50′ N.; long. 54° 53′ W. Reported by M. Daraith, in 1700. Lieut. Berryman obtained bottom over its alleged place, at a depth of 2,710 fathoms.

Watson's Rock, lat. 40° 18′ N.; long. 53° 40′ W. On the authority of Captain Watson, in 1824. Lieut. Berryman searched for and sounded over its position, finding no bottom at 500 fathoms.

Hervegault's Breakers, lat. 41° 2′ N.; long. 49° 23′ W. Reported on the authority of M. Hervegault, in 1723. Lieut. Berryman made a thorough search for them in 1852 and 1853; he obtained bottom over their assigned position, at a depth of 4,580 fathoms.

Breton Rock, lat. 39° 40′ N.; long. 41° 35′ W. On the authority of Breton, a pilot of Rochelle, and seen again in 1816. No indications of a rock was seen by Lieut. Berryman; he obtained bottom over its position, at a depth of 2,500 fathoms.

Druid's Rock, lat. 41° 19′ N.; long. 41° 25′ W. Reported, in 1831, by Captain Treadwell, of the Druid. Lieut. Berryman could see no indications of a rock, nor find bottom with 500 fathoms over its alleged position.

Gough's and Birch's Rock, lat. 40° 28′ N.; long. 30° 00′ W. Quoted in the charts, upon the authority of Captains Gough and Birch, in 1778; seen again in 1820 and 1830. After a thorough search, Lieut. Berry-

man could find no evidence of its existence; no bottom with 1,000 fathoms could be found over its assigned place.

Three Chimneys, lat. 47° 54′ N.; long. 29° 40′ W. This vigia rests upon the authority of Captain Fernel, in 1729; reported as seen again in 1824 and 1843. Lieut. Berryman made a close search for this danger. He obtained bottom over its assigned position, at a depth of 1,900 fathoms.

Mariner's Rock, lat. 46° 00′ N.; long. 29° 37′ W. On the authority of Mr. Swinton, master of the ship Mariner, in 1831. Lieut Berryman obtained soundings over its position, at a depth of 1,760 fathoms; he saw no indications of a rock.

Devil's Rock, lat. 46° 35′ N.; long. 13° 7′ W. This rock, 110 leagues W. S. W. of Ushant, was said to exist by Captain Brignon, in 1737; afterwards seen in 1764, in 1818, and twice in 1829. Lieut. Berryman saw nothing of it, after a careful search. He found bottom at 2,200 fathoms over its assigned position.

Jean Hammon's Rock, lat. 36° 54′ N.; long. 19° 49′ W. Named after its discoverer, Captain Hammon, who saw it in 1733, not seen since. Lieut. Berryman could find no bottom over its position, with 2,100 fathoms line.

Vigia of 1851, lat. 45° 19′ N.; long. 38° 36′ W. No authority is given for this vigia. Lieut. Berryman searched for it, and sounded, without obtaining bottom at 200 fathoms.

Eight Stones, between lat. 34° 30′ and 34° 45′ N.; long. 16° 40′ W. Said to have been discovered in 1761, by Captain Vobonne. Lieut. Berryman made a thorough search for them; he sounded at regular and short intervals, obtaining bottom at 2,298 fathoms. He saw no indications of their existence.

"The above positions," says he, "were all reached at a period of the day, when our latitude and longitude were accurately obtained by good observations, and soundings were taken with the line for deep-sea soundings, and no indications whatever were observed of any of them, nor of shoal water. A good look-out was kept night and day on the fore-topsail yard, about seventy feet above the level of the sea."

By referring to sheet 3, Track Chart, North Atlantic (Series A.), the reader will observe a singular and sudden bend to the south of the line drawn to represent the mean northern limits of the northern edge of the N. E. trade-winds for October and November.

The limits, as they were found to be when Lieut. Lee was there in the Dolphin, coincided, in a very striking manner, with the limits assigned to them on the Chart at that season of the year.

Now, what should cause this very remarkable change in the trade-wind boundary in this part of the ocean and at this season of the year? The change is very marked, whatever be the cause.

Dové's isothermal lines throw light upon this subject. That philosopher, in his admirable work, *Die Verbreitung Der Wärme auf der Oberfläche der Erde*, Berlin, 1852, p. 25, says:—

"Maury's Wind and Current Chart (series A.), contains a description for each month of the inner and outer limits of the N. E. trade-winds in the Atlantic Ocean. If we pay attention to the course of the inner limits for the last months of the year, we shall find that this wind is almost entirely confined to the region of the isotherm of 21°, even in the case of its sudden rising in the neighborhood of Africa, in the month of January. A corresponding regression takes place in the case of the outer limit in the neighbor-

hood of the Canary Islands. The Charts here given will help us to answer the difficult question, how the trade-winds in the interior of Africa pass into the monsoons of the Indian Sea. The north winds which prevail in summer in the Mediterranean Sea, the Etesian of the Greeks, this theory sufficiently accounts for, if we extend the outer limit of the trade-winds to the parallel of the isotherm of 20°. The immense region of space, within which the zone, inclosed by the isotherm of 20°, moves in Asia and Australia, proves, beyond a doubt, that the winds of those regions are monsoons or season-winds."

Here we have a beautiful exemplification as to one at least of the many unexpected ways in which the investigations of the meteorologist on the land, and the observations of his fellow-laborer out upon the sea dovetail with, join together, and fit into each other. The navigator at sea finds an anomaly about the limits of the trade-winds. The meteorologist on the land traces the effect to its cause, and shows that it is owing to the meteorological agency of the great deserts and arid plains far away in the interior of continents.

Thus, we unexpectedly stumble upon another link in the long chain of circumstances and facts, which, when joined with the others, serve to show the importance of concert between the meteorologist on the land and the navigator at sea.

Meteorology is a whole. Its domains are the atmosphere; it is spread out with its laws and its agents over sea and land. And therefore there should be one system of observations, one plan of research between the two. I hope ere long to see some plan adopted for the establishment of a universal system of meteorological observations.

What the greatest depth of the ocean may be, has ever been a matter of speculation among philosophers, an object of longing desire and curious inquiry among mariners.

Many questions of deep interest touching the physical condition of our planet are connected with the depths of the sea.

The basin of the Atlantic Ocean separates the Old World from the New; it is a long channel, with some conformity of outline along its opposite shores. The basin or trough in which those waters are held, extends from the Antarctic to the Arctic Seas, perhaps from pole to pole. What is the depth of this trough?

This great marine trough lies between the Andes of South America on the one hand, and the mountains of Africa on the other—each range shooting forth its peak, far beyond the limits of perpetual snow. Is the bed of the Atlantic depressed in proportion to these elevations—and is that proportion in an increased or diminished ratio? Nothing that relates to the physical condition of our planet can be without interest; and knowledge with regard to every feature of the earth, sea, or air, is profitable.

It is wise to seek for it, for the ways of nature are the paths of wisdom, and whoever seeks to tread in them is profited, both he and his generation, by the mere attempt.

Until the commencement of the plan of deep-sea soundings, as now conducted in the American Navy, the bottom of the Atlantic Ocean, indeed, I might say, the bottom of what the sailor calls "blue water," was, with here and there an exception, all over the world, as unknown to us as is the interior of the other planets of our system.

Astronomers have measured the volume and weighed the masses of those distant spheres. But neither the curiosity, nor the explorations, nor the researches of man have ever succeeded in penetrating farther than a few feet into the crust of our planet.

From the top of the Himalaya to the depth of Lieutenant Berryman's great sounding of 6,600 fathoms in the Dolphin, would, supposing that sounding to be correct, measure, in a vertical line, about 13 miles. From the topmost peak of the highest mountain on the land, to the bottom of the deepest basin under the sea, would the distance be, by vertical measurement, 13 miles of perpendicular height? To this question, we may, I think, now answer no, at least so far as the North Atlantic Ocean is concerned.

But that of the North Atlantic is not the only oceanic basin, as to the depth of which information is desired, or knowledge is wanting, and would be valuable.

What may be the shape of those reservoirs that contain the waters which perform such an important part in the economy of the terrestrial arrangement, is certainly a matter worthy of inquiry from the most enlightened minds. To map out the great oceanic basins, to lay down upon our charts the depressions in the solid parts of the earth's crust, below the sea level, would certainly be as profitable, as instructive, and as useful as is the delineation on our maps of mountain ranges and other configurations of the earth's surface.

Therefore, in this undertaking to collect physical data, that we may from them gain knowledge as to the phenomena displayed by the air and the ocean, the subject of deep-sea soundings did not escape the attention of an enlightened government wisely administered.

Congress had given the Secretary of the Navy authority to have deep-sea soundings made by our men-of-war wherever they go; and to employ the armed cruisers of the Government as they pass to and fro about their business to collect materials for the great work in hand. The first attempt to penetrate the depths of the ocean encouraged farther exertions. They may have been failures, as first attempts often are; nevertheless, Lieutenant Walsh's report of his deep-sea sounding invested the subject with renewed interest; and when it was officially brought to the notice of the lamented Commodore Warrington, the late Chief of the Bureau of Ordnance and Hydrography, and of his successor Commodore Morris, under whose orders I am now acting, they both at once gave it their hearty approval and official sanction.

The following circular order to the commanders of all vessels of the Navy was thereupon issued.

Circular.

BUREAU OF ORDNANCE AND HYDROGRAPHY, *Nov.* 22, 1851.

SIR: Your attention is particularly invited to the accompanying Directions relative to deep-sea soundings.

You will take care that they be diligently and faithfully carried out on board the vessel under your command.

You will report, from time to time, to this Bureau, the latitude, longitude, depth, drift, time, and all

the circumstances connected with each cast, whether successful in reaching bottom or not—stating the kind of sinker used, its weight, and whether the large or small twine was used.

This order is to supersede that of June 1, 1850, on the same subject, and the Directions given at pages 70 and 71 of Maury's 3d edition of *Sailing Directions*, so far as they may conflict with these.

Respectfully, your obedient servant,

C. MORRIS,

Chief of Bureau.

APPROVED: WILL. A. GRAHAM,

Secretary of the Navy.

To ———

Instructions for using the Sounding Twine.

The twine for deep-sea soundings is of two sizes; the smaller size is intended to be used when no attempt is made to bring up specimens from the bottom. It is calculated to bear 60 pounds' weight in the air; it is about seven-hundredths of an inch in diameter, and measures 180 fathoms to the pound. It is marked at every 100 fathoms, and furnished on reels containing 10,000 fathoms each.

The larger size is to be used for bringing up specimens. It is calculated to bear a weight in the air of 150 pounds; it is about one-tenth of an inch in diameter, and measures about 80 fathoms to the pound. It is furnished on reels of 5,000 fathoms each.

It is desired, as a general rule, to have one deep-sea sounding only for every space of five degrees square, on a chart which is constructed with its meridians and parallels drawn only for every five degrees of latitude and longitude respectively.

The spaces in which deep-sea soundings have been made in the North Atlantic Ocean are shown on Plate XIV., 6th edition, *Maury's Sailing Directions.* It is desirable to have the soundings on that Plate, with a note of interrogation after them, verified.

Attempts should be made to bring up specimens of the bottom whenever practicable; for this purpose the large twine should be bent on to Brooke's deep-sea sounding apparatus.

A small Stellwagen cup attached to the bolt of Brooke's lead, may be substituted with advantage for the arming.

After a little experience, the officer charged with making deep-sea soundings will, it is thought, acquire skill enough, especially when the sea is not more than 2,000 fathoms deep, to bring up specimens with Brooke's apparatus and the small twine.

When the small twine is used without a Brooke's apparatus, double it for the first 200 fathoms, and use two 32 lb. shot as the sinker; when the shot reaches the bottom, the boat may ride by it, until the surface current shall be determined, when the line should be hauled in until it parts.

The sounding should in all cases be taken from a boat and not from the vessel. The boat with its oars can be kept over the line, whereas the vessel will drift.

For deep-sea temperatures, a self-registering metallic thermometer should be used, especially at great depths. When no metallic thermometer is on board, then a resort to a non-conducting cylinder for bringing up the water should be had.

Approved: C. MORRIS.

December 17, 1853.

Directions for taking Deep-Sea Soundings.

The information acquired from experience upon the subject of deep-sea soundings, enables me to say that I now consider it as practicable to fathom the greatest depths of the ocean, whatever they may be, as it is to sound out one of our bays or harbors.

Lieut. Walsh's experiments in the Taney satisfied me that no reliance could be put upon results obtained by sounding at great depths with wire. His great sounding, therefore, was most valuable and important, for it led the way to the use of twine.

It was thought that, upon the new plan, the common wrapping thread or twine used in the shops would answer for deep soundings. For it was supposed that bottom might be reached always and at any depth, especially in calm weather, simply by fastening the end of twine from such a reel to a common 32 lb. shot, throwing the shot overboard, and then paying out the twine as fast as the shot would take it from the reel. When the shot reached bottom, it was supposed the line would stop running out; and then, cutting the thread, and seeing how much was left on the reel, the depth would, it was thought, be ascertained.

This required the loss of the shot and the twine, but they were cheap; for it was supposed that a mere thread which had strength to hold together would be strong enough.

But the experiments of Lieut. Wm. Rogers Taylor, on board the Albany, Captain Platt (a full account of which is contained in the 5th edition of this work), proved these notions to be wrong. The casts for deep-sea soundings, made on board that vessel, showed that it required twine of considerable strength for the purpose.

The existence of a physical state of things which bear upon the question was also suggested by Taylor's experiments; and that is, the probable existence in all parts of the sea of one or more under-currents. In other words, these deep-sea soundings appear to confirm what I have been endeavoring to maintain in the chapter on the "Saltness of the Sea," and elsewhere, viz: That the ocean has its system of circulation, so ordered that its waters, whether at the surface or in the depths below, are seldom or never at rest; that this circulation is all-pervading, and perpetual, and is as constant in the horizontal as it is in the vertical direction.

The confirmation which the experiments in sounding out the depths of the ocean seem to afford for this conjecture, is derived from the inference, in the first place, that I draw from the experiments which, in a few cases, have been made in sounding at the same place, first with one and then with two 32 pound shot as a sinker. The results as to depth have been accordant; but invariably the depth, as given by the *two* shots is a little less than by one. The two shots sink faster than the one, the bight of the line

in the former case, therefore, is not exposed so long to the action of the undercurrents; consequently, it is not swept so far out of the perpendicular with the two as it is with but the one shot.

In the next place, a degree of confirmation as to the correctness of this conjecture is afforded by the fact that, though the shot may reach the bottom, the line has, in no instance, ceased for any considerable length of time to run out; and, moreover, that after the shot has landed, there is, at very great depths, such a force brought upon the line, if it be held, as always to part it.

Imagine a line two, or three, or four miles long, hanging perpendicularly in the ocean—that the plummet to which it is attached, has reached the bottom—and that there be one or more undercurrents moving in opposite or different directions, and operating upon it. They would operate with what sailors call a "swigging force," and that too with a power which no line would be strong enough to withstand for any considerable length of time.

Thus the importance of strong twine was pointed out; and it was also discovered that, to know when the shot had reached the bottom, it was necessary to time the intervals which were occupied by given lengths of line in going out. The most convenient lengths for this purpose are lengths of 100 fathoms each; and as mark after mark, which denotes these 100 fathom lengths, passes from the sounding-reel, the time per watch is as carefully noted, by the officer who makes the sounding, as it should be if he were taking sights for the chronometer.

The soundings by the Albany, and others, were made from on board ship. In the first place, it was rarely that an opportunity favorable enough for a good cast from on board ship occurred. Moreover, the complaint was almost universal throughout the service of bad twine. Attempts to sound from the vessel were so often frustrated by the parting of the line, that officers were very much deterred from the trial. These failures were disheartening.

Furthermore, when the ship was hove to for the purpose, as the Albany frequently was, there was not only the drift of the ship to be taken into account, but the question as to the result still remained to perplex. Had the bottom been reached? And if so, was there any certainty that the depth was what the experiments seemed to indicate? Certainty as to this was greatly impaired by inequalities in the times of running caused by the change in the rate of motion of the vessel as she "came up and fell off."

Such was the amount of our experience upon the subject of deep-sea soundings when Lieutenant S. P. Lee was ordered to the command of the Dolphin.

With characteristic energy he set about making preparations for this new service. His first business was to give the twine, furnished for deep-sea soundings, a thorough examination. He carefully overhauled, tested, and tried several hundred thousand fathoms. Much of it he found so defective that it had to be rejected, and the vessel detained until better could be procured. It was well he did so; for the line, with which he proceeded to sea, was better than that which was rejected; nevertheless, experience proved that much of it, though new, was not strong enough. Its average strength was not even then sufficient to bear a weight of fifty-five pounds, nor was it all quite of the same size, as it should have been.

When he got to sea, he determined not to sound from the vessel at all; but to use a boat for sounding altogether.

At first, he encountered many unexpected difficulties; but with industry, his ingenuity, and perseverance, these, one after another, were overcome, until the way was made plain, and the operation stripped of a vast amount of the uncertainties which had impaired, to a greater or less extent, the value of all the results hitherto obtained.

In the first place, though the small twine, furnished for the deepest soundings, would much of it bear a weight of seventy or even eighty pounds, yet, when he came to attach to it a thirty-two pound shot, to throw the shot overboard, and let it take the line from the reel as fast as it would, he found the line would part.

He then resorted to the expedient of doubling and even of trebling the line for the first two or three hundred fathoms. Thus, the parting was prevented. He found, moreover, that the operation was greatly facilitated by watching the trending of the line from the bows of the boat; and, with one or two oars of a side, directing the men how to pull, in order to keep the line "up and down."

Accordingly, we find him, when he first put to sea, occupied for more than a month, availing himself of every opportunity for sounding during the interval, and making day after day unsuccessful attempts.

Finally, he succeeded in getting out seventeen hundred fathoms without parting. Bottom was reached at this depth.

Out of the first seventeen casts that were made, this was the only successful one.

He was now in the fair way to get at the secret. The plan is to double or triple the line for the first three hundred fathoms; and, instead of letting the shot take it as fast as it will, and so bring up occasionally with a violent jerk and parting—and this, as experience abundantly proves, is very liable to be the case, particularly at the first going off, when the shot is sinking rapidly—Lee also adopted the expedient of keeping a gentle strain on the line at first; and this was accomplished by allowing a little friction to be applied to the reel, so that it would not for the first three hundred fathoms give the line to the shot quite as fast as the shot wanted to take it.

An important part of the plan, also, was that of keeping the boat, by means of a couple or more of oars, perpendicularly over the shot. To be sure that he had reached bottom, he on several occasions repeated the trial, using in this case two instead of one thirty-two pound shot for a sinker. The result was the same agreement as to depth.

Success crowned his efforts so far, and he now began to have such confidence in his results—for the mark of each successive hundred fathoms, as it went out, was carefully timed—that, with his shot on the bottom at the depth of three or four miles, he would use it as an anchor, ride by it in his boat out there in mid ocean, while the force and set of the surface current, out upon blue water in the open sea, were accurately determined. This was the first time that such a thing had been done.

Thus, the egg was made to stand upon its end.

When Lieutenant Berryman took charge of the brig, and went to sea, of course, he availed himself of Lee's experience, and commenced where Lee had left off.

But there was still one thing wanting: positive evidence that the plummet had reached bottom; for,

hitherto, the plan had not contemplated the bringing up of specimens of the bottom, inasmuch as the hauling up of the shot from such great depth was regarded as an impracticability.

In this stage of the matter, Passed Midshipman J. M. Brooke, a clever young officer, who was at the time doing duty at the Observatory, proposed to me a contrivance by which he thought the shot might be detached as soon as it touched the bottom, and specimens brought up in its stead.

I was in the habit of consulting him; he often assisted me with his reflections; and I referred him to Mr. Greble, the instrument-maker of the Observatory, that they two might give his idea shape, and construct a model of the machine. The result was Brooke's Deep-Sea Sounding Apparatus, as exhibited on Plates VII. and VIII. It is a simple and beautiful contrivance, which a mere inspection of the Plates seems sufficient to explain.

A is a 64 pound shot, cast with a hole through it. Berryman preferred one of 46 lbs.; but experience seems to favor a heavier one. A 64 pound shot is therefore recommended.

B is an iron rod, which the armorer on board of any man-of-war, may make whenever one happens to be lost in the sounding.

c is the cup for the arming, by which the soundings are brought up. When *c* is filled with tallow or soap, a wooden plug should be forced up into the arming. Then this plug, on being extracted, will leave a cup or mould within the arming, so that a more ample supply of soundings may be brought up.

D the slings, which are made of wire attached to a leathern or canvas disk *e*.

F represents the catches of twine, and *g* the swivel to prevent the untwisting of the line from turning the shot, or the turning of the shot either from twisting or untwisting the line.

In Plate VII. the shot is seen slung ready for sounding.

In Plate VIII. it is in the act of being detached after having reached bottom, specimens of which will be brought up with the rod or bolt *B*, in the little cup *c*.

Lieut. Berryman thinks that the armorer on board the Dolphin suggested an improvement to this, by substituting for *c* a Stellwagen cup, and attaching that to the iron rod.

With this apparatus, specimens were obtained on board the Dolphin from the depth of 2,000 fathoms (12,000 feet). During her last cruise, her commander intrusted the deep-sea soundings to Midshipman John G. Mitchell. This officer, and the men employed with him, finally became so expert—always doubling the line for the first 300 fathoms, applying friction to the reel at first, so as to offer a little resistance to the shot for that depth, and keeping, with the help of the oars, the line up and down—that failure to get bottom seldom occurred, unless in cases where the twine had been injured by the mice, or damaged by lime getting upon it. Indeed, Lieut. Berryman informs me that they became so expert that they could tell, by feeling the line, whether the shot were pulling it out, or whether it were merely carried out by the force of the drift.

The sounding twine is now made in the Boston Navy Yard. To have it so made, has been found the most economical. That which was furnished to the Dolphin, when Lieut. Lee had her, was bought ready made. The strength of the weakest part, is the strength of the whole; and so inferior did much of it prove,

that, though he expended upwards of 140,000 fathoms of twine, and 116, 32 lb. shot, in attempting to sound, only 73,000 fathoms of this quantity, and 30 shot, were actually employed in getting bottom; the rest were lost by the parting of the line, &c.

Commodore Morris has directed the small twine to be made strong enough to bear a strain of 60 lbs. It weighs about 1 lb. per 180 fathoms, and is put on reels of 10,000 fathoms.

The large twine will bear a weight of 150 lbs. It is put up for use, on reels of 5,000 fathoms. This is the twine to be generally used with Brooke's apparatus.

Seeing that so much for success in deep-sea soundings depends upon the interest which the officer charged with the sounding feels in the matter, it has been decided to give twine to those vessels only, that have on board some one or more officers who will volunteer to undertake a series of deep-sea soundings.

An outfit of sounding materials will be supplied to any vessel, either upon requisition of her commander, or at the request of any officer on board, who is willing to undertake a series of deep-sea soundings.

As to the *modus operandi* in sounding, officers are referred to what has already been said, and they are reminded that uniformity is of great consequence. Always use the same twine and the same weight; always time every 100 fathoms; always keep the line up and down, and *always* sound from a boat. The experience of the Dolphin is in favor of two 32 lb. shot, as a sinker for the small-sized twine. Her soundings, particularly those taken by Mitchell during her last cruise, are referred to by way of example.

Whenever specimens of the bottom are obtained, they should be labelled with date, name of ship, and officer, latitude, longitude, and depth, carefully preserved and forwarded to the Chief of the Bureau of Ordnance and Hydrography.

In the North Atlantic, the deep-sea soundings that are principally required, are in the white space (Plate XIV.) to the southward of the Grand Banks; in the open space about the Bermudas; in the middle of the Atlantic, between 25° and 30° N., 45° and 55° W., and in all the region below the parallel of 15°, except where Lee sounded.

It would be very interesting, also, to have a series of deep-sea soundings made from *boats* in the Gulf of Mexico and Carribean Sea, to test those which were made from the vessel by Rogers Taylor, of the Albany.

The deepest parts of the ocean will probably be found south of the parallel of 35° south. Soundings by vessels bound around either of the capes, therefore, would be possessed of a peculiar interest.

As to the physical geography of the sea, it may be said we know nothing, or, only so much as may be gathered from a few faint rays that modern explorations have cast upon it; and the officers of the navy have here afforded them the rare opportunity of building up a new department in physical geography.

The problem before them is an old one. To fathom the depths of the ocean is the proposition. It has either appalled by its magnitude, or baffled with its difficulties. At any rate, no systematic attempts have ever been made to gauge its depths "off soundings." But now, with means the most simple, this first great problem in the physical geography of the sea seems to be in a fair way of receiving a satisfactory

solution, at least, so far as to enable us to form a tolerably correct idea as to the general forms of the great oceanic basins, and the troughs, which, like spurs from mountain ranges, start out from the depressions in the solid crust below its waters, into bays, gulfs, and arms of the sea.

Of all contrasts in nature, perhaps none would be more striking than that afforded between the elevations of the earth's crust into mountains, on the one hand, and its depressions below the sea-level in the beds of the ocean, on the other. Certainly, few would be more grand—none can be more imposing.

I may refer to the Dolphin's abstract log, also, for deep-sea temperatures, as well as remarks about drift.

In the vicinity of most of the vigias, Berryman reports drift-wood, sun-fish, or something which, without a close examination, and at a little distance, might well be taken for rocks or other dangers to navigation.

For deep-sea temperatures, he used non-conducting hollow cylinders for bringing up the water. His experience finally induced him to repudiate the temperatures by that, and to prefer the common self-registering thermometer in its stead, notwithstanding its many liabilities to error and derangement. A self-registering metallic deep-sea thermometer seems to be the only instrument to which we may confidently look for correct knowledge concerning the thermal condition of the substrata of the deep sea.

Passed Midshipman G. M. Morris, who had the general superintendence of this department, in a report to Lieut. Berryman at the end of the cruise, remarks:—

"Used non-conducting cylinders for obtaining the temperature of water below the surface. On 25th October, attached a self-registering thermometer to the *lower* cylinder. Upon hauling up, found temperature in cylinder 71°—self-registering thermometer showing 53°. Also, on the 26th October, attached two self-registering thermometers, one to each cylinder, first trying the temperature at surface, which we found agreed with that of the standard thermometer, 82°. On hauling up, found temperature in cylinder as noted in columns, viz: 200 fms. 80°; 500 fms. 73°—self-registering thermometer showing at 200 fms. 63°, and at 500 fms. 52°. Also, tried it again, November 4, finding temperature in cylinders 200 fms. 75°, 500 fms. 65°—self-registering thermometer showing respectively 67° and 50°.

"We infer from the above results, that the temperatures taken with the 'non-conducting cylinder' are mostly inaccurate; owing, I think, to the swell or heave of the sea, which causes the water to change in the cylinder during its ascent." A self-registering metallic thermometer is the only *reliable* instrument under all circumstances for deep-sea temperatures. In the absence of these, I still prefer the non-conducting cylinder with *good* valves.

DEEP-SEA SOUNDINGS MADE IN THE NORTH ATLANTIC OCEAN.

From Abstract Log of U. S. brig Dolphin. Lieutenant-Commanding Otway H. Berryman.

Oct. 4, 1852. Lat. 39° 39′ N.; long. 70° 30′ W. Wind light from the southward; clear and pleasant. Sea comparatively smooth; 30 lb. lead.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	25	500	5	13	800	3	55
200	2	00	600	2	52	900	4	20
300	2	45	700	4	20	1000 (no bot.)	4	45
400	3	45						

After stopping the line, brought the boat alongside, and hauled in 350 fathoms, when the line parted.

B. KENNON.

Oct. 6. Lat. 40° 50′ N.; long. 64° 44′ W. Wind light from west, and pleasant; some swell on. Got bottom with 2,200 fathoms; a *good* cast, but not timed in consequence of an error in the marking of the line. Temperature at 100 fathoms, 63°; surface, 65°.

Oct. 7. Lat. 41° 12′ N.; long. 62° 38′ W. Wind light from northwest; weather very pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	05	600	2	09	1000	2	38
200	1	22	700	3	46 (l)	1500	15	56
300	1	38	800	2	08	2000	18	48
400	1	45	900	2	28	2200 (bot.)	10	55
500	1	55						

At 700 fathoms, the line fouled; was forced to cut and knot, which caused the increase in the time of running out. Temperature at 100 fathoms, 57°; surface, 65°. Specific gravity of water at surface, 1.026; at 100 fathoms, 1.027.

G. U. MORRIS.

Oct. 8. Employed remarking sounding-line, as it was all marked wrong.

Oct. 9. Lat. 41° 40′ N. (D. R.); long. 59° 23′ W. Got bottom with 2,600 fathoms line; two 32 lb. shot. Wind northeast; moderate. Weather pleasant; a heavy swell from the northward.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	4	03	1000	3	23	1900	3	53
200	1	40	1100	3	31	2000	4	08
300	2	06	1200	3	34	2100	4	05
400	2	08	1300	3	41	2200	4	15
500	2	32	1400	3	45	2300	4	14
600	2	38	1500	3	48	2400	4	26
700	2	47	1600	3	47	2500	4	49
800	2	55	1700	3	45	2600 (bot.)	4	53
900	3	11	1800	3	51			

During the running out of the first hundred fathoms, the line jammed, which caused the excess of time noticed.

Temperature at 150 fathoms, 63°. Specific gravity at that depth, 1.028.

Passed the position assigned by Captain Welsh, of the Silas Richards, to Hervegault's rock, but saw no signs of it.

G. U. MORRIS.

Oct. 10. Lat. 41° 40′ N.; long. 56° 1′ W. Two 32 lb. shot. Fine breeze from northward and eastward, with a heavy swell; weather pleasant. 3 hours 39 min. P. M.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 15	1000	2 50	1900	3 50
200	1 28	1100	3 45 (?)	2000	4 5
300	1 40	1200	2 50	2100	4 5
400	1 57	1300	3 15	2200	4 00
500	2 00	1400	3 30	2300	4 00
600	2 18	1500	3 30	2400	3 51
700	2 22	1600	3 25	2500	4 47
800	2 30	1700	3 35	2600 (bot.)	4 22
900	2 50	1800	3 30		

The cast was very satisfactory, and bottom certainly obtained at 2,595 fathoms "up and down." Little or no drift to the boat, as the oars were kept constantly going. Temperature at 220 fathoms, 58°. Specific gravity of water, from same depth, 1.028.

B. KENNON.

Oct. 11. Lat. 40° 36′ N.; long. 54° 18′ 30″ W. Two 32 lb. shot. Wind light from the southward and westward, and pleasant. 3 hours 1 min. 30 sec. P. M.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 5	1300	3 16	2500	4 21
200	1 29	1400	3 25	2600	4 24
300	1 40	1500	3 23	2700	4 23
400	1 53	1600	3 29	2800	4 25
500	2 08	1700	3 28	2900	4 30
600	2 19	1800	3 32	3000	4 36
700	2 29	1900	3 39	3100	4 39
800	2 37	2000	3 41	3200	4 44
900	2 42	2100	3 49	3300	4 46
1000	2 48	2200	4 06	3400	4 50
1100	2 55	2300	4 18	3450 (bot.)	2 26
1200	3 09	2400	4 18		

Temperature of water, at 150 fathoms, 62°; surface, 74°. Specific gravity of water, at 300 fathoms' depth, 1.028; temperature 64° (probably a mistake). Looking for Daraith's Rock, but discover no indications of it.

G. U. MORRIS.

Oct. 12. Encountered a violent hurricane from southward and westward, which hauled by the westward to the northward and eastward, and from which the brig suffered severely, losing two of her boats and lee-gun; had hammock-rails carried away, and otherwise much injured.

Oct. 13. Lat. at noon 39° 52′ N.; long. at noon 54° 54′ W. Looking for Watson's Rock, but can discover no appearance of it. No weather for sounding; too much sea on.

Oct. 14. Lat. at noon 39° 51′ N.; long. at noon 54° 24′ W. No appearance of rocks or shoals. Still too rough to sound.

Oct. 20. Lat. 41° 7′ 6″ N.; long. 49° 23′ 15″ W. Sounded with small-size line; two 32 lb. shot. Wind light from southward and eastward, and pleasant weather. Current 0.4 knots per hour, N. N. E. 1 hour 33 min. P. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	00	1700	2	20	3200	7	20
200	1	00	1800	3	10	3300	4	10
300	2	00	1900	3	40	3400	7	00
400	1	40	2000	3	40	3500	5	10
500	1	50	2100	4	10	3600	4	20
600	2	30	2200	3	00	3700	5	5
700	2	10	2300	3	50	3800	6	45
800	2	30	2400	4	10	3900	7	30
900	2	20	2500	6	20	4000	6	50
1000	2	30	2600	5	15	4100	6	55
1100	2	30	2700	2	15	4200	5	15
1200	3	15	2800	3	30	4300	8	00
1300	2	18	2900	3	30	4400	7	00
1400	2	27	3000	7	10	4500	6	50
1500	2	45	3100	5	50	4580 (bot.)	7	10
1600	2	55						

The cause of the great differences of the times of running is owing to having checked the line to allow it to straighten, and to heave the turns out of it. The drift of the boat was but little, as two oars were kept constantly going. Temperature by self-registering thermometer, at 140 fathoms, maximum 70°, minimum 60°; surface 66°; air 68°.

BEVERLY KENNON.

This sounding of 4,580 fathoms, is near the supposed position of Hervegault's Breakers; but the existence of any rocks or shoals hereabouts is very doubtful. By the *Ice Chart*, this is a famous place for that article, and these rocks were generally seen *during the ice season.* No doubt something has been seen; but I think nothing but the *remains of icebergs.*

October 24. Lat. 43° 40′ N.; long. 42° 55′ W. Sounding-line (small size); two 32 lb. shot. Light wind from S. W. and pleasant weather. 9 hours 41 min. 5 sec. A. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	1	1000	2	51	1900	3	56
200	1	34	1100	2	53	2000	4	2
300	1	33	1200	3	9	2100	4	7
400	1	47	1300	3	11	2200	4	13
500	2	00	1400	3	19	2300	4	18
600	2	5	1500	3	25	2400	4	30
700	2	16	1600	3	33	2500	4	39
800	2	20	1700	3	43	2600	4	52
900	2	37	1800	3	45	2700 (bot.)	5	8.

G. U. MORRIS.

Self-registering thermometers at 150 fathoms, maximum 77°, minimum 63°. At 10 hours 30 min. P. M. hove to, and sounded with 200 fathoms line, no bottom, on a spot said to have 35 fathoms only. Temperature of water at 200 fathoms, 64°; at surface, 68°; of air, 70°.

Oct. 25. Lat. 44° 41′ 7″ N.; long. 40° 16′ W. Got bottom with 1,800 fathoms, two 32 lb. shot. Wind light from the E.; weather cloudy, with light drizzling rain. 2 hours 9 min. 30 sec. P. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	00	700	2	10	1300	3	30
200	1	20	800	2	30	1400	3	15
300	1	40	900	1	30	1500	2	25
400	2	15	1000	2	30	1600	3	00
500	2	30	1100	3	30	1700	3	40
600	1	15	1200	3	00	1800 (bot.)	3	40

BEVERLY KENNON.

Temperature of water at 250 fathoms, 62°; specific gravity 1.027—self-registering thermometers at 150 fathoms, maximum 70°, minimum 60°.

December 26. Lat. 33° 8′ N.; long. 16° 10′ W. The Island of Porto Santo bearing, per compass, W. ¾ S. distant about 15 miles; sounded 2,950 fathoms—no bottom; two 32 lb. shot. 2 hours 51 min. P. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
500	24	00	1500	21	30	2500	19	50
1000	15	00	2000	23	40	3000	18	00

Line only marked at every 500 fathoms. B. KENNON.

Dec. 27. Looking for the *Eight Stones*. At 10 A. M. sounded with 700 fathoms, no bottom; lat. ——; long. ——. At 10 P. M. sounded with 600 fathoms, no bottom; no indications of any kind of rocks or shoals. Temperature of water at 600 fathoms, 63°. Specific gravity of water from 600 fathoms' depth, at a temperature of 69°, 1.0266.

Dec. 28. Lat. at noon 35° 8′ N.; long. at noon 16° 20′ W. Still looking for the *Eight Stones;* but discover no indications of them. At 9 A. M. sounded with 850 fathoms—no bottom; temperature water at 850 fathoms, 62°; at 215 fathoms, 65°. Specific gravity of water from 850 fathoms, at 64°, 1.0275; from 215 fathoms' depth, at 65°, 1.0276. At 4 hours 30 min. P. M. sounded with 800 fathoms line; no bottom. At 10 P. M. lat. 34° 41′ N.; long. 16° 9′ W. sounded with 480 fathoms; no bottom.

Under short sail, over and about the *Eight Stones*.

Jan. 1, 1853. Lat. at noon 34° 32′ N.; long. 16° 49′ W. Employed cutting up the ground about the southern position assigned to the *Eight Stones*. Passed over the position and sounded with 500 fathoms; no bottom. Temperature at that depth, 59°. Very heavy swell about here; no indications of soundings.

Running lines of about 25 miles on straight courses at angles of about 15°. Man at masthead having a view of about 7 miles each way. Sounded at each angle.

Jan. 3. Lat. 34° 18′ N.; long. 16° 45′ W. Got bottom with 2,298 fathoms line, small size; two 32 lb. shot. 9 hours 17 min. 18 sec. A. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	56	900	2	17	1700	3	17
200	1	12	1000	2	32	1800	3	28
300	1	25	1100	2	39	1900	3	35
400	1	36	1200	2	46	2000	3	40
500	1	44	1300	3	00	2100	3	45
600	1	52	1400	3	00	2200	3	47
700	2	03	1500	3	06	2298 (bot.)	3	43
800	2	10	1600	3	09			

This sounding was taken upon the southern position assigned to the *Eight Stones*. G. U. MORRIS.

Jan. 4. At 8 P. M. sounded for temperature with 200 fathoms. Lat. 35° 57′ N.; long. 17° 24′ W. Temperature at 200 fathoms, 60°; at 50 fathoms, 61°; at 20 fathoms, 62°. Beating up for the position assigned Jean Hammon's Rock.

Jan. 9. Lat. 36° 59′ N.; long. 19° 58′ W. Got bottom at 2,500 fathoms, small-sized line. Wind moderate, from the westward, but a heavy swell. 12 hours 16 min. 5 sec. P. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	59	1000	2	32	1900	3	26
200	1	18	1100	2	49	2000	3	30
300	1	28	1200	2	55	2100	4	2
400	1	40	1300	2	53	2200	4	4
500	1	55	1400	3	23	2300	3	51
600	1	59	1500	2	58	2400	3	49
700	2	11	1600	3	19	2500 (bot.)	4	9
800	2	20	1700	3	18			
900	2	28	1800	3	34			

G. U. MORRIS.

Temperature of water at 500 fathoms, 59 °7; at 50 fathoms, 63°; at surface, 62°.

3 P. M. Lat. 36° 49′ N.; long. 19° 53′ 45″. Got bottom with 2,950 fathoms, on the position assigned Jean Hammon's Rock. Small-sized line; two 32 lb. shot. 3 hours 4 min. P. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	45	1100	3	00	2100	3	55
200	1	15	1200	2	45	2200	3	30
300	1	25	1300	2	55	2300	3	40
400	1	35	1400	3	00	2400	4	20
500	2	00	1500	3	00	2500	3	50
600	1	50	1600	3	30	2600	4	10
700	2	10	1700	3	00	2700	4	00
800	2	10	1800	3	20	2750 (bot.)	2	00
900	2	20	1900	3	10			
1000	2	20	2000	3	25			

BEVERLY KENNON.

Temperature at 400 fathoms, 61°; at 50 fathoms, 63°; at surface, 62°.

During this examination for Jean Hammon's Rock, the weather has been pretty good with the exception of not affording opportunities of sounding from a boat. We have *passed over* and about the position several times, and, if a rock existed, it is highly probable we should have discovered it, as the sea would break finely upon it. No indications as yet.

Jan. 12. Finished to-day the examination of the position assigned to Jean Hammon's Rock, and I am satisfied that no such rock exists now, if ever it did. Sounded with from 200 to 2,750 fathoms over and about it; but saw no indications of shoal water.

Jan. 29. Lat. 30° 49′ N.; long. 27° 25′ W. Sounded with 2,200 fathoms line; no bottom; small line, two 32 lb. shot; wind moderate from northward and eastward, and cloudy weather; a heavy sea. Time, 4 hours 35 min. P. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	00	900	2	28	1700	3	41
200	1	16	1000	2	36	1800	3	44
300	1	29	1100	3	8	1900	3	50
400	1	43	1200	3	1	2000	4	10
500	1	51	1300	3	4	2100	4	00
600	2	1	1400	3	21	2200 (bot.)	4	00
700	2	9	1500	3	9			
800	2	22	1600	3	22			

At 5 hours 36 min. 30 sec. cut the line and returned on board, in consequence of the lateness of the hour, it being quite dark.

G. U. MORRIS.

Jan. 30. Lat. 30° 45′ N.; long. 27° 31′ W. Got bottom with 2,480 fathoms; small-sized line; 32 lb. shot. Wind light from northward and eastward, and pleasant weather. Time, 9 hours 11 min. A. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	00	1000	2	43	1900	3	38
200	1	15	1100	2	47	2000	3	45
300	1	31	1200	3	00	2100	3	55
400	1	42	1300	3	04	2200	3	59
500	1	57	1400	3	18	2300	4	1
600	2	06	1500	3	22	2400	4	15
700	2	17	1600	3	25	2480 (bot.)	4	26
800	2	23	1700	3	31			
900	2	37	1800	3	54			

G. U. MORRIS.

Temperature at 200 fathoms, 64.°5; at 50 fathoms, 65°; surface, 65°.

Feb. 1, 1853. Fresh winds, and squally during this day, with a high sea. Made two attempts to sound, but forced to give it up, after losing 4 shot and 600 fathoms of the line.

Feb. 3. Lat. 27° 5′ N.; long. 28° 20′ 26″ W. Found bottom with 1,700 fathoms; two 32 lb. shot. Time, 9 hours 30 min. 30 sec. A. M.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 00	700	2 00	1300	3 00
200	1 00	800	*4 35	1400	3 00
300	1 30	900	2 40	1500	3 20
400	1 30	1000	2 40	1600 (bot.)	3 00
500	1 55	1100	2 50		
600	1 50	1200	3 00		

* No mark—hence the difference of elapsed time. As that difference is generally about 2 min., I think I am safe in reporting 1,700 instead of 1,600 fathoms. Weather unpleasant, and a little too much sea on; not, however, too much to prevent this from being quite a satisfactory cast.

B. KENNON.

At 6 P. M. temperature at 400 fathoms, 62°; at 100 fathoms, 68°.7; surface, 69°.7.

Feb. 4. Lat. 29° 21′ N.; long. 30° 48′ W. Got bottom with 2,580 fathoms; two 32 lb. shot. Fresh breezes from the east, with occasional squalls of light rain. A heavy sea on. Time, 10 hours 49 min. A. M.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
65	0 40	1000	2 35	1900	3 30
200	1 00	1100	2 30	2000	3 40
300	1 20	1200	2 50	2100	3 40
400	1 30	1300	2 55	2200	3 55
500	1 50	1400	3 00	2300	4 15
600	2 5	1500	3 5	2400	4 00
700	2 5	1600	3 20	2500	4 5
800	2 30	1700	3 30	2600	4 00
900	2 15	1800	3 30		

The seconds of the elapsed times of this sounding can only be considered as approximate, as all the watches with second-hands in the vessel were out of order; and the times were, therefore, noted, with as much accuracy as possible, by minute-hand.

G. U. MORRIS.

Temperature at 300 fathoms, 65°.5; at 100 fathoms, 68°.2; surface, 69°.2.

Feb. 5. Lat. 31° 17′ N.; long. 33° 8′ W. Got bottom with 2,400 fathoms, small twine; two 32 lb. shot. Moderate wind from eastward. Weather pleasant. Sea tolerably smooth. Time, 9 hours 40 min. A. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	45	900	2	30	1700	3	35
200	1	00	1000	2	45	1800	3	40
300	1	45	1100	2	50	1900	3	50
400	1	40	1200	3	1	2000	4	20
500	1	50	1300	3	15	2100	4	10
600	2	00	1400	3	5	2200	4	10
700	2	10	1500	3	20	2300	4	00
800	2	40	1600	3	45	2400 (bot.)	4	00

B. KENNON.

Temperature at 200 fathoms, 63°.5; at 50 fathoms, 67°.2.

Feb. 6. Lat. 28° 55′ N.; long. 35° 49′ W. Sounded with 1,880 fathoms line, but no bottom. Owing to the heavy sea, the boat could not be kept over the shot, and the line parted at that mark.

Temperature at 300 fathoms, 65°; at 50 fathoms, 67°; at surface, 70°.

Feb. 8. Lat. 29° 13′ 30″ N.; long. 41° 20′ 50″ W. Got bottom with 2,270 fathoms line. Small line; a 50 lb. lead. Wind fresh from southward and eastward, and pleasant. Sea rather rough for sounding. Time, 12 hours 50 min. 50 sec. P. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
50	0	36	900	2	50	1700	4	00
200	1	20	1000	3	10	1800	4	15
300	1	26	1100	3	00	1900	4	15
400	1	41	1200	3	27	2000	4	40
500	1	53	1300	3	18	2100	5	00
600	1	58	1400	3	35	2200	6	20
700	2	42	1500	3	40	2270 (bot.)	6	40
800	2	35	1600	4	00			

B. KENNON.

Temperature at 400 fathoms, 65°; at 100, 69°.7.

Feb. 9. Lat. 31° 16′ N.; long. 43° 28′ W. Got bottom with 2,080 fathoms; small line; two 32 lb. shot. Wind moderate from southward and eastward, and pleasant. Time, 2 hours 55 min. 32 sec. P. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	59	800	2	20	1500	3	17
200	1	9	900	2	27	1600	3	34
300	1	20	1000	2	45	1700	3	32
400	1	35	1100	2	41	1800	3	36
500	1	51	1200	2	47	1900	3	53
600	1	57	1300	3	8	2000	3	49
700	2	5	1400	3	11	2080 (bot.)	4	00

G. U. MORRIS.

Temperature at 300 fathoms, 66°; at 100 fathoms, 68°.7; at 20 fathoms, 69°.7; surface, 69°.7.

Feb. 10. Lat. 32° 1′ N.; long. 44° 31′ W. Got bottom with 2,250 fathoms. Small-sized line; a 75 lb. lead. Wind fresh from south, and pleasant. Time, 8 hours 51 min. A. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	40	800	2	18	1500	3	25
200	0	55	900	2	40	1600	* 4	25
300	1	15	1000	2	40	1700	3	50
400	1	30	1100	2	42	1800	3	57
500	1	40	1200	* 3	6	1900	* 4	8
600	2	00	1300	3	7	2000	3	50
700	2	12	1400	3	10	2100	* 4	00
						2200	* 4	30
						2250 (bot.)	2	10

* At these times the line was stopped, and the boat pulled up to windward to keep the line up and down, and then let go again.

BEVERLY KENNON.

This sounding is on the spot where Commander Barron reported bottom with 5,500 fathoms line, with a drift of three miles. I think that alone renders the cast of little or no value. I therefore determined to verify it, as none of my casts, in approaching this point, indicate such a great depth.

Temperature at 400 fathoms, 65°; at 100 fathoms 67°.5.

Feb. 11. Lat. 32° 29′ N.; long. 47° 2′ W. Made two attempts to sound, but line parted, first at 1,800 fathoms, and then at 300 fathoms. Upon overhauling the line left on the reel, it was found to be defective in many places.

Feb. 12. Lat. 32° 55′ N.; long. 47° 58′ W. Light airs, and pleasant. Sounded with 6,600 fathoms line, but found no bottom. Used the large-sized line, and Brooke's sounding-lead, weighing 46 lbs. Finding no bottom at the above depth, the line was taken to the brig, and an attempt made to haul it in, but it parted at 150 fathoms.

On trying to check it from the boat, when it was "up and down" (apparently), the strain became so great that it could not be held with both hands. When sounding, usually, even with 3,000 fathoms line out, as soon as the shot touches bottom, the line ceases to run out, so that it can easily be held for several minutes over the finger; but upon hauling in a few fathoms, the strain becomes very great. In this case, either the shot did not reach bottom at 6,600 fathoms, which is very unlikely, or there must have been a *very strong undercurrent*, which swept the bight of the line with a force equal to that of a descending shot. There appeared to be a surface current of about 0.8 of a mile per hour.

This sounding is nearly *south* of our deepest cast, 4,580 fathoms, near Hervegault's Breakers, in lat. 41° N., but nothing like such a depth has been expected here, as we have brought somewhat regular depths from east of the Canaries to this point.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. hrs.	min.	sec.	FATHOMS.	INTERVALS. min.	sec.
500	11	14	2900		19	8	5400	24	00
1000	12	39	3300		21	6	5600	25	42
1500	13	16	4300	1	2	0	5800	27	8
1700	6	29	4400		8	40	6000	27	36
1900	6	20	4600		18	36	6200	28	24
2100	8	00	5000		40	12	6400	29	5
2300	8	57	5200		20	10	6600	29	1
2500	9	50							

G. U. MORRIS.

February 13. Lat. 33° 3′ N.; long. 48° 36′ W. Got bottom with 3,550 fathoms. Small line; two 32 lb. shot. Time, 10 hours 32 min. 40 sec. A. M. Light airs and pleasant weather.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
150	1	9	1350	3	00	2550	4	10
200	1	16	1450	3	00	2650	4	00
350	1	32	1550	3	20	2750	4	10
450	1	31	1650	3	30	2850	6	00
550	1	50	1750	3	30	2950	2	20
650	2	00	1850	3	40	3050	9	00
750	2	22	1950	3	50	3150	12	20
850	2	7	2050	3	50	3250	13	00
950	2	38	2150	3	50	3350	13	00
1050	2	39	2250	4	00	3450	14	15
1150	2	36	2350	4	20	3550	12	15
1250	3	00	2450	4	10	Here the line stopped running.		

BEVERLY KENNON.

Temperature at 400 fathoms, 60°; at 100 fathoms, 66°; surface, 66°.

Feb. 15. Lat. 32° 47′ N.; long. 50° 00′ W. Sounded with 3250 fathoms, no bottom. Brooke's sounding apparatus and four 20 lb. leads, making the entire weight 126 lbs. For the first 2,000 fathoms, the sea was pretty smooth, with very little wind; but in less than fifteen minutes after, the freshening of the wind and rising of the sea, prevented the line from being kept up and down, even with three oars going.

Time, 1 hour 23 min. 50 sec. P. M.

FATHOMS.	INTERVALS. min.	sec.	
500	9	25	Smooth sea—calm.
1000	9	23	" " light breeze.
1500	9	30	" " " "
2000	17	32	Fresh squall of wind and rain. Stopped the line
2500	13	56	and pulled up to it, to get up and down.
3000	14	4	Fresh wind, and disagreeable cross sea.
3250	6	20	" " " "

Cut the line, and returned on board. As the boat drifted more than on former occasions, the cast was about 3,000 fathoms, up and down.

BEVERLY KENNON.

Feb. 20. Lat. ——(?) N.; long. ——(?) W. Got bottom with 1,380 fathoms; a fifty lb. lead. Time, 9 hours 20 min. 55 sec. Wind light at southwest; weather pleasant.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
75	8	30	575	2	12	1075	3	30
175	1	5	675	2	35	1175	3	41
275	1	27	775	2	50	1275	3	59
375	1	48	875	3	00	1380 (bot.)	5	10
475	1	28	975	3	20			

B. KENNON.

Feb. 22. Lat. 28° 20′ N.; long. 59° 44′ W. Found bottom at 2,900 fathoms; large-sized line; Brooke's sounding-lead, and two 32 lb. shot, weighing in all 96 lbs. The first 600 fathoms ran out so rapidly that the marks could not be seen. When 2,900 fathoms had passed off the reel, the line stopped running out. It was running fairly, and it is to be presumed the shot touched the bottom, and were disengaged from the line. Hauled in 100 fathoms from the boat, and then took the line to the brig; when, although the greatest care was used, it parted, after hauling in about 300 fathoms.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
600	9	40	1600	6	53	2600	8	51
800	4	40	1800	7	13	2800	10	5
1000	5	30	2000	8	00	2900 (bot.)	5	10
1200	5	55	2200	7	55			
1400	6	12	2400	8	42			

G. U. MORRIS.

Feb. 23. Lat. 28° 04′ N.; long. 61° 44′ W. Got bottom with 3,080 fathoms; two 32 lb. shot. Time, 10 hours 18 min. 34 sec. A. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
200	2	16	1200	2	50	2200	3	48
300	1	35	1300	2	55	2300	3	57
400	1	45	1400	3	00	2400	3	52
500	1	54	1500	3	15	2500	3	58
600	1	58	1600	3	09	2600	4	02
700	2	10	1700	3	16	2700	4	13
800	2	23	1800	3	25	2800	4	15
900	2	27	1900	3	28	2900	4	35
1000	2	30	2000	3	37	3000	4	30
1100	2	35	2100	3	40	3080 (bot.)	4	20

The up and down cast is 3,000 fathoms.

B. KENNON.

Temperature at 400 fathoms, 66°; at 100 fathoms, 69°; surface, 70°.7; air, 71°.

Feb. 24. Lat. 28° 23′ N.; long. 64° 17′ W. Got bottom with 2,518 fathoms; small-sized line; two 32 lb. shot.

Feb. 25. Lat. 27° 42′ 36″ N.; long. 66° 11′ 15″ W. Sounded with 1,000 fathoms line, no bottom. Owing to the roughness of the sea, the line parted at that depth. Temperature at 400 fathoms, 60°; at 100 fathoms, 65°.

Feb. 26. Lat. 26° 49′ N.; long. 66° 54′ W. Got bottom with 2,920 fathoms line; small line; two 32 lb. shot. Wind fresh from W. N. W. High swell. Too rough for a favorable cast.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	55	1100	2	55	2100	3	58
200	1	20	1200	3	03	2200	3	52
300	1	40	1300	3	04	2300	4	00
400	2	50	1400	3	21	2400	4	35
500	2	00	1500	3	13	2500	4	30
600	1	48	1600	3	44	2600	4	25
700	2	24	1700	3	31	2700	4	25
800	2	36	1800	3	42	2800	4	30
900	2	37	1900	3	48	2930 (bot.)	2	00 (?)
1000	2	42	2000	4	12			

The up and down cast is about 2,750 fathoms.

B. KENNON.

Feb. 28. Lat. 28° 16′ N.; long. 69° 24′ W. Got bottom with 2,950 fathoms; two 32 lb. shot. Moderate winds from the eastward, and pleasant weather. Time, 9 hours 34 min. 13 sec. A. M.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
50	0	28	1050	2	50	2050	4	00
150	1	4	1150	3	00	2150	4	11
250	1	26	1250	3	20	2250	4	14
350	1	34	1350	3	8	2350	4	35
450	1	48	1450	3	26	2450	4	25
550	2	00	1550	3	20	2550	4	15
650	2	10	1650	3	46	2650	4	45
750	2	20	1750	3	37	2750	4	55
850	2	37	1850	4	3	2850	4	40
950	2	33	1950	3	50	2950 (bot.)	6	00

Temperature at 400 fathoms, 61°; at 100 fathoms, 67°.2.

B. KENNON.

U. S. Brig Dolphin's Second Cruise under Lieutenant-Commanding Otway H. Berryman.

June 2, 1853. Lat. 37° 34′ N.; long. 68° 52′ W. Weather pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
1000	20	25	1800	7	38	2600	8	41
1200	5	59	2000	8	08	2800	9	01
1400	6	36	2200	8	39	2920 (bot.)	6	36
1600	7	20	2400	8	40			

Temperature at surface, 76°; at 100 fathoms, 72°; at 300 fathoms, 69°. A very satisfactory sound.

G. U. MORRIS.

June 3. Lat. 37° 58′ N.; long. 67° 12′ W. Weather pleasant. Temperature of air, 72°; at surface, 79°; at 10 fathoms, 78°. At 5 P. M. temperature of air, 83; at surface, 68°; at 10 fathoms, 68°.

In sounding for temperature, at 500 fathoms, the temperature at depth was the same as at the surface, viz: temperature at surface, 68°; at 200 fathoms, 68°; at 500 fathoms, 68°. The streaks of *cold water*, noticed at 8 A. M., continued during the whole day, sometimes changing temperature every two or three hours quite 10°. I had sounded with 5,000 fathoms, but the sound was not satisfactory. I hoped to have found hereabouts shoal-water enough to locate Maury's submarine mountain, or the northwest end of it, which would probably account for the great velocity of the current, and roughness of the sea; the gulf water turning such a point to run off to the eastward.

Latter part, weather pleasant. At 12 hours 30 min., the water suddenly fell from 78° to 68°, changed color to greenish, and was filled with very small animalcules. Current, per morning and afternoon observations, 3.6 miles per hour, for ten hours (interval between observations). Kept on the ground, to get

soundings over Potomac Shoal; ran back into a *cold streak*, which does not seem more than *three* miles wide, in a S. S. E. and N. N. W. direction.

June 5. Lat. 39° 46′ N.; long. 64° 1′ W. Weather rainy; no opportunity for sounding, since the attempt over Potomac soundings. Passed near Murry Reef; saw no indications of reefs or shoals.

June 7. Lat. 39° 32′ N.; long. 64° 14′ W. Weather fine; two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	56	1000	2	25	1900	3	20
200	1	14	1100	2	30	2000	3	35
300	1	25	1200	2	42	2100	3	45
400	1	40	1300	2	43	2200	3	50
500	1	50	1400	2	50	2300	3	55
600	1	53	1500	3	00	2400	3	45
700	2	02	1600	3	05	2500	4	00
800	2	10	1700	3	08	2600	4	03
900	2	25	1800	3	12	2750 (bot.)	4	07

Temperature at surface, 70.°5; at 200 fathoms, 63°.5; at 500 fathoms, 55°. Transparency; 20 lb. lead seen at 7 fathoms.

J. G. MITCHELL.*

This is the first attempt of Mr. Mitchell, and he has been very accurate. The difference of proportion in the intervals may be owing to the swell, which was considerable.

O. H. BERRYMAN.

June 8. Lat. 40° 34′ N.; long. 59° 13′ 45″ W. Water changing temperature frequently several degrees, but no indications of shoal water. These changes I attribute to the various cold streaks found on the south edge of the "stream."

June 9. Lat. 41° 07′ 12″ N.; long. 55° 39′ 30″ W. Weather pleasant; water changed in one hour from 71° to 61°; a very short and rough sea on, like a strong eddy. This being in the immediate vicinity of Daraith's Rock, sounded with 500 fathoms; no bottom. Temperature at 500 fathoms, 55°; water falling every hour. During the latter part of this day, the influence of this cold region of water has been very perceptible, in the appearance of the atmosphere. A haze hangs over the surface constantly, and the current of air is quite strong aloft, when scarcely a breath is perceived on the surface of the water. It is a perfect condenser; I shall call it an Oceanic Lake. Ends pleasant, with the same rough sea. At 10 o'clock, water fell to 58° at the surface. Commenced a regular search for Daraith's and Watson's Rocks. This temperature may be influenced by the Gulf of St. Lawrence.

June 10. Lat. 41° 07′ N.; long. 54° 37′ W. Weather fine; two 32 lb. shot.

* During the rest of this cruise, all the deep-sea soundings are made by Mitchell.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
35	0	15	1000	2	27	1900	3	28
100	1	13	1100	2	38	2000	3	32
200	1	22	1200	2	51	2100	3	46
300	1	35	1300	2	54	2200	3	47
400	1	45	1400	2	55	2300	3	52
500	1	50	1500	3	10	2400	4	02
600	1	56	1600	3	20	2500	4	02
700	2	09	1700	3	21	2600	4	08
800	2	15	1800	3	26	2710 (bot.)	3	20
900	2	20						

Temperature of surface, 59°; at 200 fathoms, 51°; at 500 fathoms, 48°.8.

June 10. Lat. 40° 52′ N.; long. 54° 28′ 15″ W. Weather pleasant; passing misty clouds, which appear to rise and form entirely over and about the cold region of water we are now in; at 4 A. M. the water suddenly changed from 60° to 70°, in half an hour, evidently the south edge of the Oceanic Lake; got into it at 6 o'clock last evening, and out at 4h. 30m. this morning, on a southeast course of 25 miles; sounded 500 fathoms; no bottom. 7 A. M., the water again 59°; the brig going at the rate of 5 knots; no breeze on the water—all aloft; the "condenser" in full operation, keeping a continued process of *fog-making;* large fog-banks being seen on the horizon. At 10, sounded for temperature; surface, 59°; 200 fathoms, 51°; at 500 fathoms, 48°.8; sent boats to try for undercurrents, and measure the velocity of both surface and undercurrents. This region is just south of the deep entrance between the "Banks" into the Gulf of St. Lawrence. Can it be that the cold waters of the gulf have made their appearance here? Here also the various rocks have been seen by Daraith or Darialis, Watson, Ackett, and some others. From the appearance of the sea, a strong current is very perceptible; it is very turbulent. It was here the Dolphin had such bad weather on the 12th of last October (1852). No doubt, some unfortunate wreck has been converted into a rock by the above-named navigators; for I noticed how much a boat, bottom up, looked like one, while the sea was washing over it at intervals, and *we passed within a boat-hook's length of it.* It had grass and weeds on it too. At 11h. 30m. I visited the sounding-boat, and found she had just got bottom at 2,710 fathoms. The boat *riding by the line without any difficulty*—an up and down fair sound. By her, we try the surface and undercurrents. At 1 P. M., the Master (Mr. English) returned, and reported the following as the result of experiments for current:—

Surface	(two experiments),	both	E. S. E.,	per compass,	1	knot.
50 fathoms	"	"	" S. E. by E.	"	"	1.4 "
100 "	"	"	1.3 and 1.2 S. E. by E.	"	"	1.2½ "
150 "	"	"	1.7 and 1.5 S. E. by E.	"	"	1.6 "

The current above recorded agrees well with our reckoning. The difference of velocity and

temperature, as the depth increases, induces me to conclude that the waters of the St. Lawrence have something to do with it at this season of the year.

In hauling in the line, 200 fathoms was all that could be obtained of the 2,710 fathoms which had been used in sounding. The *block was weighed*, before and after trying the current, and a difference of 20 pounds was the result. The block is about 14 inches square, loaded with lead.

This day ends with a hazy atmosphere, and heavy dew; sounded frequently during the day, with 500 fathoms; no bottom. Searching for Daraith's and Watson's Rocks; not the least appearance of rocks, except parts of trees, old planks, &c., passing.

June 11. Lat. 41° N.; long. 54° 12′ W. Commences light air and heavy dew. Sea very rough in "ripples," indicating a strong current. Temperature of water changing every hour, according as we stand in or out of the cold streak of water we have been in for the last day. Sounding with 500 fathoms, *no bottom.* It seems quite impossible for rocks to be in this vicinity. Near the position assigned them, I find 2,700 fathoms water. Vessels are passing constantly, going east, and no doubt these rocks would have been seen fifty times over, if they existed.

June 12. We are experiencing an easterly current, and in a streak of cold, which still appears very narrow.

June 12. Lat. 40° 36′ N.; long. 53° 52′ W. Passed several pieces of wood, and other articles of roots and limbs of trees, apparently a long time in the water.

June 14. Lat. 41° 43′ N.; long. 51° 51′ W. Weather wet and cloudy; two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	14	1200	2	56	2200	3	38
200	1	29	1300	3	00	2300	3	45
300	1	42	1400	3	05	2400	3	50
400	1	53	1500	3	10	2500	4	40
500	2	01	1600	3	14	2600	4	03
600	2	11	1700	3	27	2700	4	43
700	2	18	1800	3	24	2800	4	50
800	2	35	1900	3	43	2900	4	15
900	2	39	2000	3	43	3000	4	17
1000	2	42	2100	3	41	3130 (bot.)		
1100	2	48						

* Between the 24th, 25th, 27th, and 28th hundred fathom marks, checked the line, which accounts for the irregularity in running.

*JOHN G. MITCHELL.

Temperature at surface, 62°; at 300 fathoms, 52½.

At 5 A. M. the water commenced getting colder, and by 7, had fallen to 63°, from 70°—evidently

getting into another cold streak; at 9 o'clock, the water getting warmer, having risen to 68°. Watson and Daraith's Rocks are not in existence; with this examination and the one of last October, I shall be satisfied to report their "non-existence."

Middle part constant rain, with a steady breeze from the eastward; at 1 P. M., sent a boat to sound; sounded for temperature at 300 fathoms 62° at the surface, and 52½° at 300 fathoms; at 2 hours 45 min. the boat returned and reported bottom with 3,130 fathoms, small line and two 32 lb. shot. This is an increase of upwards of 400 fathoms since our last cast farther to the east, in October last; we had bottom at 4,580 fathoms.

Our temperatures show that we are in *that* cold streak yet.

June 15. Lat. 40° 2′ N.; long. 49° W. Occasionally a sprig of gulf-weed is seen, and also small pieces of board. We are now approaching the location of the celebrated Hervegault's Breakers; I sounded on their position last year, and found 4,580 fathoms of water; but did not look after them long enough *to swear* that they do not exist. With that first, and this second examination, I hope to be able to establish their non-existence. Immediately north of these reported breakers, 'tis said, soundings may be had; (?) "we shall see." Thus far, our streak of cold water has continued nearly east and west for about *three hundred miles;* one or two interruptions by occasionally getting into warmer water by standing too far north or too far south.

The water changing temperature as we advance north towards "Hervegault's Breakers." (?)

June 16. Lat. 41° 8′ N.; long. 49° 9′ 15″ W. The water has been changing very much in temperature. In the morning the temperature was as low as 48°. This is near Hervegault's Breakers, but no indications of any danger; I am certain that a merchant ship, in heavy weather, might imagine breakers hereabouts, for with the ripples produced by currents, &c., it has a wild appearance. We still continue in a cold streak of water; a *regular condenser*. The wind is very light this morning, and some mirage in the eastern horizon.

Passed pieces of drift-wood, with grass and barnacles on it, and small sprigs of weed. Appearances of different currents. Water changed temperature at surface to 61° by midnight, and to 46° at 10 fathoms. Sounded for temperature at 100 and 200 fathoms; at 100 fathoms 47°, and at 200 fathoms 46.°7. Clear and pleasant, approaching the region of cold water, just south of the Grand Banks of Newfoundland.

June 17. Lat. 42° 22′ N.; long. 50° W. Weather fine; two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	56	700	2	08	1300	2	52
200	1	15	800	2	16	1400	3	00
300	1	27	900	2	31	1500	3	04
400	1	33	1000	2	33	1600	3	14
500	1	54	1100	2	35	1700	4	00
600	1	57	1200	2	45	1650 (bot.)		

Temperature of surface 55°, at 200 fathoms 52°, at 500 fathoms 46°; transparency—a 30 lb. lead seen at 7 fathoms; the lead painted white.

June 17. Middle part foggy at intervals; fog banks rising from the eastward, and pass over very thick. Being in a "condenser," I am not surprised; the wind from the southward always brings thick and foggy weather over these cold patches of water. At 2h. 40m. the water changed color from blue to green. Temperature falling gradually. Fog banks about the horizon to the eastward; at 4, the temperature at the surface was 51°, at 200 fathoms 45°.5, and at 500 fathoms 36°.5. Towards sunset the whole sea filled with whales and porpoises sporting.

At 8 P. M. sounded, found bottom at 175 fathoms. Sand with black specks. This I suppose to be the very south end of the Grand Banks. Temperature at surface, 51°; at 175 fathoms, 36°.

There seems little or no current in this cold region.

Having passed through the cold region alluded to in my instructions, I am satisfied no soundings can be obtained unless by the small line. The sea is 1,700 fathoms deep, just 17 miles south of this point.

June 19. Lat. 41° 06′ N; long. 48° 39′ W. Commence with a thick fog. At 7 hours 30min. tacked to the westward for "Hervegault." No signs yet of "dangers" hereabouts; nothing but a drifting wreck or tree, I am sure, for this seems to be their rendezvous.

Middle part thick fog. Temperature at surface, 59°; at 200 fathoms, 58°; at 500 fathoms, 53°.

June 20. Lat. 41° 54′ N; long. 47° 31′ W. Cloudy with rain. At 4 A. M. temperature at surface 64°; at 100 fathoms, 66°; at 300 fathoms, 65°. Ends pleasant; wind west. At 9 hours 30 min. temperature at surface, 69°; at 100 fathoms, 65°; at 300 fathoms, 66°. I attribute this difference to some accident to the lower cylinder, when the upper one was taken off.

June 21. Lat. 41° 8′ N.; long. 43° 38′ 30″ W. Weather pleasant, cross and rough sea. Two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
75	0	48	700	2	28	1400	3	16
100	0	31	800	2	34	1500	3	35
200	1	28	900	2	44	1600	3	33
300	1	41	1000	2	51	1700	3	38
400	1	51	1100	3	07	1800	3	42
500	2	01	1200	3	09	1900	3	50
600	2	14	1300	3	16	1975 (bot.)		

Temperature at surface, 69°; at 100 fathoms, 65°; at 300 fathoms, 63°.

Commences fine breezes; heavy sea from N. W. Sounded for temperature; surface, 69°; 100 fathoms, 67°; 300 fathoms, 66°. At 1 P. M. sounded; bottom at 1,975 fathoms. It was on this spot H. B. M. surveying ship Thunder failed in finding bottom with 3,700 fathoms line in 1848. This sound to-day, was very good; no doubt as to having reached the bottom. I shall steer now for Breton Rock. Ends pleasant. At 10 P. M. sounded for temperature; surface, 67°; at 100 fathoms, 64°.5; at 300 fathoms, 65°.

Owing to the heavy sea on, no satisfactory results can be obtained this time. The rolling motion causing the cylinders to lose the water, and receive it at different depths, as the line is hauled in.

June 22. Lat. 39° 48′ N.; long. 41° 16′ W. Fresh winds from S. S. W.; slightly hazy. Standing S. S. E. for Breton Rock. Sea too high for sounding at meridian; find ourselves east of the position of Breton Rock. Entirely too much sea to lower a boat for sounding.

June 23. Lat. 39° 15′ N.; long. 41° 18′ W. Employed looking for Breton Rock. Sky almost entirely overcast. Latter part; no appearances of soundings or rocks; sea too heavy to sound. Temperature at surface, 69°; depth 10 fathoms, 66°.

June 24. Lat. 30° 36′ N.; long. 41° 06′ W. Dirty-looking weather. Two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	58	1000	2	38	1900	3	46
200	1	17	1100	2	50	2000	3	32
300	1	35	1200	3	00	2100	3	45
400	1	42	1300	3	02	2200	3	57
500	1	53	1400	3	03	2300	4	07
600	2	03	1500	3	12	2400	4	01
700	2	14	1600	2	53	2500	3	48
800	2	25	1700	3	30	2600	4	52
900	2	25	1800	3	42	2675 (bot.)	4	20

Temperature air, 69°; surface, 67°; depth 10 fathoms, 66°.5. Sea very heavy; found bottom with 2,675 fathoms; line out; line ranging a little ahead, being scarcely able to keep head to sea, with all the oars out. (I think the line must have reached the bottom at 2,500 fathoms, as it ran very slowly between the 25th and 26th hundred marks.

J. G. MITCHELL.)

Drift-wood with barnacles about this place; some small sprigs of gulf-weed.

June 25. Lat. 41° 3′ N.; long. 41° 56′ W. Weather threatening and barometer falling; awaiting the return of good weather to examine the location given to Druid Rock; ends rainy; hove to, near the position of Druid Rock. Temperature air, 62°; surface, 66°; depth, 10 fathoms, 66°.5.

June 26. Lat. 40° 39′ N.; long. 42° 20′ W. Middle part pleasant; too much swell for sounding; made sail and commenced examination for Druid Rock; small sprigs of gulf-weed passing; at 5.30 sounded with 500 fathoms line; no bottom. Temperature air, 63°; surface, 65°.5; at 200 fathoms, 62°; at 500 fathoms, 61°.

June 27. Lat. 41° 12′ N.; long. 41° 58′ W. Weather squally until 1 A. M.; sounding with deep-sea line; 500 fathoms out, no bottom. Temperature at surface, 66°; at 200 fathoms, 64°; at 500 fathoms, 64°; at 8, sounded with 500 fathoms, no bottom; ends fresh winds and squally, a very high sea on.

June 28. Lat. 41° 28′ N.; long. 41° 35′ W. Fresh winds and a heavy swell; sounded with 500

fathoms line, no bottom; no appearance of rocks or soundings; abandon farther search for Druid Rock; satisfied it does not exist; the sea appears to be more uniform in its temperature here, as may be seen by our log; middle part pleasant; no indications of soundings in any direction. Temperature air, 66°; surface, 66°; depth (10 fathoms) 65°.

June 29. Lat. 42° 10′ N.; long. 42° 04′ W. Weather pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
600	9 50	1400	12 05	1950 (bot.)	6 30
800	4 30	1600	6 35		
1000	5 35	1800	6 55		

Temperature: surface, 63°; at 200 fathoms, 62°; at 500 fathoms, 57°. Middle part—temperature at 200 fathoms, 66°.5; at 500 fathoms, 64°.5. The temperature at 500 fathoms may be inaccurate, owing to the swell, which has been very considerable for several days. The water seems slightly discolored; many birds about—tern and petrel. At 8h. 30m. P. M., sounded for temperature at 500 fathoms; no bottom; temperature at surface, 63°; 500 fathoms, 60°. Found bottom with 1,950 fathoms; after hauling in 100 fathoms the line was up and down, and on hauling in more it parted, making the depth of water 1,850 fathoms.

July 2, 1853. Lat. 46° 53′ N.; long. 37° 46′ W. Weather pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 05	800	2 43	1500	3 22
200	1 25	900	2 33	1600	3 33
300	1 35	1000	2 49	1700	3 17
400	1 47	1100	2 55	1800	3 33
500	1 58	1200	3 00	1900	3 42
600	2 13	1300	3 05	2000	3 55
700	2 26	1400	3 13		

Winds fresh; at daylight water discolored. This seems to be the case quite often, as we get to the northward. A heavy swell from northward; middle part more pleasant; sent a boat to sound, although a very rough sea; small line and two round shot; found bottom with 2,030 fathoms line out; on pulling over the line, with all the oars, one man was able to haul in only 30 fathoms of line, leaving the true depth 2,000 fathoms, line up and down. Temperature at the surface, 58°.5; at 100 fathoms, 58°; at 300 fathoms, 56°.5.

July 3. Lat. 48° 16′ N.; long. 35° 22′ 30″ W. Weather overcast; wind fresh; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
70	0 48	870	2 35	1670	3 39
170	1 17	970	2 45	1770	3 40
270	1 30	1070	2 50	1870	3 49
370	1 43	1170	2 55	1970	3 49
470	1 56	1270	3 00	2070	4 01
570	2 01	1370	3 08	2160	3 57
670	2 10	1470	3 18	(2100 bot.)	
770	2 20	1570	3 29		

Temperature at surface, 56°; at 200 fathoms, 52°; at 500 fathoms, 47°.5.

July 4. Lat. 49° 51′ N.; long. 31° 34° W. Weather cloudy, with rain; fine breeze; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	0 55	800	2 24	1500	3 05
200	1 15	900	2 24	1600	3 10
300	1 30	1000	2 35	1700	3 22
400	1 40	1100	2 45	1800	3 22
500	1 50	1200	2 45	1900	4 06
600	2 00	1300	2 55	(1920 bot.)	
700	2 12	1400	3 05		

Temperature at surface, 54°; at 200 fathoms, 53°; at 500 fathoms, 48°; of air, 56°.

July 5. Lat. 51° 40′ N.; long. 28° 33′ W. Squally, with rain; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
800	14 25	1400	6 10	(1750 bot.)	
1000	5 25	1600	6 30		
1200	5 45	1760	5 15		

At 9 A. M. temperature at 200 fathoms, 53°; at 500 fathoms, 48°. Water changed temperature at daylight, 4° colder; by 6 A. M. it had risen to its former temperature of 54°; looked discolored. No bottom at 500 fathoms. At 5 P. M. water appears discolored. Temperature at surface, 54°; at 200 fathoms, 53°; at 500 fathoms, 51°; air, 55°.

July 6. Lat. 53° 28′ N.; long. 25° 01′ W. Weather variable; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
200	2 35	1200	5 25	1920	4 44
400	3 05	1400	5 46	(1900 bot.)	
800	8 31	1600	6 12		
1000	5 04	1800	6 58		

Temperature at surface, 52°.5; at 200 fathoms, 51°; at 500 fathoms, 49°. Every appearance of soundings by color of water. The ocean in this region appears generally as in the vicinity of some coast.

July 7. Lat. 54° 17′ N.; long. 22° 33′ W. Variable weather; Brooke's Sounding Apparatus.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
200	2 40	1200	7 58	2200	12 45
400	4 25	1400	8 27	2400	14 40
600	5 51	1600	9 10	2600	19 15
800	6 44	1800	9 25	2800	14 50
1000	7 30	2000	10 05	(2000 bot. probably?)	

Fine chalky clay. Temperature at surface, 55°.5; at 200 fathoms, 53°; at 500 fathoms, 50°; air, 64°.

July 12. Lat. 54° 26′ N.; long. 12° 10′ W. Fresh breeze and pleasant. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
300	3 30	900	4 54	1500	6 28
500	3 35	1100	5 20	1630	5 32
700	4 15	1300	6 01	(1625 bot.)	

Temperature at surface, 56°.5; at 200 fathoms, 52°.5; 500 fathoms, 50°.; of air, 60°.5.

July 14. Lat. 50° 54′ N; long. 17° 02′ W. Fresh breeze and cloudy; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
275	2 45	1475	6 10	2475	8 25
475	3 10	1675	6 51	2675	8 40
875	8 50	1875	7 29	2700	1 10
1075	5 20	2075	7 48	(2675 bot.)	
1275	5 50	2275	7 52		

Temperature at surface, 56°.5; at 200 fathoms, 55°.5; at 500 fathoms, 52°; of air, 57°.

July 16. Latitude 46° 43′; longitude 21° 45′ W. Variable weather; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 05	1000	2 45	1800	3 25
200	1 20	1100	2 45	1900	3 30
300	1 35	1200	2 45	2000	3 36
400	1 50	1300	2 55	2100	3 47
500	2 05	1400	3 05	2200	3 47
600	2 10	1500	3 10	2300	3 55
700	2 15	1600	3 15	2400	3 55
800	2 25	1700	3 20	(2460 bot.)	
900	2 35				

Temperature at surface, 60°.5; at 500 fathoms, 54°; of air, 60°.5.

July 17. Lat. 44° 42′ N.; long. 24° 35′ W. Weather pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
125	1 23	925	5 05	1515	6 05
325	2 30	1125	5 25	(1500 bot.)	
725	8 57	1325	5 45		

Temperature at surface, 63°.5; at 200 fathoms, 57°.5; at 500 fathoms, 55°; of air, 63°.

July 18. Lat. 44° 43′ N.; long. 24° 35′ W. Weather pleasant. Shot, 50 lbs.; with Brooke's apparatus.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
200	2 15	800	5 35	1360	6 45
400	3 30	1000	6 10	(1370 bot.)	
600	4 40	1200	7 05		

Bottom, whitish clay. Temperature at surface, 63°; at 1,000 fathoms, 60°; of air, 63°.

July 19. Lat. 43° 47′ N.; long. 25° 24′ W. Weather variable. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
200	2 35	1000	5 35	1760	7 05
600	7 55	1200	6 15	1850 (bot.)	5 15
800	4 55	1560	9 25		

Temperature at surface, 64°.5; at 200 fathoms, 60°.5; at 500 fathoms, 60°; of air, 67°.

July 20. Lat. 45° 07′ N.; long. 26° 08′ W.; thick weather. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 00	700	2 16	1300	3 05
200	1 20	800	2 26	1400	3 15
300	1 35	900	2 36	1500	3 25
400	1 45	1000	2 46	1520	0 50
500	1 55	1100	2 54	(1500 bot.)	
600	2 05	1200	2 47		

Temperature at surface, 64°; at 200 fathoms, 61°; at 500 fathoms, 59°; of air, 66°.

July 21. Lat. 46° 26′ N.; long. 26° 55′ W. Fresh breeze, cloudy. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 00	600	2 10	1100	2 55
200	1 20	700	2 20	1200	3 05
300	1 35	800	2 30	1300	3 15
400	1 45	900	2 50	1400	3 25
500	2 00	1000	2 45	1420 (bot.)	1 12

July 22. Lat. 45° 14′ N.; long. 27° 41′ W. Variable weather. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
65	0 37	565	2 10	1065	2 55
165	1 13	665	2 20	1165	3 05
265	1 30	765	2 40	1265	3 15
365	1 45	865	2 40	1345	2 55
465	1 55	965	2 45	(1320 bot.)	

Temperature at surface, 64°; 200 fathoms, 57°; 500 fathoms, 54°; air, 69°.

July 24. Lat. 42° 44′ N.; long. 28° 20′ W. Weather pleasant. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 06	600	2 10	1100	3 00
200	1 26	700	2 25	1200	3 10
300	1 40	800	2 30	1250	1 43
400	1 50	900	2 40	(1210 bot.)	
500	2 00	1000	2 50		

Temperature at surface, 67°; at 200 fathoms, 64°; at 500 fathoms, 64°; air 69°.

July 25. Lat. 42° 49′ N.; long. 29° W. Weather cloudy. 50 lb. lead, and Brooke's apparatus.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 00	500	4 30	1080 (bot.)	16 20
300	3 10	700	6 00		

Temperature at surface, 66°; at 200 fathoms, 63°; at 500 fathoms, 63°; of air, 73°.

July 26. Lat. 40° 48′ N.; long. 30° 02′ W. Weather pleasant. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
50	0 25	450	1 56	850	2 26
150	1 15	550	2 06	860	0 24
250	1 32	650	2 16	(830 bot.)	
350	1 44	750	2 16		

Aug. 10, 1853. Lat. 38° 54′ N.; long. 33° 30′ W. Weather pleasant. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 00	700	2 19	1300	3 10
200	1 21	800	2 21	1400	3 25
300	1 39	900	2 38	1500	3 20
400	1 48	1000	2 37	1520	0 40
500	1 55	1100	2 48	(1500 bot.)	
600	2 07	1200	2 57		

Temperature at surface, 73°; at 200 fathoms, 68°.8; at 500 fathoms, 65°.

No good observations for transparency; saw 20 lb. lead at 5 fathoms. At midnight, several meteors shooting from N. E. to S. W. and from N. to S. nearly calm.

Aug. 11. Lat. 39° 18′ 33″ N.; long. 33° 32′ W. Weather light, variable, sea deep-blue. No soundings.

Aug. 12. Lat. 40° 35′ N.; long. 31° 56′ W. Weather pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 00	700	2 12	1100	2 38
200	1 20	800	2 22	1200	2 50
300	1 33	900	2 25	1240	1 20
500	3 40	1000	2 38	(1230 bot.)	
600	2 02				

Temperature at surface, 71°.5; at 200 fathoms, 65°; at 500 fathoms, 59°.

No appearances of Gough and Birch Rocks—satisfied they do not exist in the position given them, 830 fathoms water on the spot. At 2 P. M. run out 1,000 fathoms, with two cylinders attached, no bottom; in hauling in, line parted at 550 fathoms from lead losing both cylinders; upon examination, end of line appeared to have been cut with a knife. Middle part clear and pleasant, winds northward and westward; smooth sea.

Aug. 13. Lat. 42° 40′ N.; long. 31° 11′ W. Weather pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
50	0 22	750	1 58	1450	2 50
150	1 06	850	2 8	1550	3
250	1 18	950	2 18	1650	3 10
350	1 28	1050	2 28	1750	1 35
450	1 38	1150	2 38	1680 (bot.)	
550	1 48	1250	2 48		
650	1 58	1350	2 49		

Temperature at surface, 68°; at 200 fathoms, 64°; at 500 fathoms, 62°; with a swell from the westward.

Aug. 14. Lat. 44° 52′ 30″ N.; long. 30° 38′ 30″ W. Weather overcast; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1	700	2 8	1300	3
200	1 12	800	2 20	1400	3 20
300	1 25	900	2 34	1500	3 19
400	1 37	1000	2 48	1580	2 54
500	1 50	1100	2 48	(1560 bot.)	
600	2 6	1200	2 58		

Temperature at surface, 66°; at 200 fathoms, 62°; at 500 fathoms, 57°.

Aug. 15. Lat. 46° 15′ N.; long. 30° 04′ W. Weather pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1		800	2	20	1500	3	
200	1	20	900	2	30	1600	3	10
300	1	35	1000	2	30	1700	3	30
400	1	35	1100	2	30	1800	4	10
500	1	50	1200	2	45	1810		40
600	2		1300	2	55	(1760 bot.)		
700	2	10	1400	3				

Temperature at surface, 65°; at 200 fathoms, 62°; at 500 fathoms, 56°.

Standing for the Three Chimneys; at noon 30 miles N. W. of Muriner's Rock, or rather its position; shall take it into consideration after looking for the Chimneys. Sea dark blue; no appearance of soundings; standing N. E. ½ N. for the Three Chimneys.

Aug. 16. Lat. 47° 58′ N.; long. 29° 35′ W. Overcast, with indications of bad weather; two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
90		55	790	2	23	1490	3	14
190	1	17	890	2	23	1590	3	18
290	1	28	990	2	32	1690	3	29
390	1	39	1090	2	44	1790	3	20
490	1	50	1190	2	51	1890	3	40
590	2	1	1290	3	3	1935	2	35
690	2	12	1390	3	6	(1900 bot.)		

Temperature at surface, 59°.5; at 200 fathoms, 53°; at 500 fathoms, 51°.

Aug. 16. Wind increasing from S. W.; hopes of reaching the Three Chimneys to-day; at 3 hours 30 min. sent a boat to sound; latter part blowing hard, with lightning to the southward and eastward.

Aug. 17. Lat. 48° N.; long. 29° 25′ W. Weather stormy; hove to; no soundings. At 4 A. M. the wind shifted to the northward and westward, and blew hard. At 5 A. M. it blew a perfect hurricane. Bar. down to 28.94; sea rising fast; so misty to windward from the salt spray that it was impossible to see anything; the brig under a reefed fore spencer, laying down with her hammock rail under. At 5h. 30m. lee waist-boat filled, split open, and went adrift; everything battened down tight. This state of things continued until 8 A. M. when we were able to set fore storm staysail, and balanced reefed mainsail; here the gale began to moderate; berth-decks, mess-bags, and hammocks all wet from the water coming in

between ceiling and deck; Bar. 28.97; latter part, passing squalls of wind and rain; sea heavy; the storm was evidently a *rotary*, for the wind had been from the southward for several days, and after blowing a hard gale from S. E. the wind suddenly shifted to N. W. and was heavier than I have ever known before; during the first part of the day saw other vessels under nothing but a reefed spanker.

Aug. 18. Lat. 46° 56′ 03″ N.; long. 29° 14′ W. At 2 P. M. finding the wind steady at N. W. and the chance of a proper examination rather broken up, bore away to the eastward, having had a cast of 1,900 fathoms on the spot assigned the Chimneys; do not believe they exist.

Aug. 19. Lat. 48° 37′ N.; long. 25° 22′ 30″ W. Weather squally, wind N. and W.; no soundings.

Aug. 20. Lat. 49° 40′ N.; long. 21° 06′ 30″. No soundings; weather improving; squalls of wind and rain at intervals; wind northward and westward.

Aug. 21. Lat. 49° 59′ N.; long. 17° 35′ 15″ W. The weather better than a week past. Observing the water to be green, and filled with animalculæ, sent a boat to sound at 10 A. M. Two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
20	0	08	1020	2	40	2020	3	50
120	1	02	1120	2	48	2120	4	06
220	1	20	1220	2	50	2220	4	06
320	1	35	1320	3	08	2320	3	50
420	1	47	1420	3	10	2420	4	18
520	1	59	1520	3	20	2520	4	19
620	2	08	1620	3	20	2620	4	27
720	2	13	1720	3	30	2720	4	50
820	2	24	1820	3	40	2760	2	00
920	2	32	1920	3	40	(2700 bot.)		

Middle part, water still green. We have now passed around the west and north side of the submarine elevation joining the Azores on the north. To-day we reached mid-channel of the polar current on this side (east), found 2,700 fathoms. No opportunities have occurred for experimenting on surface and under-currents. At midnight, temperature at surface, 59°; at 200 fathoms, 56°; at 500 fathoms, 54°.

Temperature at surface, 58°; at 200 fathoms, 54°; at 500 fathoms, 52.

Aug. 22. Lat. 49° 57′ N.; long. 13° 16′ W.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
400	6	45	1000	7	15	1400	9	00
600	5	20	1200	8	10	1580 (bot.)	9	10
800	6	20						

Weather pleasant. Brooke's patent sounding apparatus. The water blue, and very full of small

medusæ. At 3, sent a boat to sound with Brooke's patent sounding apparatus; bottom at 1,570 fathoms, yellowish, sticky clay. At 9 P. M. discovered a comet in the west about 15° high, tail upwards, about 3° long. Weather pleasant; wind northward and westward; finished line of deep-sea soundings to the shore of the bank west of the Land's End, England.

Temperature at surface, 58°.5; at 500 fathoms, 55°; at 200 fathoms, no water in cylinder.

Aug. 23. Lat. 49° 50′ N.; long. 10° 29′ W. Weather beautiful; no soundings; wind northward and westward; the water quite green; looking like soundings on the edge of the bank west of the Land's End of England. At noon, the latitude and longitude gave us a position on the English chart on soundings of 73 fathoms. At 12 hours 30 min. P. M. got bottom at that depth, showing the chronometers to be correct, as they were at Horta, the mean of the three giving the longitude of the landing within a second or two, as ascertained by Captain Vidal, of the English Navy, in his survey of the Azores. The lead brought up coarse and fine sand, with a few parts of light, broken shells. The comet visible, as last night, to the northward and westward.

Aug. 24. No observation or sounding. Weather rainy; got a pilot and stood up the channel.

Sept. 17, 1853. Lat. 47° 43′ 21″ N.; long. 8° 57′ 30″. After having spent upwards of a fortnight at South Hampton, the Dolphin sailed on the morning of the 13th, and is now at sea in deep water; delays arising from purser's accounts, and from waiting for sounding-twine expected by the steamer Humboldt from New York. It being favorable, dispatched a boat for a deep-sea cast, and to try undercurrent. The water full of medusæ about the size of a pea; specimens preserved. At 12 hours 30 min. P. M. the boat returned. Current setting at surface N. E. by E. 0.2; at 150 fathoms, S. S. W. 0.2. It was thought that bottom was found at 1,800 fathoms with the new sinker, but, on hauling in the line, the shot was found not detached; perhaps the bottom was very soft, being near the edge of soundings on the northwest entrance of the Bay of Biscay, where there may be a deposit from the rivers of France too soft to allow the shot to be detached, whilst an undercurrent perhaps kept the line taught.

Sept. 18. Lat. 47° 38′ N.; long. 9° 8′ W. Light airs; calm and pleasant weather.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1		900	5	58	1700	8	18
300	3		1100	6	35	1900	10	3
500	4	18	1300	7	15	2000	11	34
700	5	14	1500	7	45	(1800 bot.)		

50 lb. shot, and Brooke's sounding apparatus; also used Stellwagen's lead, with which last found bottom at 1,800 fathoms; drab-colored mud mixed with fine sand; water very full of all kinds of medusæ; good experiments for transparency, a white lead seen at nine fathoms. In the first attempt for deep soundings, the shot did not become detached, one side of the wire only unhooked; no appearances of bottom

in the cylinder, though I am sure the sinker reached bottom. The second attempt was made at 5 hours 30 min. P. M., with a 30 lb. Stellwagen's lead; got bottom at 1,800 fathoms; a large quantity of soft mud and fine grit, all drab color. Suppose the first sinker did not come off owing to an undercurrent keeping the line taught, as appeared to be the case by the lead having the soundings on one side of the cup, showing that it landed sideways or inclined.

Temperature at surface, 59°; at 200 fathoms, 59°; at 500 fathoms, 53°.

Sept. 19. Lat. 47° 18′ 8″ N.; long. 10° 4′ 45″ W. Weather misty. At 5 P. M. lowered a boat, and tried for undercurrent and temperature at 1,000, 500, and 200 fathoms: used three cylinders, with one of Tagliabue's self-registering thermometers to each. The two nearest the surface were found crushed, and the lower one differed from the water in the cylinder 4°, the water at 1,000 fathoms being 49° by cylinder, and 53° by self-registering thermometer. Temperature at surface, 60°; at 200 fathoms, 56°; at 500 fathoms, 53°. Tried the strength of largest-sized line three times, and found it sustained a weight of 302 lbs.

Sept. 20. Lat. 47° 2′ 50″ N.; long. 11° 30′ W. Weather pleasant. Middle part standing for the position assigned Devil's Rock. No person I conversed with in England believed it to exist, and Captain Caldbeck informed me that he once run for it, and found a huge tree near the position; he at first was certain he had found the Devil's Rock, but had the good sense to make a proper examination with the above result. No soundings to-day. Our armorer was enabled to improve Mr. Brooke's sounding apparatus by the addition of a small Stellwagen cup; this is the result of a failure to bring up soundings the last cast with it. This cup is the same diameter of the bolt, enabling it to pass through the hole in the sinker.

Sept. 21. Lat. 46° 32′ N.; long. 12° 49′ W. Weather pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1		900	2	33	1700	3	25
200	1	17	1000	2	50	1800	4	
300	1	36	1100	2	50	1900	3	50
400	1	47	1200	3		2000	3	55
500	2		1300	3	10	2100	3	35
600	2	5	1400	3	5	2200	4	20
700	2	13	1500	3	15	2210	1	7
800	2	22	1600	3	15	(2200 bot.)		

The variation of compass greater than that marked in variation chart. Azimuth at 8 A. M. gives 29° 30′ W.; chart, 27° W.

Sent a boat to sound at 1 P. M.; small line, and one of our new 47 lb. sinkers with Brooke's fixtures;

line got foul of line for temperature, and parted, losing shot, &c. Sounded afterwards with two 32 lb. shot; found bottom at 2,200 fathoms.

Temperature at surface, 60°; at 200 fathoms, 55°; at 500 fathoms, 55°.

Sept. 22. Lat. 46° 44′ 24″ N.; long. 13° 49′ 15″ W. Weather overcast; no soundings.

Sept. 23. Lat 44° 05′ N.; long. 13° 29′ W. Weather pleasant. At 3h. 25m. P. M. sent a boat to sound. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	0 40	1000	2 30	1900	3 30
200	1 10	1100	2 30	2000	3 45
300	1 20	1200	2 40	2100	3 55
400	1 35	1300	2 35	2200	3 50
500	1 45	1400	3 00	2300	4 00
600	1 55	1500	3 10	2400	4 10
700	1 55	1600	3 20	2500	4 20
800	2 10	1700	3 20	2580	4 15
900	2 20	1800	3 30	(2560 bot.)	

A good prospect of running a line of soundings, S. W. (true), and the winds being westerly, determined to abandon the westerly exploration for rocks and vigias, the season being already too far advanced for much success in high latitudes, southwesterly gales being prevalent at this season. Temperature at surface, 64°; at 100 fathoms, 62°; at 300 fathoms, 58°.

Sept. 24. Lat. 42° 07′ N.; long. 15° 29′ W. Weather moderate. At 3 hours 40 min. P. M. sent a boat to sound. Got bottom at 2,540 fathoms. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 2	1000	2 48	1900	3 40
200	1 18	1100	2 52	2000	3 50
300	1 30	1200	2 58	2100	4
400	1 42	1300	3	2200	4
500	1 58	1400	3 5	2300	4
600	2 8	1500	3 15	2400	4 15
700	2 8	1600	3 15	2500	4 25
800	2 28	1700	3 30	2540 (bot.)	2 15
900	2 38	1800	3 30		

Temperature at surface, 65° 5′; at 200 fathoms, 60°; at 500 fathoms, 57° 5′.

Sept. 25. Lat 40° 20′ N.; long. 17° 48′ W. Weather pleasant. At 1 hour 35 min. P. M. sent a boat to sound. Two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
50	0	28	1050	2	54	2050	4	15
150	1	12	1150	3	6	2150	4	25
250	1	27	1250	3	18	2250	4	40
350	1	39	1350	3	20	2350	4	50
450	1	51	1450	3	23	2450	4	50
550	2	3	1550	3	40	2550	4	35
650	2	13	1650	3	40	2650	4	55
750	2	24	1750	3	45	2670	1	35
850	2	35	1850	4		2650 (bot.)		
950	2	42	1950	4	15			

Temperature at surface, 69°; at 200 fathoms, 65°; at 500 fathoms, 59°.

Sept. 26. Lat. 39° 14′ N.; long. 19° 1′ W. Weather overcast; 56 lb. leaden shot, with Brooke's apparatus attached.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	45	1100	6	10	2100	8	
300	2	45	1300	6	40	2300	8	35
500	3	55	1500	7	15	2500	9	25
700	4	45	1700	7	40	2700	9	20
900	5	35	1900	7	45	2820 (bot.)	5	55

The line parted at 1,500 fathoms, in attempting to haul it in; brought up part of the leg of a huge brown medusa; found surface current 0.2, N. W. by W.; at 50 fathoms 0.2, N. by. E.; at 100 fathoms 0.2, N. ½ E.; at 150 fathoms N.; at 200 fathoms 0.2 N. by E., the current represented hereabouts, noticed by so many navigators, we have not experienced.

Water transparent; saw 20 lb. lead at 7 fathoms. Temperature at surface, 70°; at 200 fathoms, 65°; at 500 fathoms, 57°.

Sept. 27. Lat. 38° 39′ N.; long. 19° 29′ 45″ W. Weather overcast; wind light; not far enough from yesterday's position to sound; some slight motion in water, like tide rips, which was attributed to local squalls from the southward, from clouds which passed ahead of us.

Sept. 28. Lat. 37° 14′ 41″ N.; long. 20° 21′ 45″ W. Weather overcast with light rain; being within 25 miles of a deep-sea sound last winter, I pass on until to-morrow. The armorer suggested an improvement to Brooke's sounding apparatus, by having branches from the top of the spindle going

down outside of the sinker, with the ends as low as the lower end of spindle, having a Stellwagen cup on each. He will make one.

Sept. 29. Lat. 34° 23′ N.; long. 20° 57′ W. Weather overcast. At 1 P. M. sent a boat to sound. Two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
55	0	43	855	2	38	1655	3	42
155	1	18	955	2	29	1755	3	45
255	1	26	1055	3	00	1855	4	08
355	1	41	1155	3	00	1955	4	19
455	1	53	1255	3	17	2055	4	19
555	2	04	1355	3	17	2155	4	17
655	2	17	1455	3	22	2165	0	42
755	2	28	1555	3	27			

Passed yesterday over the ground we sounded on for Jean Hammon's Rock; no appearances of shoal water, unless porpoises, turtle, and dolphin indicate it; parted the line three times in sounding.

Temperature at surface, 73°; at 200 fathoms, 65°; at 500 fathoms, 61°.

Sept. 30. Lat. 31° 46′ N.; long. 22° 03′ 30″ W. Weather pleasant. At 1 P. M. sent a boat to sound. 35 lb. Stellwagen lead.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
200	2	35	1200	7	45	2300	10	20
400	4	15	1500	12	25	2500	10	30
600	5	13	1700	8	15	2700	11	15
800	7	22	1900	9	10	2880 (bot.)	12	20
1000	7	15	2100	9	55			

Sun bright; sea blue and clear. In experiments for transparency, saw 20 lb. lead at ten fathoms. The first attempt to sound was with a 50 lb. iron shot, with Brooke's sounding apparatus attached; but the twine being too short, the shot detached itself, and was lost; second attempt found bottom, but lost lead, and about 1,500 fathoms of line.

Temperature at surface, 73°.5; at 200 fathoms, 70°; at 500 fathoms, 65°.5.

Oct. 1, 1853. Lat. 29° 12′ N.; long. 22° 51′ W. Fine trades, and hazy weather. At 1 P. M. sent a boat to sound. 50 lb. iron shot, with Brooke's apparatus; but the line being composed of several remnants, and sufficient care not being taken with the marks, could not tell the depth exactly.

Temperature at surface, 73°; at 200 fathoms, 69°; at 500 fathoms, 64°.

Oct. 2. Lat. 26° 34′ N.; long. 23° 41′ W. Weather pleasant; two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 03	900	2 47	1700	3 50
200	1 17	1000	2 41	1800	3 45
300	1 30	1100	2 52	1900	4 00
400	1 44	1200	3 06	2000	3 55
500	1 56	1300	3 14	2100	4 5
600	2 05	1400	3 30	2150	2 10
700	2 18	1500	3 30		
800	2 27	1600	3 30		

Temperature at surface, 74°; at 200 fathoms, 69°.7; at 500 fathoms, 62.

Have the trades; quite disappointed at not getting bottom yesterday; the large-sized line is nearly all expended. I shall despair of getting other specimens of bottom, unless something can be found at Port Praya, to lay up three parts of small twine into one. I regret this the more as I looked for an occasional verification of other soundings taken with two shot and small line. Think the line parted to-day before the shot reached the bottom.

Oct. 3. Lat. 23° 59′ N.; long. 24° 20′ W. Weather pleasant, trade-winds. At 2 hours 50 min. P. M. sent a boat to sound. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 03	1100	2 35	2100	3 50
200	1 15	1200	2 40	2200	3 36
300	1 29	1300	2 45	2300	3 37
400	1 39	1400	2 50	2400	3 45
500	1 42	1500	2 55	2500	4 05
600	2 00	1600	3 19	2600	4 15
700	2 00	1700	3 29	2700	3 45
800	2 08	1800	3 21	2750	3 00
900	2 20	1900	3 11	2700 (bot.)	
1000	2 30	2000	3 26		

Temperature at surface, 75°; at 200 fathoms, 71°; at 500 fathoms, 65°.

Oct. 4. Lat. 21° 06′ N.; long. 24° 38′ W. Weather rainy, with stray trades; two 32 lb. shot. Sea increasing; saw Black Fish.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
200	2	20	1200	5	55	2200	8	15
400	3	00	1400	6	25	2400	9	00
600	3	50	1600	6	55	2600	9	00
800	4	40	1800	7	45	2640	2	00
1000	5	25	2000	7	55	(2625 bot.)		

Temperature at surface, 76°.5; at 200 fathoms, 71°.7; at 500 fathoms, 67°.5.

Oct. 5. Lat. 18° 14′ N.; long. 24° 51′ W. Weather pleasant. At 1 P. M. sent a boat to sound. 50 lb. iron shot, with Brooke's sounding apparatus attached.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
200	2	10	1000	6	10	1800	8	40
400	3	20	1200	6	35	2000	8	45
600	4	15	1400	7	25	2080 (bot.)	3	40
800	5	05	1600	7	55			

In hauling up, the line parted; our small line seems to have been injured, from dampness, or whitewash getting on it, and will not bear hauling in. This finishes our line of soundings from the English Channel, being now 60 miles north of St. Antonio off the Cape de Verdes. Temperature at surface, 79°; at 200 fathoms, 73°; at 500 fathoms, 62°.

Oct. 6. Filled away and passed to the southward of St. Vincent for Porto Praya, S. E. by S., where I shall fill up with provisions, &c. and then run a line of sounding across the Atlantic.

Oct. 10. Lat. 16° 57′ 58″ N.; long. 27° 02′ 36″ W. We are now 27 days from Southampton, during which time we have sounded away 40,000 fathoms of line, and sailed about 4,000 miles. I visited St. Vincent and Porto Praya, and shall resume our soundings to-day.

Not much current has been experienced among these islands. Perhaps the trade-winds having just set in, it has not started yet. Some writers give a N. E. current, but I doubt if it runs in that direction. At noon to-day our reckoning shows 20′ west since yesterday.

Our temperature of sea-water, at 500 fathoms to-day, does not show the bed of the Great Polar Current, it being 67°—whereas, on the 5th, in lat. 18° 14′, long. 24° 51′ W. it was 62°—we may have crossed it.

Oct. 10. Lat. 17° 02′ N.; long. 27° 08′ W. Weather fine; two 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
110	1	15	1110	5	35	2110	7	52
310	3	00	1310	6	13	2310	8	08
510	3	53	1510	6	47	2510	8	50
710	4	29	1710	7	20	2520 (bot.)		
910	5	07	1910	7	41			

Temperature at sur ace, 80°; at 200 fathoms, 67°; at 500 fathoms, 67°.

Oct. 11. Lat. 18° 44′ N.; long. 29° 18′ W. At 1, temperature at surface, 80°; at 200 fathoms, 78°; at 500 fathoms, 66°. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 03	890	4 50	2090	8 02
200	1 20	1090	5 14	2290	8 13
300	1 35	1290	5 53	2490	8 20
400	1 44	1490	6 25	2590	4 20
500	1 54	1690	6 51	(2520 bot.)	
690	3 54	1890	7 32		

Found our usual current in the last twenty-four hours of 0.8 of a knot west. Our observations for variation agree nearly with the chart. There has been a gradual reduction of the difference of between sixteen and seventeen degrees variation, and I hope to get good azimuths and amplitudes during the time. In a few days I shall sail across the curves of variation by Barlow, and shall notice the difference carefully.

Oct. 12. Lat. 20° 02′ N.; long. 31° 06′ W. During forenoon employed overhauling lines. Find size 21 thread very rotten in spots, so that it is nearly useless. Line last received from New York, 9 thread very good in appearance, shall try it to-day for the first time. Current to-day set us west of our reckoning. At 1, hove to and sent a boat to sound with 9 thd. line—10,000 fathoms on reel—two shot. Sounded for temperature meantime from brig. At 500 fathoms, 63°; 200 fathoms, 64°; surface, 78°. Every prospect of having good soundings every day now, but owing to the want of some large line unable to bring up bottom. Hope to get for next cruise, some made of *three* parts of sounding twine. Boat returned at 3 P. M. reporting bottom at 2,560 fathoms.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
200	2 20	1100	3 30	1900	4 51
300	1 43	1200	3 30	2000	4 57
400	2 04	1300	3 30	2100	4 58
500	2 20	1400	3 59	2200	5 07
600	2 30	1500	4 06	2300	5 11
*700	2 53	1600	4 19	2400	4 59
800	2 58	1700	4 23	2500	5 43
900	3 08	1800	4 27	2600 (bot. 2560.)	6 14
1000	3 20				

I do not understand why the small line really runs slower than a larger size, both having the same sinker.

Oct. 13. Lat. 21° 48′ N.; long. 32° 36′ W. Temperature at 200 fathoms, 64°. Good observations—

* Fouled line.

change in our current since yesterday—having experienced a northwesterly set of 0.6 knot per hour. Our observed variation still exceeds that of Barlow's Chart, by a degree and more.

At 2 hours 30 min. hove to, and sent a boat to sound—small line, 9 thd. After using two shot several times, and losing a great deal of time by its parting, succeeded in getting bottom with *one* shot at 2,720 fathoms.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	10	1100	3	25	2100	4	47
200	1	27	1200	3	38	2200	5	25
300	1	45	1300	4	19	2300	5	2
400	2	7	1400	3	57	2400	5	2
500	2	24	1500	4	1	2500	5	26
600	2	34	1600	4	17	2600	5	29
700	2	51	1700	4	24	2700	5	41
800	3	3	1800	4	30	2735	2	15
900	3	6	1900	5	3	(2720 bot.)		
1000	3	17	2000	4	35			

Oct. 14. Lat. 20° 29′ N.; long. 34° 18′ W. One 50 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	52	1100	2	48	2100	3	56
200	1	1	1200	2	52	2200	3	58
300	1	15	1300	3	7	2300	4	2
400	1	29	1400	3	10	2400	4	16
500	1	43	1500	3	25	2500	4	14
600	1	53	1600	3	28	2600	4	20
700	2	4	1700	3	37	2700	4	19
800	2	18	1800	3	40	2800	4	30
900	2	33	1900	3	50	2870	3	20
1000	2	40	2000	3	50	(2850 bot.)		

Temperature at surface, 78°.5; at 200 fathoms, 73°.5; at 500 fathoms, 67°.5; of air, 78°.

Oct. 15. Lat. 18° 49′ N.; long. 36° 16′ W. 50 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	42	1100	2	25	2100	3	27
200	1		1200	2	30	2200	3	16
300	1	10	1300	2	35	2300	3	22
400	1	28	1400	2	45	2400	3	40
500	1	30	1500	2	43	2500	3	21
600	1	45	1600	2	55	2600	4	12
700	1	55	1700	3		2700	4	12
800	2	2	1800	3	2	2800	4	8
900	2	8	1900	3	5	2820 (bot.)	1	32
1000	2	15	2000	3	25			

Temperature at surface, 79°; at 200 fathoms, 75°; at 500 fathoms, 69°; air, 79°.

Oct. 16. Lat. 17° 9′ N.; long. 38° 4′ W. Temperature at surface, 80°; at 200 fathoms, 77°; at 500 fathoms, 73°.5. At 10, hove to, and sent a boat to sound; a bad sea on. After making four attempts, and losing four or five thousand fathoms of line, obliged to abandon it.

Oct. 17. Lat. 19° 32′ N.; long. 40° 23′ W. Temperature at surface, 79°; at 200 fathoms, 77°; at 500 fathoms, 74°. At 1 hour 15 min. boat returned and reported bottom at 2,580 fathoms. Line parted, on first attempt, with two shot, at 1,800 fathoms, but succeeded in second with one shot (line 21 thread).

Oct. 18. Lat. 21° 16′ N.; long. 42° 9′ W. Used one 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	3	900	3	4	1700	4	20
200	1	24	1000	3	13	1800	4	23
300	1	44	1100	3	25	1900	4	22
400	2		1200	3	37	2000	4	36
500	2	20	1300	3	46	2100	4	47
600	2	32	1400	3	53	2200	4	30
700	2	47	1500	4	2	2300	5	3
800	2	55	1600	3	57	2400	5	

Bottom, 2,370 fathoms.

Temperature of air, 78°; at surface, 79°; at 200 fathoms, 74°.5; at 500, 68°.

Oct. 19. Lat. 23° 6′ N.; long. 44° W.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	0 47	700	2 27	1300	3 36
200	1 13	800	2 40	1400	3 36
300	1 30	900	2 50	1500	4 8
400	1 45	1000	3 2	1600	4 8
500	2 5	1100	3 16	1700	4 8
600	2 13	1200	3 24	1800	5 57

Bottom, 1,760 fathoms.

The sounding to-day seems to indicate our approach to Mr. Maury's submarine mountain, running S. E. from the Capes of Delaware, including Bermuda. Temperature of air, 80°; at surface, 79°; at 200 fathoms, 76°; at 500 fathoms, 72°.

Oct. 20. Lat. 21° 18′ N.; long. 46° 14′ W. Used one 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	0 53	700	2 26	1400	3 27
200	1 17	800	2 47	1500	3 41
300	1 40	900	2 51	1700	7 48
400	2 01	1100	5 24	1800	4 10
500	2 10	1200	3 42	1900	4 16
600	2 23	1300	3 20	(1875 bot.)	

Temperature air, 80°; surface, 80°; at 200 fathoms, 72°; at 500 fathoms, 63°. This depth of 500, with a temperature of 63°, indicates an undercurrent, but it is impossible to experiment. It is in the range of the polar current, which is supposed to underrun the Gulf Stream, near and south of the Grand Banks of Newfoundland.

Oct. 21. Lat. 19° 51′ N.; long. 48° 2′ W. Used one 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
80	0 35	980	3 11	1780	4 17
180	1 22	1080	3 19	1880	4 35
380	3 43	1180	3 30	1980	4 41
480	2 00	1280	3 40	2080	4 47
580	2 20	1380	3 49	2180	4 53
680	2 35	1480	3 56	2275	5 37
780	2 47	1580	4 03	2240 (bot.)	
880	3 00	1680	4 10		

Temperature air, 81°; surface, 81°; at 200 fathoms, 77°.8; at 500 fathoms, 72°. No opportunity for trying the current. The surface current, however, is N. W. by our reckoning.

Oct. 22. Lat. 18° 32′ N.; long. 49° 48′ W.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1		1000	3	3	1900	4	13
200	1	25	1100	3	7	2000	4	37
300	1	45	1200	3	27	2100	4	44
400	2		1300	3	37	2200	4	47
500	2	13	1400	3	37	2300	4	52
600	2	21	1500	3	57	2400	5	15
700	2	32	1600	4	2	2410	1	
800	2	45	1700	4	14	(2370 bot.)		
900	2	55	1800	4	22			

Temperature of air, 82°.5; surface water, 81°; at 200 fathoms, 79°; at 500 fathoms, 64°. I apprehend some accident happened to the lower cylinder yesterday, for the water brought up in it from 500 fathoms was 72°; differing 8° from that of to-day.

Oct. 23. Lat. 21° 26′ N.; long. 51° 31′ W. Used one 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	11	1000	3	24	1900	4	49
200	1	30	1100	3	41	2000	5	2
300	1	51	1200	3	46	2100	5	6
400	2	9	1300	4	6	2200	5	12
500	2	25	1400	4	6	2300	5	26
600	2	41	1500	4	16	2320	1	25
700	2	50	1600	4	28	(2300 bot.)		
800	3	6	1700	4	33			
900	3	15	1800	4	42			

Temperature of air, 81°; surface water, 81°; at 200 fathoms, 75°; at 500 fathoms, 65°.

Oct. 24. Lat. 22° 27′ N.; long. 53° 15′ W. Used one 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
80		50	980	2	58	1880	4	13
180	1	23	1080	3	3	1980	4	17
280	1	45	1180	3	30	2080	4	13
380	2		1280	3	35	2180	4	37
480	2	10	1380	3	38	2280	4	39
580	2	22	1480	3	52	2380	4	48
680	2	38	1580	4		2410	2	20
780	2	50	1680	4	5	(2390 bot.)		
880	2	58	1780	4	6			

Temperature of air, 81°; surface water, 81°; at 200 fathoms, 78°; at 500 fathoms, 71°. At 2h. 45m. boat returned, after an absence of five hours, having been obliged to expend nearly 7,000 fathoms of line before getting bottom. Found bottom at last trial 2,390 fathoms.

Oct. 25. Lat. 21° 45′ N.; long. 55° 46′ W. Used small line and one 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
80		52	1180	3	9	2280	4	26
180	1	19	1280	3	19	2380	4	17
280	1	37	1380	3	27	2480	4	40
380	1	53	1480	3	36	2580	4	42
480	2	4	1580	3	43	2680	4	47
580	2	15	1680	3	47	2780	5	11
680	2	26	1780	3	58	2880	5	35
780	2	37	1880	4	9	2930	3	
880	2	48	1980	4	16	(2920 bot.)		
980	2	55	2080	4	10			
1080	3	2	2180	4	9			

Temperature of air, 83°; surface water, 81°; at 200 fathoms, 79°; at 500 fathoms, 71°.

Since yesterday, our current has been due west.

At 500 fathoms, the temperature, by one of Tagliabue's self-registering thermometers attached to the lower cylinder, was 53°; differing 18° from the cylinder.

Oct. 26. Lat. 20° 51′ N.; long. 58° 26′ W. Used small line, and one 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
80		47	1080	3	05	2080	4	29
180	1	17	1180	3	21	2180	4	33
280	1	31	1280	3	33	2280	4	36
380	1	45	1380	3	36	2380	4	42
480	1	56	1480	3	50	2480	4	57
580	2	07	1580	3	57	2580	5	10
680	2	19	1680	4	04	2680	5	28
780	2	41	1780	4	07	2780	5	55
880	2	48	1880	4	09	2830		
980	2	57	1980	4	25	2800 (bot.)		

Sounded for temperature from the brig; attaching a self-registering thermometer to each cylinder, so as to test the accuracy of the latter (cylinder), there being so great a difference yesterday. Temperature at surface, by thermometer, 81°; at 200 fathoms, 63°; at 500 fathoms, 52°. By cylinder at surface, 82°; at 200

fathoms, 80°; at 500 fathoms, 73°. This great discrepancy shows our cylinders to have been inaccurate. This renders all our previous deep-sea temperatures of little value.

Oct. 27. Lat. 20° 2′ N.; long. 61° 2′ W. Used for deep-sea cast small line, and one 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100		55	1100	3	14	2100	4	13
200	1	21	1200	3	15	2200	4	21
300	1	44	1300	3	27	2300	4	21
400	1	56	1400	3	19	2400	4	25
500	2	17	1500	3	29	2500	4	37
600	2	32	1600	3	36	2600	4	26
700	2	35	1700	4	04	2700	4	38
800	2	46	1800	3	51	2800	4	47
900	2	56	1900	4	05	2820	1	26
1000	3	04	2000	4	04	2810 (bot.)		

Sounded for temperatures with self-registering thermometers; but no results were obtained. The thermometer at 500 fathoms indicated *no difference* from its register. The one at 200 fathoms was 67°; at the surface, 82°.

Nov. 3, 1853. Lat. 21° 19′ N.; long. 66° 27′ W. Used small line and one 32 lb. shot.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
70		40	1170	3	05	2270	4	11
170	1	16	1270	3	13	2370	4	18
270	1	34	1370	3	05	2470	4	20
370	1	47	1470	3	35	2570	4	32
470	1	59	1570	3	27	2670	4	41
570	2	10	1670	3	40	2770	4	34
670	2	16	1770	3	31	2870	4	30
770	2	34	1870	3	37	2970	5	25
870	2	37	1970	3	48	2980	1	05
970	2	49	2070	3	48	(2960 bot.)		
1070	2	55	2170	4	18			

Temperature at surface 83°; at 200 fathoms, 81°; at 500 fathoms, 80°. This last temperature I am sure must be too high; I suspect some defect of the cylinder.

Nov. 4. Lat. 23° 42′ N.; long. 67° 37′ W. Used 15 thd. line (3d size), and two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 6	1200	3 21	2200	4 41
200	1 19	1300	3 20	2300	4 27
300	1 37	1400	3 35	2400	4 37
400	1 50	1500	3 36	2500	4 56
500	2 04	1600	3 53	2600	4 40
600	2 12	1700	3 56	2700	5 10
700	2 25	1800	3 54	2800	4 51
800	2 40	1900	4 07	2900	5 15
900	2 48	2000	4 17	2985	5 04
1000	2 54	2100	4 15	(2940 bot.)	
1100	3 06				

Sounded for temperatures from the brig. Placed a self-registering thermometer on each cylinder. On hauling up, found a great difference between the temperature in the cylinders and that indicated by the thermometers. Surface water, 82°; at 200 fathoms, cylinder, 75°; thermometer, 67°; at 500 fathoms, cylinder, 65°; thermometer, 50°. This is very perplexing.

O. H. BERRYMAN,
Commanding U. S. Brig Dolphin.

Deep-Sea Soundings taken on board U. S. Ship Congress.

"May 25. Lat. 35° 02′ S.; long. 50° 24′ W. One 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	1 12	300	1 46	500	1 25
200	1 26	400	1 38	600	1 40

After running out 600 fathoms, the drift became so great it was deemed unadvisable to expend more time. Bottom was not reached.

May 28. Lat. 31° 04′ S.; long. 44° 19′ W. Two 32 lb. shot.

FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.	FATHOMS.	INTERVALS. min. sec.
100	0 50	900	1 50	1700	2 10
200	1 15	1000	2 10	1800	2 2
300	1 25	1100	2 15	1900	2 16
400	1 30	1200	2 15	2000	2 17
500	1 55	1300	2 15	2100	3 15
600	2 05	1400	2 25	2200	5 50
700	2 30	1500	2 20		
800	1 40	1600	2 20		

At 2,200 fathoms mark, the difference of elapsed time, as well as the sudden increase of the angle

formed by the line, indicated that the shot had reached bottom. The drift was considerable, allowing for which, by as near a calculation as could be made, the depth at this place may be set down at 1,500 fathoms.

June 21, 1853. Lat. 9° 02′ S.; long. 33° 01′ W.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	1	20	800	2	15	1500	3	00
200	1	25	900	2	05	1600	2	45
300	1	25	1000	2	10	1700	2	45
400	1	40	1100	2	30	1800	2	30
500	1	30	1200	2	30	1900	2	45
600	1	50	1300	2	20	2000	2	35
700	2	20	1400	2	40	2100	3	55

The elapsed time, during the running out of the last or 2,100th fathom length, being irregular, and occupying nearly four minutes, and also because the line, which had heretofore retained a plumb direction, now tended off at a considerable angle, it was believed the shot had reached bottom. Allowing 30° for the ultimate trend of the line, will give 1,820 fathoms; which may be considered as the approximate depth here."

To my old shipmate and early friend, Capt. Thos. A. Dornin, commanding U. S. ship Portsmouth, belongs the honor of contributing the first deep-sea sounding from the Pacific Ocean.

August 4, 1853. Lat. 39° 55′ N.; long. 140° 13′ W. There being a perfect calm, an attempt was made to sound from that ship.

After the first 300 fathoms had run out, a breeze sprung up, the ship began to drift, and when 2,500 fathoms had been paid out, the line parted without any satisfactory result.

The next day, Passed Midshipman Wm. M. Gamble, the Acting Master, was sent out in a boat with two 32 lb. shot, and 4,400 fathoms of twine on the reel. The line was waxed, but parted with 1,450 fathoms out.

With the remaining line and shot, a second and less unsuccessful attempt was made in lat. 39° 50′ N.; long. 139° 26′ W.

Lat. 39° 40′ N.; D. R. 39° 50′ N.; long. by Chron. none; D. R. 139° 26′ W.

FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.	FATHOMS.	INTERVALS. min.	sec.
100	0	38	1000	2	30	1900	3	10
200	0	44	1100	2	36	2000	3	22
300	2	28	1200	2	42	2100	3	22
400	1	30	1300	2	47	2200	3	26
500	1	42	1400	2	50	2300	3	22
600	4	00*	1500	2	55	2400	3	30
700	3	48*	1600	2	57	2500	3	59
800	4	32*	1700	3	04	2600	7	21*
900	2	23	1800	3	07	2650	4	40

Temperature air, 70°; water, 68°. Barometer 30.25 in.

There is an irregularity as to the rate of descent from 500 to 800 fathoms, marked *, which is not explained, and which I cannot account for, unless the line was checked, or got foul in the boat. With this exception, the rate of descent conforms to the 32 lb. shot rate of the Dolphin, sufficiently near to suggest the probability that the ocean at that place is not more than 2,500 fathoms (15,000 feet) deep.

SUMMARY STATEMENT OF ALL DEEP-SEA SOUNDINGS, AS FAR AS THE SAME HAVE BEEN RECEIVED AT THIS OFFICE, DECEMBER, 1853.

U. S. Ship Albany.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Dec. 6, 1850	38° 38′ N.	66° 31′ W.	1625*	April 10, 1851	23° 47′ N.	83° 22′ W.	593
" 9, "	33 34	61 38	1950*	" 19, "	23 21	82 44	995
" 11, "	30 05	58 52	1000*	" 21, "	25 19	83 41	52
" 11, "	29 58	58 48	1500*	" 22, "	26 43	84 41	137
" 16, "	21 34	63 24	1600	" 23, "	29 12	86 01	152
" 29, "	17 54	67 28	1200	June 13, "	27 00	85 43	1310
Jan. 4, 1851	18 20	69 49	370	" 14, "	27 55	85 44	376
" 5, "	17 16	71 26	1275	" 14, "	28 27	85 54	220
" 13, "	19 12	76 05	1200	Dec. 2, "	26 25	83 23	1502†
" 16, "	22 29	84 35	420	" 10, "	27 04	79 44	380
" 16, "	22 32	84 32	720	" 11, "	27 16	79 49	274
" 28, "	24 05	82 05	470	" 11, "	27 16	79 49	284
" 29, "	24 37	79 48	500	" 11, "	27 55	79 45	440
Feb. 6, "	19 57	72 11	640	" 11, "	27 51	79 09	647
" 18, "	15 40	77 07	1300	" 11, "	27 34	77 54	631
" 19, "	11 07	79 13	600	" 12, "	27 19	77 18	690
" 28, "	17 54	80 25	895	" 12, "	27 10	76 59	1180
March 3, "	19 20	81 50	660	" 13, "	27 10	75 06	1806
" 4, "	21 25	84 45	990	" 14, "	26 31	74 10	1590
" 5, "	22 05	86 22	445	" 14, "	26 28	73 50	1778
" 16, "	19 30	94 30	530	" 15, "	25 30	72 07	4100
" 16, "	19 37	94 49	967	" 16, "	24 48	70 22	1893
April 3, "	25 56	95 51	490	" 17, "	24 41	69 39	3600†
" 4, "	26 58	92 58	725	" 19, "	22 40	69 00	2762
" 5, "	26 36	88 56	962	Jan. 9, 1852	9 44	81 01	1650
" 6, "	26 43	85 27	795	Feb. 15, "	11 23	79 36	2290
" 7, "	25 23	85 19	693	" 16, "	12 25	78 22	2320
" 8, "	24 39	85 12	916				

* No bottom. † Doubtful.

Deep-Sea Soundings on Board the U. S. Brig Dolphin. Lieutenant S. P. LEE Commanding.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Nov. 24, 1851	25° 30′ N.	37° 44′ W.	1720	Jan. 20, 1852	0° 23′ N.	21° 45′ W.	2000*
" 30, "	23 42	32 39	2180	" 22, "	2 27 S.	23 38	3020
" 30, "	23 41	32 39	2200	" 24, "	5 42	25 40	2970
Dec. 1, "	23 15	32 24	2200	" 25, "	6 59	25 43	3250
" 7, "	18 39	25 24	1970	" 27, "	4 11	24 00	3200
" 7, "	18 19	25 05	1675	" 29, "	3 33	22 38	3575
" 10, "	18 11	23 48	1612	" 31, "	2 26	20 47	3450
" 11, "	17 34	22 50	1370	Feb. 3, "	0 18 N.	18 40	2000*
" 13, "	16 29	20 58	1941	" 5, "	0 45	18 28	2680
" 14, "	16 34	20 47	1875	" 13, "	0 31 S.	17 45	2840
" 15, "	16 59	21 38	1580	" 29, "	5 32	32 43	2490
" 16, "	15 24	21 46	1220	Mar. 13, "	3 51	33 02	2150
" 16, "	15 09	22 28	1380	" 28, "	4 20	34 45	2440*
" 17, "	15 08	22 57	1120	" 31, "	4 24	35 23	2700
" 17, "	15 02	23 12	790	April 9, "	0 57 N.	41 06	2980
Jan. 7, 1852	11 07	21 56	1160	" 12, "	1 06	43 43	2000*
" 7, "	11 07	21 56	1120	May 26, "	7 57	47 51	1970
" 8, "	8 43	20 52	2270	" 31, "	13 28	52 26	1960*
" 9, "	7 17	20 07	2050	" 31, "	12 47	52 57	2780
" 9, "	7 17	20 07	1940	June 2, "	12 20	54 48	2570
" 13, "	4 14	19 20	2670	" 4, "	15 25	55 01	3020
" 14, "	3 42	19 06	2760	" 8, "	19 02	59 33	3300
" 15, "	3 51	19 06	2760	" 12, "	26 32	60 06	3825
" 17, "	3 01	18 36	2725	" 14, "	24 11	61 43	3450
" 18, "	2 36	19 22	2840	" 20, "	24 36	65 12	3560
" 19, "	2 10	19 57	2750	" 28, "	36 04	73 59	1460
" 19, "	2 10	19 57	2690				

* No bottom.

Deep-Sea Soundings on Board the U. S. Brig Dolphin. Lieutenant O. H. BERRYMAN Commanding.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Oct. 4, 1852	39° 39′ N.	70° 30′ W.	1000*
" 6, "	40 50	64 44	2200
" 7, "	41 12	62 38	2200
" 9, "	41 40	59 23	2600
" 10, "	41 40	56 01	2595
" 11, "	40 36	54 18	3450
" 20, "	41 07	49 23	4580
" 24, "	43 40	42 55	2700
" 25, "	44 41	40 16	1800
" 26, "			1500
Dec. 26, "	33 08	16 10	2950*
Jan. 3, 1853	34 18	16 45	2298
" 9, "	36 59	19 58	2500
" 9, "	36 49	19 54	2750
" 29, "	30 49	27 25	1100*
" 29, "	30 49	27 25	2200*
Feb. 3, "	27 05	28 21	1700
" 4, "	27 21	30 48	2580
" 5, "	31 17	33 08	2400
" 6, "	28 55	35 49	1880*
" 8, "	29 14	41 21	2270
" 9, "	31 16	43 28	2080
" 10, "	32 01	44 21	2250
" 11, "	32 29	47 02	1950*
" 12, "	32 55	47 58	6600*
" 13, "	33 03	48 36	3550
" 15, "	32 47	50 00	3250*
" 20, "	29 26	56 42	1480
" 22, "	28 20	59 44	2900
" 23, "	28 04	61 44	3080
" 24, "	28 23	64 17	2518
" 26, "	26 49	66 54	2720
" 28, "	28 14	69 24	2950
June 2, "	37 24	68 52	2920
" 3, "	38 03	67 14	4920*
" 7, "	40 34	58 30	2750
" 10, "	41 07	54 37	2710
" 14, "	41 43	51 31	3130
" 17, "	42 22	50 00	1650
" 21, "	41 09	43 40	1975
" 24, "	39 36	41 06	2675
" 29, "	42 10	42 04	1850
July 2, "	46 53	37 46	2000
" 3, "	48 16	35 22	2100
" 4, "	49 53	31 34	1900
" 5, "	51 40	28 33	1750
" 6, "	53 28	25 01	1900
" 7, "	54 17	22 33	2000
" 9, "	57 18	16 07	620
" 12, "	54 26	12 10	1625
July 14, 1853	50° 54′ N.	17° 02′ W.	2675
" 16, "	46 48	21 42	2465
" 17, "	44 42	24 35	1500
" 18, "	44 43	24 35	1370
" 19, "	43 47	25 24	1850
" 20, "	45 07	26 08	1500
" 21, "	46 26	26 55	1400
" 22, "	45 13	27 38	1320
" 24, "	42 44	28 20	1210
" 25, "	40 49	29 00	1080
" 26, "	40 48	30 02	830
Aug. 10, "	38 54	33 30	1500
" 12, "	40 35	31 56	1230
" 13, "	42 40	31 11	1680
" 14, "	44 52	30 38	1560
" 15, "	46 15	30 04	1760
" 16, "	47 58	29 35	1900
" 21, "	49 59	17 35	2700
" 22, "	49 57	13 16	1580
Sept. 18, "	47 38	9 08	1800
" 21, "	46 32	12 49	2190
" 23, "	44 05	13 29	2560
" 24, "	42 07	15 29	2500
" 25, "	40 20	17 48	2650
" 26, "	39 14	19 01	2820
" 29, "	34 23	20 57	2150
" 30, "	31 46	22 03	2850
Oct. 1, "	29 12	22 50	2800
" 3, "	23 58	24 20	2700
" 4, "	21 06	24 38	2625
" 5, "	18 14	24 51	2080
" 10, "	17 02	28 08	2460
" 11, "	18 44	29 18	2520
" 12, "	20 02	31 06	2560
" 13, "	21 48	32 36	7020
" 14, "	20 29	34 18	2850
" 15, "	18 49	36 16	2820
" 17, "	19 23	40 23	2580
" 18, "	21 16	42 09	2370
" 19, "	23 06	44 00	1760
" 20, "	21 18	46 14	1875
" 21, "	19 51	48 02	2240
" 22, "	18 32	49 48	2370
" 23, "	21 26	51 31	2300
" 24, "	22 27	53 15	2390
" 25, "	21 45	55 46	2900
" 26, "	20 51	58 26	2800
" 27, "	20 02	61 02	2810
Nov. 3, "	21 19	66 27	2960
" 4, "	23 42	67 37	2940

* No bottom.

Deep-Sea Soundings on Board the U. S. Ship Jamestown.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Jan. 3, 1851	36° 43′ N.	74° 10′ W.	1500*	June 13, 1851	38° 50′ N.	43° 49′ W.	1600†
" 4, "	36 33	73 00	1900*	" 18, "	37 50	32 07	2000
" 5, "	37 06	68 02	2000	" 23, "	36 00	27 20	4000*
" 6, "	38 13	62 32	3700	" 24, "	35 06	26 52	2000*
" 7, "	38 50	45 33	2000				

U. S. Ship Plymouth.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Sept. 2, 1851	37° 28′ N.	56° 22′ W.	5000	Sept. 9, 1851	34° 11′ N.	43° 21′ W.	2800

U. S. Ship Portsmouth.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Dec. 31, 1851	21° 19′ N.	38° 10′ W.	4700†	Aug. 5, 1853	39° 40′ N.	139° 26′ W.	2850
Aug. 4, 1853	39 55	140 13	2500*				

Taney.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Nov. 15, 1849	31° 59′ N.	56° 43′ W.	5700*

U. S. Ship Saratoga.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Nov. 28, 1850	28° 21′ S.	29° 31′ W.	3100

U. S. Ship Congress.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
June 12, 1851	28° 46′ S.	43° 46′ W.	2880	April 15, 1851	34° 50′ S.	51° 40′ W.	950
Aug. 7, "	23 59	43 44	90	May 12, "	28 00	45 58	800
April 1, "	35 20	51 30	1000	" 13, "	27 32	47 08	320
" 3, "	35 23	47 27	2550	Sept. 10, "	30 28	45 41	1780
" 9, "	34 37	44 11	2093*				

U. S. Ship John Adams.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
May 3, 1851	33° 50′ N.	52° 34′ W.	2600	May 10, 1851	31° 01′ N.	44° 31′ W.	2300
" 9, "	32 06	44 47	5500†	" 21, "	35 07	25 43	1040

* No bottom. † Uncertain.

U. S. Ship Susquehanna.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
June 18, 1851	33° 35′ N.	38° 32′ W.	1800

U. S. Ship St. Louis.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Oct. 4, 1852	36° 16′ N.	46° 52′ W.	5070*

U. S. Steamer Saranac.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
July 24, 1853	12° 09′ N.	55° 17′ W.	2435				

With the view of showing the law of descent, both from boats and ships, for the various weights used with the small twine, the following tables have been prepared by Lieutenants S. P. Lee and R. H. Wyman. This law, owing to various circumstances connected with the commencement of almost every sounding, does not begin fairly to develop itself until 400 or 500 fathoms have run out. Notwithstanding this, certain anomalies remain for which it is difficult to account. They warn us, however, of the importance of close attention to the timing of every 100 fathoms, as the marks go out, and to keeping the line up and down from the boat by aid of the oars.

Berryman's line was of a more uniform size than Lee's, which, therefore, gives the more weight to his values of the rate of descent. Though these tables exhibit anomalies which we cannot satisfactorily account for, yet they are exceedingly valuable by reason of the check and the guide they afford for our future deep-sea soundings. They admonish operators as to the importance of *always* sounding from a boat, of using the same weights, the same twine, and of timing accurately.

* No bottom.

Time of Descent for every 100 *Fathoms. Small Line*

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
December 10, 1853 . . .	1.02	1.16																	
" 10, " . . .	1.02	1.16	1.06																
" 10, " . . .	0.57	1.13	1.22	1.35															
" 11, " . . .	1.02	1.12	1.29	1.52	1.42	2.01													
" 12, " . . .	0.53	1.11	1.21	1.35	1.39	1.40													
" 12, " . . .	0.53	1.12	1.32	1.37	2.07	2.23	2.20	2.28	2.49	2.41	2.13								
" 1, " . . .	0.54	1.00	0.59	0.59	1.16	1.48	1.43	1.56	1.56	1.29	1.45	2.07	1.35	1.33	1.49				
" 13, " . . .	0.59	1.14	1.27	1.35	1.35	1.35	1.48	2.05	2.28	1.50	2.21	3.10	2.17	3.34	2.44	2.24	3.33	3.03	2.52
" 16, 1851 . . .	0.57	1.17	1.22	1.35	1.42	1.49	2.03	2.14	2.06	2.06	2.34	2.31	2.03	2.25	2.45	2.35	2.41	3.08	2.45
February 15, 1852, *a*. . .			1.04	1.21	1.46	1.51	1.33	1.59	2.11	1.39	2.03	2.17	1.52	2.21	2.04	2.02	2.40	2.09	2.23
" 16, " *b*. . .	1.00	1.13	1.22	1.18	1.26	1.36	1.46	2.02	2.09	1.41	1.40	1.50	2 25	2.43	1.59	2.10	2.51	2.12	2.57
December 19, 1851, *c*. . .	0.54	1.13	1.29	1.42	1.52	1.58	2.12	2.23	2.15	2.18	2.28	2.35	2.44	2.41	2.38	2.46	3.20	2.58	2.36
" 15, " *d*. . .	0.55	1.05	1.09	1.13	1.45	1.52	1.49	1.50	2.07	2.12	1.56	2.20	2.17	2.14	2.41	2.17	2.20	2.51	2.16
Average interval	0.52	1.12	1.18	1.29	1.35	1.51	1.54	2.07	2.15	1.59	2.07	2.24	2.10	2.32	2.23	2.22	2.54	3.03	2.38
	12	12	11	11	10	10	8	8	8	8	8	7	7	7	7	6	6	6	6

Time of Descent for every 100 *Fathoms. Small*

	FATHOMS.											
	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
	INTERVALS.											
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
January 3, 1852 . . .	1.52	2.17	2.25	2.20								
" 20, " . . .	1.40	1.54	2.11	2.25	2.47							
" 3, " . . .	1.46	2.00	3.34	3.42	2.52	3.07	2.12					
October 25, 1851 . . .	1.43	2.06	2.21	2.40	2.59	3.00	3.17	3.42				
November 28, " . . .	1.42	1.58	2.26	2.40			3.17	3.26				
February 14, 1852 . . .	1.50	2.03	2.26	1.22	2.49	3.00	3.15	3.15				
June 9, " . . .	1.56	2.14	2.32	2.48	3.00	3.17	3.25	3.28				
December 17, 1851 . . .	1.55	2.05	2.22	2.33	2.52	2.17	3.09	3.39	3.28			
June 9, 1852 . . .	1.52	2.10	2.30	2.40	2.56	3.08	3.09	3.37	3.41	4.54		
December 16, 1851 . . .	1.53	2.15	2.26	2.39	2.40	3.00	3.10	3.15	3.19	3.31	3.39	
February 18, 1852 . . .	1.50	2.20	2.44	2.58	3.08	3.20	3.37	3.41	3.46	3.55		
" 15, " . . .	1.46	2.01	2.14	2.33	2.43	2.52	3.03	3.15	3.23	3.29	3.39	3.47
December 14, 1851 . . .	1.49	2.06	2.20	3.20	2.00	2.18	4.02	3.20	3.30	3.35	4.03	4.22
January 10, 1852 . . .	1.45	2.00	2.14	2.28	2.40	2.59	3.04	3.16	3.16	3.32	3.39	3.50
December 7, 1851 . . .	2.14	2.29	2.42	2.53	3.00	3.15	3.20	3.30	3.55	4.09	3.51	3.58
January 10, 1852 . . .	1.50	2.06	2.21	2.35	2.45	2.58	3.09	3.25	3.25	3.32	3.38	3.48
May 31, " . . .	1.54	2.11	2.16	2.34	2.49	2.52	3.14	3.22	3.28	3.50	3.56	4.02
November 30, 1851 . . .	2.05	2.41	2.17	3.12	3.10	3.20	3.40	3.45	3.55	4.10	4.10	4.40
January 8, 1852 . . .	1.47	2.08	2.19	2.29	2.50	2.50	2.52	3.28	3.23	3.44	3.37	3.58
" 20, " . . .	1.43	1.50	1.57	2.32	2.25	2.43	2.45	2.42	2.56	2.56	2.52	3.08
April 12, " . . .	2.13	2.32	2.48	2.52	3.15	3.20	3.46	3.56	3.59	4.11	4.13	4.24
January 23, " . . .	2.01	2.14	2.29	2.52	2.54	3.03	3.12	3.22	3.22	3.30	3.44	3.53
" 21, " . . .	1.54	2.12	2.26	2.30	2.50	3.06	3.20	3.31	3.36	3.51	4.00	4.06
" 9, " . . .	1.48	2.05	2.22	2.17	2.52	2.57	3.17	3.07	3.31	3.33	3.42	3.45
June 21, " . . .	1.44	2.01	2.15	2.39	2.46	3.00	3.08	3.27	3.40	3.50	3.40	3.55
January 13, " . . .	1.40	1.47	2.11	2.32	2.39	2.54	3.08	3.09	3.27	3.35	3.39	3.53
" 14, " . . .	1.40	1.56	2.12	2.25	2.37	2.34	2.55	3.05	3.22	3.36	3.35	3.48
" 17, " . . .	1.56	2.11	2.27	2.42	2.59	3.09	3.19	3.29	3.39	3.45	3.59	3.57
" 22, " . . .	1.57	2.25	2.35	2.40	2.59	3.00	3.20	3.19	3.21	3.34	3.38	3.47
Average interval . .	1.51	2.09	2.25	2.39	2.49	2.58	3.13	3.24	3.31	3.45	3.45	3.57
No. of casts	29	29	29	29	27	26	27	26	22	21	19	18

waxed; one 32 *lb. shot. From U. S. Ship Albany.*

	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300
	3.27																							
a.	2.52	1.59	2.33	2.55	1.58																			
b.	1.06	3.45	3.23	4.49	2.41																			
c.	3.20	3.29	3.11	3.25	3.16	3.19	3.19	2.23	4.15	3.01														
d.	2.40	3.55	2.31	3.02	2.59	2.26	2.56	3.15	2.39	3.36	2.35	3.00	3.09	2.52	3.13	2.47	3.14	2.42	3.16	2.56	3.22	2.48	2.51	4.10
	2.41	3.17	2.39	3.35	2.43	2.52	3.07	2.49	3.27	3.18	2.35	3.00	3.09	2.52	3.13	2.47	3.14	2.42	3.16	2.56	3.22	2.48	2.51	4.10
	5	4	4	4	4	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Line; one 32 *lb. shot. Boat Dolphin*—(LEE).

FATHOMS.

	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
	INTERVALS.															
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
	4.35															
	3.51															
	4.20	4.21	4.21	4.28												
	4.01	4.18	4.08	4.17												
	4.27	4.05	4.35	4.28	4.46											
	4.01	4.08	4.28	4.14	3.44											
	4.16	4.30	4.23	4.28	5.07											
	4.25	4.41	4.43	4.50	4.53	4.57										
	4.15	4.11	4.34	4.32	4.32	4.28										
	3.07	3.28	3.26	3.21	3.32	3.34										
	4.38	4.41	4.38	5.32	4.48	5.16										
	3.50	3.56	4.11	4.16	4.26	4.49	4.48									
	4.09	4.21	4.35	4.25	4.50	4.59	5.09									
	4.00	4.16	4.09	4.23	4.34	4.44	4.34	4.49								
	4.13	4.18	4.39	4.35	4.49	4.54	5.19	5.01	5.11							
	4.04	4.04	4.14	4.19	4.29	4.45	4.44	4.49	4.50	5.07	5.08					
	3.55	4.04	4.08	4.30	4.23	4.29	4.49	4.53	5.05	5.04	5.17	5.15	6.31			
	4.02	4.18	4.21	4.39	4.45	4.47	4.49	5.03	5.06	5.06	5.17	5.25	5.42			
	3.58	4.03	4.01	4.08	4.02	4.11	4.08	4.15	4.16	5.36	4.21	4.08	4.09	4.30	4.44	4.40
	4.07	4.13	4.20	4.26	4.31	4.39	4.47	4.48	4.54	5.13	5.01	4.56	5.27	4.30	4.44	4.40
	19	17	17	17	15	12	8	6	5	4	4	3	3	1	1	1

Time of Descent for every 100 *Fathoms. Small Line waxed; one* 32 *lb. shot. Boat Dolphin*—(LEE).

	FATHOMS.																																	
	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800
	INTERVALS.																																			
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
June 28, 1852 . .			1.52	2.07	2.15	2.23	2.33	2.40	2.48	2.51	3.02	3.06					3.45																			
May 26, " . .	1.36	1.45	1.55	2.07	2.14	2.24	2.38	2.49	2.53	3.11	3.06	3.19	3.14	3.15	3.20	3.35	3.46	2.49																		
" 24, " . .	1.37	1.43	2.11	2.24	2.28	2.30	2.53	2.57	3.05	3.08	3.20	3.22	3.38	3.38	3.51	3.50	4.02	4.11																		
Feb. 3, " . .	1.46	1.59	2.15	2.19	2.26	2.40	2.52	2.58	3.02	3.10	3.12	3.14	3.28	3.18	3.25	3.18	3.42	3.57																		
" 4, " . .	1.39	1.55	2.07	2.18	2.35	2.39	2.47	3.19	3.02	2.48	2.54	3.01	3.06	3.16	3.32	3.56	4.02	3.50	3.51																	
" 16, " . .	1.33	1.54	2.05	1.29	2.25	2.33	2.42	2.55	3.00	3.04	3.13	3.19	3.19	3.31	3.30	3.32	3.24	3.25	3.43			3.38														
March 13, " . .	1.43	1.53	2.06	2.17	2.29	2.28	2.47	2.50	3.07	3.07	3.11	3.24	3.32	3.30	3.30	3.42	4.13	4.15	4.23	4.33	4.46	4.40														
" 28, " . .	1.38	1.49	2.00	2.08	2.14	2.25	2.32	2.37	2.45	2.58			3.12	3.11	3.16	3.14	3.54	3.58	3.39	3.50	4.02	4.07	4.10													
Feb. 29, " . .	1.39	1.57	2.10	2.19	2.25	2.43	2.49	2.53	3.07	3.18	3.27	3.40	3.46	3.47	4.00	4.07	2.45	2.52	2.50	2.50	3.06	3.07	3.17	2.50												
June 2, " . .	1.44	1.52	2.05	2.18	2.30	2.35	2.49	2.49	2.52	2.57	3.09	3.20	3.15	3.27	3.36	3.46	2.39	2.45	2.42	2.54	2.54	2.51	3.01	2.57	3.12											
Feb. 5, " . .	1.16	1.25	1.33	1.34	1.42	1.44	1.50	1.59	2.07	2.07	2.13	2.20	2.21	2.28	2.37	2.42	3.36	3.50	3.50	4.07	4.06	4.12	4.06	4.14	4.32											
Jan. 15, " . .	1.27	1.41	1.44	1.14	1.48	1.53	1.58	2.03	2.07	2.08	2.15	2.20	2.23	2.30	2.27	2.32	3.51	3.32	4.03	3.55	3.38	2.56	3.53	4.12	4.39											
" 18, " . .	1.41	1.51	2.03	2.11	2.23	2.34	2.41	2.41	2.52	2.59	3.10	3.15	3.28	3.23	3.28	3.33	3.00	3.59	4.01	4.00	4.15	4.10	4.20	4.15	4.20											
March 31, " . .	2.07	2.23	2.29	2.46	2.56	3.06	3.13	3.14	3.20	3.33	3.36			3.53	4.05	3.44	4.25	3.39	4.11	4.01	4.03	3.35	3.59	4.02	4.15	5.47										
May 31, " . .	1.35	1.55	2.10	2.20	2.30	2.55	3.00	3.05	3.15	3.15	3.25	3.35	3.40	3.50	4.45	4.00	3.29	3.35	3.43	3.44	3.50	3.56	4.04	3.59	4.13	4.22	4.21									
Feb. 13, " . .	1.47	2.05	2.15	2.29	2.29	2.38	2.53	2.55	3.10	3.10	3.16	3.30	3.30	3.32	3.30	3.46	4.02	3.58	3.05	4.05	3.40	5.27	4.50	4.15		4.20	4.30									
Jan. 24, " . .	1.35	1.49	1.59	2.14	2.16	2.27	2.30	2.41	2.47	2.55	3.05	3.12	3.15	3.18	3.22	3.28	4.06	4.15	4.15	4.25	4.15	4.59	4.41	4.48	4.52	5.00	4.53	5.28								
April 9, " . .	1.42	1.56	2.11	2.16	2.38	2.43	2.42	2.15	2.57	3.05	3.05	3.07	3.47	3.52	3.49	3.55	3.30	3.31	3.37	3.37	3.48	3.44	3.57	3.58	4.00	4.02	4.00	4.13	4.11	4.10						
June 4, " . .	1.42	2.07	2.03	2.19	2.37	2.39	2.52	3.09	3.20	3.24	3.33	3.48	3.44	3.49	4.06	4.19	3.48	3.54	4.11	3.50	4.01	4.07	4.07	4.24	4.26	4.21	4.47	4.35	5.34	5.52						
Jan. 25, " . .	1.37	1.48	1.52	1.58	2.20	2.14	2.21	1.58	2.39	2.43	2.52	2.50	3.03	3.11	3.17	3.17	3.45	3.49	3.52	4.00	4.07	4.11	4.15	4.25	4.26	4.29	4.29	4.34	5.12	5.12						
" 27, " . .	1.40	2.00	2.05	2.13	2.22	2.30	2.38	2.47	2.55	2.58	3.12	3.12	3.16	3.25	3.31	3.43	3.54	3.56	4.00	4.06	4.23	4.16	4.25	4.27	4.40	4.36	4.32	4.35	4.52	5.03	6.15					
June 6, " . .	1.41	1.55	2.04	2.15	2.25	2.33	2.38	2.47	2.52	3.00	3.05	3.20	3.19	3.26	3.33	3.38	4.24	4.27			4.24	4.17	4.47	4.49	5.10	4.57	5.00	5.18	5.27	6.48	7.25	8.07				
" 8, " . .	1.48	2.00	2.12	2.20	2.28	2.42	2.52	2.55	3.08	3.15	3.20	3.20	3.35	3.36	3.49	3.50	3.30	3.35	3.38	3.39	3.46	3.52	4.02	4.08	4.12	4.16	4.24	4.31	4.31	4.36	4.37	4.39				
Jan. 31, " . .	1.45	2.09	2.31	2.43	3.00	3.12	3.17		3.30	3.33	3.46	3.55	3.44		4.16	4.15	3.29	3.33	3.38	3.34	3.40	3.33	3.34	3.31	3.43	4.07	5.25	4.08	4.20	4.59	4.39	5.09	4.22			
June 14, " . .	1.19	1.28	1.40	1.48	1.53	2.02	2.20	2.28	2.32	2.50	2.50	2.58	3.01	3.02	3.08	3.26	2.44	2.44	2.46	2.51	2.53	2.59	3.07	3.07	3.08	3.08	3.09	3.10	3.10	3.10	3.12	3.13	3.20	3.23	3.28	3.34
Jan. 29, " . .	1.50	1.59	2.12	2.14	2.45	3.22	2.53	2.48	2.57	3.02	3.14	3.17	3.18	3.14	3.25	3.28																				
June 12, " . .		1.41	1.49	1.51	1.58	2.02	2.10	2.14	2.26	2.32	2.32	2.34	2.42	2.36	2.43	2.41																				
Average interval	1.39	1.53	2.03	2.10	2.23	2.32	2.40	2.43	2.54	2.59	3.06	3.12	3.17	3.21	3.31	3.34	3.39	3.40	3.41	3.46	3.51	3.54	4.00	4.00	4.13	4.23	4.26	4.25	4.35	4.52	5.01	5.02	4.01	3.23	3.28	3.34
No. of casts . .	26	27	28	28	28	28	28	27	28	28	27	26	26	26	27	27	26	25	21	19	20	21	19	18	16	13	12	10	9	9	6	5	3	1	1	1

Time of Descent for every 100 *Fathoms. Two* 32 *lb. shot; Small Line. U. S. Brig Dolphin*—(LEE).

	FATHOMS.																		
	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600
	INTERVALS.																							
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
November 23, 1851 . . .	1.30	1.38	1.50	2.10																				
" 30, " . . .	1.20	1.34	1.46	2.00																				
December 14, " . . .	1.35	1.47	1.56	2.00																				
January 3, 1852 . . .	1.23	1.31	1.45	1.49																				
" 6, " . . .	1.18	1.30	1.40	1.45																				
" 14, " . . .	1.09	1.18	1.33	1.38																				
November 30, " . . .	1.21	1.34	1.40	1.56	2.02																			
December 16, " . . .	1.49	1.17	1.58	2.03	2.07																			
" 17, " . . .	1.30	1.37	1.50	1.59	2.10																			
January 20, " . . .	1.11	1.24	1.18	1.37	2.07																			
November 28, " . . .		1.47	2.00	2.01	2.17	2.15																		
January 9, " . . .	1.16	1.27	1.34	1.43	1.54	2.01																		
" 7, " . . .	1.18	1.32	1.40	1.47	1.52	1.58	2.08	2.15	2.26															
" 7, " . . .	1.15	1.25	1.30	1.42	1.53	1.58	2.10	2.14	2.24															
November 30, " . . .	1.13	1.34	1.38	1.37	1.52	1.50	2.00	2.03	2.04	2.12														
December 16, " . . .	1.24	1.41	2.48	1.57	2.42	1.16	2.22	2.33	2.39	2.39														
January 13, " . . .	1.10	1.20	1.32	1.43	1.48	2.02	2.10	2.17	2.20	2.33	2.41	3.44												
December 15, " . . .	1.30	1.40	2.14	1.46	2.16	2.19	2.18	2.27	2.42	2.40	2.46	2.51	3.00											
" 7, " . . .	1.31	1.41	1.55	1.47	2.01	2.50	2.21	2.26	2.37	3.37			3.16	3.21										
" 10, " . . .	1.32	1.45	1.53	2.01	2.11	2.17	2.20	2.33	2.40	2.38	2.52	2.37	2.48	3.05										
November 24, " . . .	1.28	1.42	2.15	2.30	2.13	2.27	2.27	2.43	2.40	2.25	2.41	3.11	3.08	3.40	3.25									
December 13, " . . .	1.35	1.42	1.53	2.00	2.02	2.17	2.12	2.38	2.35	2.42	2.49	2.55	3.00	3.06	3.09	3.17	3.28							
January 9, " . . .	1.19	1.33	1.41	1.48	1.55	2.10	2.13	2.21	2.31	2.38	2.47	2.58	2.57	3.00	3.13	3.10	3.17							
December 1, " . . .	1.30	1.44	1.58	2.04	2.13	2.23	2.30	2.46	2.49	2.47	3.06	3.07	3.24	3.22	3.25	3.45	3.39	3.50	3.55					
January 12, " . . .	1.02	1.07	1.13	1.19	1.25	1.28	1.36	1.35	1.41	1.44	1.47	1.48	1.52	1.57	1.56	2.04	2.07	2.10	2.15					
November 30, " . . .	1.28	1.42	1.53	1.57	2.09	2.19	2.29	2.30	2.39	2.50	2.57	3.10	3.12	3.21	3.27	3.29	3.46	3.39	3.47	3.52				
January 11, " . . .	1.14	1.30	1.40	1.46	1.59	2.03	2.14	2.20	2.29	2.36	2.39	2.51	2.56	3.00	3.13	3.12	3.24	3.29	3.29	3.36	3.40	3.40	3.57	
" 19, " . . .	1.16	1.24	1.34	1.42	1.52	2.02	2.13	2.19	2.23	2.28	2.32	2.38	2.47	2.48	2.58	3.01	3.03	3.12	3.18	3.17	3.23	3.24	3.34	3.43
Average interval . . .	1.22	1.33	1.47	1.52	2.03	2.06	2.14	2.22	2.29	2.36	2.41	2.54	2.56	3.04	3.06	3.08	3.15	3.16	3.21	3.25	3.31	3.32	3.45	3.43
No. of casts	27	28	28	28	22	18	16	16	16	14	11	11	11	10	8	7	7	5	5	3	2	2	2	1

Table showing the Intervals of Descent for every 100 *Fathoms.*

DATE.	FATHOMS. 100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100
	INTERVALS.																				
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
October 7, 1852 . .	1.05	1.22	1.38	1.45	1.55	2.09	3.46	2.08	2.28	2.38											
February 2, 1853 . .	1.00	1.00	1.30	1.30	1.55	1.50	2.00	4.35[1]	2.40	2.40	2.50	3.00	3.00	3.00	3.20	3.00					
October 25, 1852 . .	1.00	1.20	1.40	2.15	2.30	1.15[1]	2.10	2.30	1.30[1]	2.30	3.30	3.00	3.30	3.15	2.25[1]	3.00[1]	3.40	3.40			
February 9, 1853 . .	0.59	1.09	1.20	1.35	1.51	1.57	2.05	2.20	2.27	2.45	2.41	2.47	3.08	3.11	3.17	3.34	3.32	3.36	3.53	3.49	4.00
January 3, " . .	0.56	1.12	1.25	1.36	1.44	1.52	2.03	2.10	2.17	2.32	2.39	2.46	3.00	3.00	3.06	3.09	3.17	3.28	3.35	3.40	3.45
" 29, " . .	1.00	1.16	1.29	1.43	1.51	2.01	2.09	2.22	2.38	2.36	3.08	3.01	3.04	3.21	3.09	3.22	3.41	3.44	3.50	4.10	4.00
" 30, " *a.* .	1.00	1.15	1.31	1.42	1.57	2.06	2.17	2.23	2.37	2.43	2.47	3.00	3.04	3.18	3.22	3.25	3.31	3.54	3.38	3.45	3.55
February 5, " *b.* .	0.45	1.00	1.45	1.40	1.50	2.00	2.10	2.40	2.30	2.45	2.50	3.01	3.15	3.05	3.20	3.45[1]	3.35	3.40	3.50	4.20	4.10
October 10, 1852, *c.* .	1.15	1.28	1.40	1.57	2.00	2.18	2.22	2.30	2.50	2.50	3.45	2.50	3.15	3.30	3.30	3.25	3.25	3.30	3.50	4.05	4.05
January 9, 1853, *d.* .	0.59	1.18	1.28	1.40	1.55	1.59	2.11	2.20	2.28	2.32	2.49	2.55	2.53	3.23	2.58	3.19	3.18	3.34	3.26	3.30	4.02
February 4, " *e.* .	0.40	1.00	1.20	1.30	1.50	2.05	2.05	2.30	2.15	2.35	2.30	2.50	2.55	3.00	3.05	3.20	3.30	3.30	3.30	3.40	3.40
January 9, " *f.* .	0.45	1.15	1.25	1.35	2.00	1.50	2.10	2.10	2.20	2.30	3.00	2.45	2.55	3.00	3.00	3.30	3.00	3.20	3.10	3.25	3.55
October 24, 1852, *g.* .	1.01	1.34	1.33	1.47	2.00	2.05	2.16	2.20	2.37	2.51	2.53	3.09	3.11	3.19	3.25	3.33	3.43	3.45	3.56	4.02	4.07
" 9, " *h.* .	4.03[1]	1.40	2.06	2.08	2.32	2.38	2.47	2.55	3.11	3.23	3.31	3.34	3.41	3.45	3.48	3.47	3.45	3.51	3.53	4.08	4.05
" 11, " *i.* .	1.05	1.29	1.40	1.53	2.08	2.19	2.29	2.37	2.42	2.48	2.55	3.09	3.16	3.25	3.23	3.29	3.28	3.32	3.39	3.41	3.49
" 20, " *k.* .	1.00	1.00	2.00	1.40	1.50	2.30	2.10	2.30	2.20	2.30	2.30	3.15	2.18	2.27	2.45	2.55	2.20	3.10	3.40	3.40	4.10[1]
February 13, 1853, *l.* .		1.16	1.32	1.31	1.50	2.00	2.22	2.07	2.38	2.39	2.36	3.00	3.00	3.00	3.20	3.30	3.30	3.40	3.50	3.50	3.50
" 23, " *m.* .			1.35	1.45	1.54	1.58	2.10	2.23	2.27	2.30	2.35	2.50	2.55	3.00	3.15	3.09	3.16	3.25	3.28	3.37	3.40
" 26, " *n.* .	0.55	1.20	1.40	2.50	2.00	1.48[1]	2.24	2.36	2.37	2.42	2.55	3.03	3.04	3.21	3.13	3.44[1]	3.31	3.42	3.48	4.12	3.58
Average interval .	0.55	1.16	1.35	1.47	1.58	2.06	2.19	2.25	2.33	2.40	2.55	2.59	3.05	3.11	3.15	3.22	3.25	3.35	3.41	3.51	4.03
No. of casts . . .	16	18	19	19	19	17	19	18	18	19	18	18	18	18	17	15	17	17	16	16	15

[1] The times marked with a small figure (1) are omitted in the means, as evidently incorrect.

Time of Descent for every 100 *Fathoms. Two* 32 *lb. Shot; Small Line. From Boat Dolphin*—(BERRYMAN).

	FATHOMS. 100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
	INTERVALS.													
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
August 12, 1853	1.00	1.20	1.33	3.40	2.02	2.12	2.22	2.25	2.38	2.58	2.50			
July 24, "	1.06	1.26	1.40	1.50	2.00	2.10	2.25	2.30	2.40	2.50	3.00	3.10		
" 21, "	1.00	1.20	1.35	1.45	2.00	2.10	2.20	2.30	2.50	2.45	2.55	3.05	3.15	3.25
" 20, "	1.00	1.20	1.35	1.45	1.55	2.05	2.16	2.26	2.36	2.46	2.54	2.47	3.05	3.15
October 11, "	1.03	1.20	1.35	1.44	1.54									
August 10. "	1.00	1.21	1.39	1.48	1.55	2.07	2.19	2.21	2.38	2.37	2.48	2.57	3.10	3.25
" 14, "	1.00	1.12	1.25	1.37	1.50	2.06	2.08	2.20	2.34	2.48	2.48	2.58	3.00	3.20
June 17, "	0.56	1.15	1.27	1.33	1.54	1.57	2.08	2.16	2.31	2.33	2.35	2.45	2.52	3.00
" 21, "	1.19	1.28	1.41	1.51	2.01	2.14	2.28	2.34	2.44	2.51	3.07	3.09	3.16	3.53
August 15, "	1.00	1.20	1.35	1.35	1.50	2.00	2.10	2.20	2.30	2.30	2.30	2.45	2.55	3.00
July 4, "	0·55	1.15	1.30	1.40	1.50	2.00	2.12	2.24	2.24	2.35	2.45	2.45	2.55	3.05
" 2, "	1.05	1.25	1.35	1.47	1.58	2.13	2.26	2.43	2.33	2.49	2.55	3.00	3.05	3.13
October 2, "	1.03	1.17	1.30	1.44	1.56	2.05	2.18	2.27	2.47	2.41	2.52	3.06	3.14	3.30
September 21, "	1.00	1.17	1.36	1.47	2.00	2.05	2.13	2.22	2.33	2.50	2.50	3.00	3.10	3.05
July 16, " *a.*	1.05	1.20	1.35	1.50	2.05	2.10	2.15	2.25	2.35	2.45	2.45	2.45	2.55	3.05
September 23, " *b.*	0.40	1.10	1.20	1.35	1.45	1.55	1.55	2.10	2.20	2.30	2.30	2.40	2.35	3.00
" 24, " *c.*	1.02	1.18	1.30	1.42	1.58	2.08	2.08	2.28	2.38	2.48	2.52	2.58	3.00	3.05
June 10, " *d.*	1.13	1.22	1.35	1.45	1.50	1.56	2.09	2.15	2.20	2.27	2.38	2.51	2.54	2.55
" 24, " *f.*	0.58	1.17	1.35	1.42	1.53	2.03	2.14	2.25	2.25	2.38	2.50	3.00	3.02	3.03
" 7, " *g.*	0.56	1.14	1.25	1.40	1.50	1.53	2.02	2.10	2.25	2.25	2.30	2.42	2.43	2.50
October 3, " *h.*	1.03	1.15	1.29	1.39	1.42	2.00	2.00	2.08	2.20	2.30	2.35	2.40	2.45	2.50
November 4, " *k.*	1.06	1.19	1.37	1.50	2.14	2.12	2.25	2.40	2.48	2.54	3.06	3.21	3.20	3.35
June 14, " *l.*	1.14	1.29	1.42	1.53	2.01	2.11	2.18	2.35	2.39	2.42	2.48	2.56	3.00	3.05
Average interval	1.02	1.19	1.33	1.49	1.55	2.05	2.15	2.24	2.34	2.41	2.48	3.01	3.01	3.10
No. of casts	23	23	23	23	23	22	22	22	22	22	22	21	20	20

Two 32 *lb. shot; Small Line. From Boat Dolphin*—(BERRYMAN).

	FATHOMS. 2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300	4400	4500
	INTERVALS.																							
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
	3.47																							
	4.00																							
a.	3.59	4.01	4.15																					
b.	4.10	4.00	4.00																					
c.	4.00	4.00	3.51[1]	4.47																				
d.	4.04	3.51	3.49	4.09																				
e.	3.55	4.15	4.00	4.05	4.00																			
f.	3.30	3.40	4.20	3.50	4.10	4.00																		
g.	4.13	4.18	4.30	4.39	4.52	5.08																		
h.	4.15	4.14	4.26	4.49	4.53																			
i.	4.06	4.18	4.18	4.21	4.24	4.23	4.25	4.30	4.36	4.39	4.44	4.46	4.50											
k.	3.00[1]	3.50	4.10	6.20[1]	5.15	2.15[1]	3.30	3.30	7.10[1]	5.50	7.20[1]	4.10	7.00[1]	5.10	4.20	5.05	6.45	7.30	6.50	6.55	5.15	8.00	7.00	6.50
l.	4.00	4.20	4.10	4.10	4.00	4.10	6.00[1]	12.20[1]	9.00[1]	12.20[1]	13.30[1]	13.00[1]	14.15[1]	12.15[1]										
m.	3.48	3.57	3.52	3.58	4.02	4.13	4.15	4.35	4.30															
n.	3.52	4.00	4.35	4.30	4.25	4.25	4.30																	
	3.58	4.03	4.12	4.19	4.27	4.28	4.10	4.09	4.33	5.14	4.44	4.28	4.50	5.10	4.20	5.05	6.45	7.30	6.50	6.55	5.15	8.00	7.00	6.50
	14	13	12	10	9	7	4	3	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1

Small Line. From Boat Dolphin—(BERRYMAN).

	FATHOMS. 1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
	INTERVALS.															
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
	3.25															
	3.20															
	3.19															
	3.04	3.14	4.00													
	3.33	3.38	3.42	3.50												
	3.00	3.10	3.30	4.10												
	3.05	3.10	3.22	3.22	4.06											
	3.22	3.33	3.17	3.33	3.42	3.55										
	3.30	3.30	3.50	3.45	4.00	3.55	4.05									
	3.15	3.15	3.25	4.00	3.50	3.55	3.35	4.20								
a.	3.10	3.15	3.20	3.25	3.30	3.36	3.47	3.47	3.55	3.55						
b.	3.10	3.20	3.20	3.30	3.30	3.45	3.55	3.50	4.00	4.10	4.20					
c.	3.15	3.15	3.30	3.30	3.40	3.50	4.00	4.00	4.00	4.15	4.25					
d.	3.10	3.20	3.21	3.26	3.28	3.32	3.46	3.47	3.52	4.02	4.02	4.08				
f.	3.12	2.53	3.30	3.42	3.46	3.32	3.45	3.57	4.07	4.01	3.38	4.52				
g.	3.00	3.05	3.08	3.12	3.20	3.35	3.45	3.50	3.55	3.45	4.00	4.03	4.07			
h.	2.55	3.19	3.29	3.21	3.11	3.26	3.50	3.36	3.37	3.45	4.05	4.15	3.45			
k.	3.36	3.33	3.56	3.54	4.07	4.17	4.15	4.41	4.27	4.37	4.56	4.40	5.10	4.51	5.15	
l.	3.10	3.14	3.27	3.24	3.43	3.43	3.48	3.38	3.40	3.50	4.40	4.03	4.40	4.50	4.17	4.17
	3.14	3.18	3.30	3.36	3.41	3.45	3.51	3.57	3.58	4.02	4.16	4.20	4.25	4.50	4.45	4.17
	19	16	16	15	13	12	11	10	9	9	8	6	4	2	2	1

Time of Descent for every 100 *Fathoms. One* 32 *lb. Shot;*

	FATHOMS.											
	100	200	300	400	500	600	700	800	900	1000	1100	1200
	INTERVALS.											
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
October 22, 1853, *a.* . . .	1.00	1.25	1.45	2.00	2.13	2.21	2.32	2.45	2.55	3.03	3.07	3.27
" 20, " . . .	0.53	1.17	1.40	2.01	2.10	2.23	2.26	2.47	2.51			3.42
" 23, " *b.* . . .	1.11	1.30	1.51	2.09	2.25	2.41	2.50	3.06	3.15	3.24	3.41	3.46
" 18, " *c.* . . .	1.03	1.24	1.44	2.00	2.20	2.32	2.47	2.55	3.04	3.13	3.25	3.37
" 13, " *d.* . . .	1.10	1.27	1.45	2.07	2.24	2.34	2.51	3.03	3.06	3.17	3.25	3.38
" 27, " *e.* . . .	0.55	1.21	1.44	1.56	2.17	2.32	2.35	2.46	2.56	3.04	3.14	3.15
Average interval . . .	1.02	1.24	1.45	2.02	2.18	2.30	2.40	2.54	3.01	3.12	3.22	3.34
No. of casts	6	6	6	6	6	6	6	6	6	5	5	6

Average Time of Descent for every 100 *Fathoms. Two* 32 *lb. shot; Small Line.* From

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
Mean of soundings—(LEE) . . .			1.22	1.33	1.47	1.52	2.03	2.06	2.14	2.22	2.29	2.36	2.41	2.54	2.56	3.4	3.6	3.8	3.15
" " (BERRYMAN) .	0.56	1.16	1.35	1.47	1.58	2.06	2.19	2.25	2.33	2.40	2.55	2.59	3.05	3.11	3.15	3.22	3.25	3.35	3.41
" " " .	1.02	1.19	1.33	1.49	1.55	2.05	2.15	2.24	2.34	2.41	2.48	3.01	3.01	3.10	3.14	3.18	3.30	3.36	3.41
Average interval	0.58	1.17	1.30	1.43	1.53	2.01	2.12	2.18	2.27	2.34	2.44	2.52	2.56	3.05	3.08	3.14	3.23	3.26	3.32
No. of casts	39	41	69	70	70	67	63	58	56	57	56	53	49	49	47	41	41	39	36

Table showing the Intervals of Descent for every 100 *Fathoms. One* 32 *lb. Shot; Small Line.*

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
Mean of soundings—(LEE)			1.51	2.09	2.25	2.39	2.49	2.58	3.13	3.24	3.31	3.45	3.45	3.57
Mean of soundings — (BERRYMAN)	1.02	1.24	1.45	2.02	2.18	2.30	2.40	2.54	3.01	3.12	3.22	3.34	3.41	3.43
Average interval	1.02	1.24	1.12	2.05	2.21	2.34	2.44	2.56	3.07	3.18	3.26	3.39	3.43	3.50
No. of casts . .	6	6	35	35	35	35	33	32	33	31	27	27	24	24

Small Line. From Boat Dolphin—(BERRYMAN).

	FATHOMS.															
	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800
	INTERVALS.															
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
a.	3.37	3.37	3.57	4.02	4.14	4.22	4.13	4.37	4.44	4.47						
	3.30	3.27	3.41			4.10	4.16				4.52	5.15				
b.	4.06	4.06	4.26	4.28	4.33	4.42	4.49	5.02	5.06	5.12	5.26					
c.	3.46	3.53	4.02	3.57	4.20	4.23	4.22	4.36	4.47	4.30	5.03	5.00				
d.	4.19*	3.57	4.01	4.17	4.24	4.30	5.03	4.35	4.47	5.25	5.02	5.02	5.26	5.29	5.41	
e.	3.27	3.19	3.29	3.36	4.04	3.51	4.05	4.04	4.13	4.21	4.21	4.25	4.37	4.26	4.38	4.47
	3.41	3.43	3.54	4.04	4.19	4.20	4.28	4.35	4.43	4.51	5.08	4.55	5.01	4.58	5.09	4.47
	5	6	6	5	5	6	6	5	5	5	5	4	2	2	2	1

Mean of Soundings by Lieutenants S. P. LEE and O. H. BERRYMAN, 1851–52–53.

2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300	4400	4500
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
3.16	3.21	3.25	3.31	3.32	3.45	3.43																			
3.51	4.03	3.58	4.03	4.12	4.19	4.27	4.28	4.10	4.09	4.33	5.14	4.44	4.28	4.50	5.10	5.20	5.05	6.45	7.30	6.50	6.55	5.15	8.00	7.00	6.50
3.45	3.51	3.57	3.58	4.02	4.16	4.20	4.25	4.50	4.45	4.17															
3.37	3.45	3.47	3.51	3.55	4.06	4.10	4.26	4.30	4.27	4.25	5.14	4.44	4.28	4.50	5.10	5.20	5.05	6.45	7.30	6.50	6.55	5.15	8.00	7.00	6.50
33	31	27	24	23	20	16	11	6	5	3	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1

From Mean of Soundings by Lieutenants S. P. LEE and O. H. BERRYMAN, 1851–52–53.

	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
	4.07	4.13	4.20	4.26	4.31	4.39	4.4	4.48	4.54	5.13	5.01	4.56	5.27	4.30	4.44	4.40
	3.54	4.04	4.19	4.20	4.28	4.35	4.43	4.51	5.08	4.55	5.01	4.58	5.09	4.47		
	4.00	4.08	4.19	4.23	4.29	4.37	4.45	4.49	5.01	5.04	5.01	4.57	5.18	4.38	4.44	4.40
	25	22	22	23	21	17	13	11	10	8	6	5	5	2	1	1

It will be remarked, how much more rapidly the line went out from the Albany, than it did to the same weight (one 32 lb. shot) from the Dolphin's boat.

It will be also noted, how very uniform is the rate of descent in the last of the Dolphin's tables, and in which two 32 lb. shot were used. This was on her last cruise, when the soundings were entrusted entirely to one officer—young Mitchell—and when the boat's crew had become so *au fait* at the business.

These results are highly satisfactory; they do Mitchell great credit, and I point to them as a model for others.

It is very evident, that a shot will sink at the same rate, whether it be dropped overboard from a ship or a boat. We account, then, for the apparently more rapid rate of descent from the Albany, by the greater drift of the vessel, for, of course, as she fell off and gathered headway, she slipped from under the line, which increased its rate of going out. We, therefore, are forced to the conclusion that the Gulf of Mexico and Caribbean Sea are not so deep, as, from the Albany's soundings, these two basins were supposed to be.

Indeed, the ocean generally is not quite so deep as this system of deep-sea soundings would represent it. The undercurrents operate upon the line; it bends to them, and of course the sounding reported is rarely, if ever, a true "up and down" measure.

It will be observed how much the waxing of the line increases its rate of descent.

Many of the irregularities in these tables of the Dolphin, are owing to changes in the size of the line. Lieut. Lee weighed his, and found it to vary from 100 to 114 lbs. per 10,000 fathoms.

The human mind delights in the marvellous; and there is no subject which those who cater for it will seize upon with more avidity, than upon the reports which are now and then made of the enormous depths to which the plummet has descended in the deep sea, without reaching bottom. It is always desirable to prevent error from building up its edifices in the popular mind; for when truth comes along, it has first to pull these down, and to contend with many difficulties in removing the vast amount of rubbish made, before it can begin a single structure.

It seems, therefore, the proper time, now that so much has been done with the Atlantic Ocean, in the way of sounding it out, to review the great depths which have been reported from time to time.

First referring to Plate XIV. and the former edition of this work, there is the great wire cast of 5,700 fathoms from the Taney. This always, in my judgment, required confirmation, because of the material used. The other soundings near its place on the chart, render the probability of any such depth of water in that part of the ocean still more questionable.

I have, therefore, in the shadings of this Plate, directed Professor Flye, by whom the lines are drawn, not to regard it.

Besides this, there are the soundings of 5,200 fathoms by the Plymouth, in lat. 37° 28′ N., long. 56° 32′ W.; of 5,070 by the St. Louis, in lat. 36° 16′ N., long. 46° 52′ 15″ W.; and of 4,000 by the Jamestown, lat. 36° N., long. 27° 20′ W., all of which are reported without bottom, and all of which were marked as doubtful from the first, owing to the evidence furnished by the official reports which were made with them to this office.

With regard to the Plymouth's sounding, no time except the total was kept. The cast was made from the vessel; and during the operation, the wind and sea increased so much, says Captain Kelly, "that I deemed it advisable to part the line and await a more favorable opportunity, not being able to sound with any accuracy."*

In the case of the St. Louis, the sounding was made from a boat; pains were taken to keep the line up and down, but the shot was timed only by the 1,000 fathoms. And though Captain Ingraham reported bottom, the intervals, in my judgment, did not indicate such a depth, and therefore the note of interrogation was applied, expressive of that doubt.

The Jamestown simply reports no bottom; and on board that vessel, the supposition that bottom in any case had been reached, "arose from the fact that the line paying out briskly would suddenly cease, and on being hauled in would for a moment come up very heavily, and then, as though the weight of the shot had parted from it, come up easily."†

It was not supposed that the depth of the ocean could be so great, so near the Western Islands; hence the note of interrogation, which I ventured to attach to that sounding, the propriety of which Berryman's soundings seem now to confirm.

I have practically erased the last; and though I doubt the other two, yet, as they are in a part of the ocean where soundings are scarce, and where vessels frequently go, I have left them there with the hope that they would tempt some navigator to get a true sounding, and so erase them.

With regard to the other soundings, which I had no reason, at the time they were made, to doubt, but upon which subsequent results have thrown light sufficient to cause them to be erased entirely, or seriously questioned, I may simply remark, that in this class, among others, is included Capt. Barron's sounding of 5,500 fathoms in the Jno. Adams, lat. 32° 06′ N., long. 44° 47′ W. This cast was made from the ship. The shot was timed by the 1,000 fathoms, but the officers were sure, from the feeling of the line, that bottom had been reached. Several good and accurate soundings have been since made near the same place by the Dolphin, and from a boat, which show the depth to be less than 3,000 fathoms. Hence, the erasure of Barron's cast.

There is a number of other soundings, especially those very great ones which are marked with the sign of "no bottom," to which I have attached notes of doubt (?) on Plate XIV.

Though I had no reason to question their accuracy at first, yet subsequent and reliable soundings seem to show that the sea, there, is not as deep as they indicate it to be.

Since, however, the great wire sounding of Lieut. Walsh, in the Taney, was made, in 1849, and for full details of which, see the previous edition of this work, three others, with a greater length of line out, have been made. They deserve special notice, for I think all of them are in error as to depth.

One of these casts was of 8,300 fathoms, by Lieut. J. P. Parker, of the U. S. frigate, Congress, 4th April, 1852, lat. 35°35′ S.; long. 45°10′ W. Another, of 7,706 fathoms, by Capt. Denham, of H. M. S.

* See Maury's Sailing Directions, page 213, 5th ed.

† Ibid.

Herald, 30th Oct. 1852, lat. 36° 49′ S.; long. 37° 06′ W. And the other, of 6,600 fathoms, by Lieut. O. H. Berryman, commanding U. S. Brig Dolphin, 12th Feb. 1853, lat. 32° 55′ N.; long. 47° 58′ W.

The first two casts, it will be observed, were made within 400 miles of each other, and with the same twine; for Commodore McKeever supplied, from the stock on board the Congress, 15,000 fathoms to the Herald. The plummet used by Capt. Denham was a 9 lb. lead. It is much to be regretted that he did not use a 32 lb. shot; for, then, his line being the same, his sounding might have been compared with our own, with far greater satisfaction.

Capt. Denham's last 706 fathoms (from 7,000 to 7,706) went out at the rate of four-fifths of a mile per hour. He had a 9 lb. lead as a sinker. Now, let us ask any sailor who is familiar with the resistance made by lines when towed through the water, whether, in his opinion, a force of 9 lbs. could tow eight miles length of line, three-tenths of an inch in circumference, at the rate of four-fifths of a mile the hour? Moreover, his eighth thousand fathoms went out faster than his fifth. Surely, a 9 lb. lead would not drag a line 7,000 fathoms long, and upwards, through the water faster than it would drag one out 4,000 fathoms in length.

It is probable that there is in all parts of the deep sea one or more undercurrents, of greater or less velocity. Nature, by her ways, indicates this; reason, with her lights, suggests it; and experiment seems to confirm it. Our experience in deep-sea soundings is now considerable; and seldom, indeed, has it occurred that the line has ceased going out after the shot has reached bottom. And I suppose it is the currents of the sea, coursing through their channels of circulation, that continue to take it out.

Suppose where Captain Denham sounded, there had been but one undercurrent, and that that had a rate of only one-tenth of a mile per hour; the line, then, that his 9 lb. sinker had to tow through the water, instead of being straight, was probably a curve. It may in reality have been a curve of several convolutions; for, for aught we know, there may be in the deep sea several strata of currents, as we know there often are several strata of winds, one above the other, in the atmosphere.

Parker, of the Congress, gives the time of every 500 fathoms, after the first 300 had gone out; Denham, of the Herald, is more systematic; he gives the time of every 100 fathoms, from the beginning; Berryman, of the Dolphin, on the contrary, is less so; he gives the time for every 500, for the first 1,500 fathoms, then for every 200, till he reached 2,500 fathoms; then for 400, then for 1,000, then for 100, and so on, at irregular intervals, which impairs the value of his results. Denham's is the best in this respect. Now to compare them fairly, we must have them all for like intervals. I therefore compute Berryman's as far only as is necessary to make them correspond with Parker's times and intervals, arranging Denham's accordingly.

This being done, let us compare the times of the three casts together, referring them also to the average rate of descent determined by actual experiment (see pp. 290, 291), that we may see the difference of rate at which the same line will run out, as Parker's and Denham's, to sinkers of different weights; as well as the depths at which all uniformity as to rate of descent begins to disappear.

	INTERVALS.						
	8300 fathoms. 32 lb. shot.		7706 fathoms. 9 lb. shot.		6600 fathoms. 46 lb. shot.		
	CONGRESS.		HERALD.		DOLPHIN.		
	min.	sec.	min.	sec.	min.	sec.	
From 300 to 800 fathoms	8	45	14	20	12	6	
" 800 to 1300 "	11	00	18	25	12	51	
" 1300 to 1800 "	13	00	19	30	15	07	
" 1800 to 2300 "	15	00	22	00	20	07	
" 2300 to 2800 "	19	00	23	50	24	11	
" 2800 to 3300 "	37	00	28	20	25	53	
" 3300 to 3800 "	51	00	39	20	28	00	1000 fathoms.
" 3800 to 4300 "	28	00	43	40	34	00	
" 4300 to 4800 "	33	15	42	25	47	22	
" 4800 to 5300 "	34	45	47	50	52	16	
" 5300 to 5800 "	34	00	53	50	64	50	
" 5800 to 6300 "	34	30	55	05	70	32	
" 6300 to 6800 "	21	30	53	55	72	34	
" 6800 to 7300 "	27	00	52	25			
" 7300 to 7800 "	38	30	44	14			
" 7800 to 8300 "	21	00					

I do not recollect the size of the Dolphin's twine; it is evident, however, that this, as well as all other sounding-twine, requires force to pull it from the reel, and to drag it down through the depths of the ocean; that the deeper the plummet, and the greater the length of line to be dragged down, the greater the resistance, and, therefore, the slower the rate at which the line goes out.

Hence, we may deduce a rule which, as a general rule, may be taken as correct, viz: that when the line ceases to go out at something like a regularly-decreasing rate, there is no reliance to be put upon the sounding after the change; and that when the rate of going out becomes uniform—or now fast, now slow—the plummet has probably ceased to drag the line down, and the force which continues to take the sounding-line out is due to the wind, currents, heave of the sea, or drift—one, some, or all.

Let us apply this rule to these casts:—

That of the Congress fulfilled these conditions, as to a tolerably regular decreasing rate, to the 2,800 fathoms mark. The rates after that indicate pretty clearly that, whatever might have been the agent which continued to take the line out, it was not the sinking of the 32 lb. shot. There is an appearance of too much uniformity in the rate after that. Therefore, I infer that, when the 2,800 fathoms mark went out, the shot was probably on or near the bottom; and that, where this sounding was made, the ocean, instead of being some 8,300 fathoms deep, is not more than 3,000.

The Herald's plummet fulfilled the conditions generally, of a decreasing rate, until the 4,300 fathoms

mark went out; and after this the rate becomes of such a character as to justify the conclusion that the 9 lb. sinker used had then ceased, or nearly ceased, to descend, if it were not already on the bottom.

The care with which Captain Denham observed every 100 fathoms mark, and timed it as it went out, enables us to detect, probably, more closely in his sounding than in either of the others, the time when his plummet ceased to sink.

From 100 to 700 fathoms, each 100 fathoms mark required between two and three minutes to go out; from 700 to 1,600, each mark required between three and four minutes; from 1,600 to 2,700, each mark required between four and five minutes; from 2,700 to 3,000, each required between five and six minutes. Here the times begin to become irregular; the 3,200 and 3,300 marks, each took between six and seven minutes to go out. After this, there is no more regularity as to the increasing times. Every 100 fathoms mark thereafter appears to have a rate of its own, varying from seven to twelve minutes—but now fast, now slow—and in such a manner as to justify the inference that the ocean, where the Herald reports 7,706 fathoms, is probably not more than 4,000 fathoms deep. It was probably the wind, or some agent at the surface, that caused the irregularity as to time after the 4,300 fathoms mark went out.

The Dolphin had the heaviest plummet, and the largest line. The time required with her for each of the first 500 fathoms marks to run out, was longer than the Congress, but shorter than the Herald. But after the 4,300 fathoms mark of the Herald went out, then the Herald's line was the swifter; then it assumed, approximately at least, the condition of equal lengths in equal times; whereas, the Dolphin's continued to decrease its rate, and to go slower and slower, till the 6,300 fathoms mark went out. She sent down 6,600 fathoms; the interval, therefore, from 6,300 to 6,800 is computed. The inference, therefore, would be that, if the weight had not reached bottom before, it ceased to go down about the time the 6,300 fathoms mark went out.

But the sounding was not made with the usual care; and, with the lights now before me, no such inference as to depth is admissible. Subsequent soundings in the vicinity give bottom at a much less depth. Lieut. Berryman informs me that, since these were made, he has no confidence whatever in that 6,300 fathoms cast. Nor have I.

THE BASIN OF THE ATLANTIC—ITS SHAPE.

PLATE XIV.

This Plate is a great improvement upon that in the preceding edition. It is believed to give, with some approaches to accuracy, the shape of the basin which holds the waters of the North Atlantic Ocean, especially of that part of it which lies between the equator and a line from Cape Race, in Newfoundland, to Rockall, off the west coast of Ireland.

The little circles over the figures, on the Plate, which represent the soundings, are intended to show, by their centre, the latitude and longitude of the soundings, with as much accuracy as the scale on which the

Plate is constructed will admit. Those soundings which have above them and this little circle a dash, with a dot over the middle of it, indicate that at the depth expressed by the figures below, in fathoms of 6 feet to the fathom, there was "no bottom," according to the official report.

The shaded bands represent the one, two, three, and four thousand fathom steppes at the bottom of the Atlantic. That is, from the shore to the outer edge of the darkest shading, the sea is less than 1,000 fathoms deep; within the space covered by the next deepest shading, it is between 1,000 and 2,000 fathoms deep; within the space covered by the next shading it is between 2,000 and 3,000 fathoms deep; the lightest shading is intended to show where the ocean is more than 3,000, but less than 4,000 fathoms deep; and where there is no shading, the representation intends to show that the sea is more than 4,000 fathoms deep.

With this explanation, it will be perceived that the tracing of these various curves is, in many places, and for the most part, matter of conjecture; they can be accurately drawn only where soundings have been actually obtained, and the Plate itself shows, therefore, what parts of the curves are drawn from data and what by conjecture.

All that is hoped to be accomplished by this Plate for the present, is to enable persons to form something like a general idea as to the shape of the Atlantic basin, so far at least as the deep-sea soundings returned to this office will enable one to do, and to excite an interest with regard to this subject among officers; hoping that, with the promise of such interesting results before them, officers will be induced to pay more attention to the subject of deep-sea soundings—and to the general order at page 225, which makes it their duty to get casts whenever practicable—than generally they have done.

One of the conclusions which it would seem that we are authorized to draw from thus presenting the results, so far obtained, is this, viz: that if there be any part of the Atlantic Ocean, between the Banks of Newfoundland and the equator, more than 4,000 fathoms deep, it is probably no great part in comparison to the whole.

Another feature exhibited as to the shape of the steppes in this great oceanic basin is worthy of notice. There seems to be, as we travel south from the Grand Banks of Newfoundland, a precipitous ledge, or what sailors call a "jumping-off place," right under the Gulf Stream.

To compare great things with small, we have repeated here some of the peculiarities which I observed, in 1839, about the Hatteras Shoals. These shoals are formed by the cold current which runs along the shores of the United States counter to the Gulf Stream.

They are shelving from the north. That is, as you approach them from the north, you gradually lessen your water until you reach the shoalest part, and then there is a sudden jump off into deep water.

The conflict between the two currents is sharp as they round this cape. The Gulf Stream is the stronger. Its course is interfered with by this cape and shoal and counter current, and in a similar way it is encroached upon by the Grand Banks and the cold current from the north. Does not this view give grounds for the conjecture, that the deposits which form the Grand Banks come from the north?

This Plate was drawn by Professor Flye, from the data contained in the chapter on deep-sea soundings, page 277.

FIG. 1—PLATE XV.

Vertical Section of the North Atlantic Ocean.

Plate XV., drawn by Professor Major, is a profile view of the basin of the Atlantic.

It commences from the volcanic ranges in Mexico, lat. 20½°, and, pursuing a straight line, terminates on the shores of western Africa, lat. 18° N.

This section confirms the conjecture which these deep-sea soundings suggested soon after they were commenced, and which was mentioned in former editions of this work, viz: that the bottom of the sea is probably much more rugged and abrupt than the surface of the dry land.

Reasons why such should be the case are obvious: on the land, the winds, the rains, and rivers are always abrading, drifting, and washing down the high places and filling up the low; these agents are not felt at all, or, if felt, felt but feebly at the bottom of the deep sea.

On the dry land, frosts and the force of gravity are great levellers. At the bottom of the deep sea no frosts are felt, and the difference of the force of gravity operating upon a rock at the bottom of the sea, and upon the top of a mountain, is as the difference in weight between air and water.

Both of these Plates, however, though I do not claim for either of them any minute degree of accuracy, are suggestive.

"OOZE AND BOTTOM OF THE SEA."

By referring back to the abstract log of the Dolphin, as well as to the table of deep-sea soundings, it will be seen that specimens of the bottom were brought up several times by Brooke's apparatus; and that these specimens on one occasion were drawn from the depth of 12,000 feet (2,000 fathoms).

They were sent to the Microscopists, Prof. Bailey, of West Point, and Ehrenberg, of Berlin, for examination.

After a few days, I had the pleasure of receiving the following in reply, from the former:—

WEST POINT, November 29, 1853.

"MY DEAR SIR: I am greatly obliged to you for the deep soundings you sent me last week, and I have looked at them with great interest. They are exactly what I have wanted to get hold of—the bottom of the ocean at the depth of *more than two miles!* I hardly hoped ever to have a chance of examining—yet, thanks to Brooke's contrivance, we have it clean and free from grease, so that it can at once be put under the microscope. I was greatly delighted to find that *all* these deep soundings are filled with microscopic shells; not a particle of sand or gravel exists in them. They are chiefly made up of perfect little calcareous shells (Foraminifera), and contain, also, a small number of siliceous shells (Diatomaceæ).

It is not probable that these animals lived at the depths where these shells are found, but I rather think that they inhabit the waters near the surface; and when they die, their shells settle to the bottom. With reference to this point, I shall be very glad to examine bottles of water from various depths which were brought home by the Dolphin, and any similar materials, either 'bottom,' or water from other localities. I shall study them carefully. * * * The results already obtained are of very great interest, and have many important bearings on geology and zoology. * * * * * *

I hope you will induce as many as possible to collect soundings with Brooke's lead, in all parts of the world, so that we can map out the animalculi as you have the whales. Get your whalers also to collect mud from pancake ice, &c., in the polar regions—this is always full of interesting microscopic forms."

Truly, these results are suggestive; they seem to form but a slender clue, indeed—do these little mites of shells, by which the chambers of the deep are to be threaded and mysteries of the ocean revealed; yet in right hands, and to right minds, they are sure guides to both light and knowledge.

The first noticeable thing the microscope gives of these specimens is, that all of them are of the animal, not one of the mineral kingdom.

The ocean teems with life, we know. Of the four elements of the old philosophers—fire, earth, air, and water, perhaps the sea most of all abounds with living creatures.

The space occupied on the surface of our planet, by the different families of animals and their remains, is inversely as the size of the individual.

The smaller the animal the greater the space occupied by his remains. Though not invariably the case, yet this rule, to a certain extent, is true, and will, therefore, answer our present purposes, which are simply those of illustration.

Take the elephant and his remains, or a microscopic animal and his, and compare them. The contrast, as to space occupied, is as striking as that of the coral reef or island with the dimensions of the whale. The graveyard that would hold the corallines is larger than the graveyard that would hold the elephants.

As Professor Bailey remarks, the animalculæ, whose remains Brooke's lead has brought up from the bottom of the deep sea, probably did not live or die there. They would have had no light there, and their frail little textures would have been subjected in their growth to a pressure upon them of a column of water of 12,000 feet high, equal to the weight of 400 atmospheres. They probably lived and died near the surface, where they could feel the genial influences of both light and heat, and were buried in the lichen caves below, after death.

Brooke's lead and the microscope, therefore, it would seem, are about to teach us to regard the ocean in a new light. Its bosom which so teems with animal life, its face upon which time writes no wrinkles, makes no impression, are, it would now seem, as obedient to the great law of change as is any department whatever, either of the animal or the vegetable kingdom. It is now suggested that, henceforward, we should view the surface of the sea as a nursery, teeming with nascent organisms; its depths, as the cemetery for families of living creatures that outnumber the sands on the sea-shore for multitude.

Where there is a nursery, hard by there will be found also a graveyard—such is the condition of the

animal world. But it never occurred to us before to consider the surface of the sea one wide nursery, its every ripple as a cradle, and its bottom as one vast burial-place.

On those parts of the solid portions of the earth's crust which are at the bottom of the atmosphere, various agents are at work, levelling both upwards and downwards. Heat and cold, rain and sunshine, the winds and the streams, all assisted by the forces of gravitation, are unceasingly wasting away the high places, and as perpetually filling up the low.

But in contemplating the levelling agencies that are at work upon the solid portions of the crust of our planet which are at the bottom of the sea, we had come, while treating in another part of this work touching the depth of the ocean, almost to the conclusion that these levelling agents are powerless there.

In the deep sea there are no abrading processes at work; neither frosts nor rains are felt there; and the force of gravitation is so paralyzed down there, that it cannot use half its power, as on the dry land, in tearing the overhanging rock from the precipice and casting it down in the valley below.

When, therefore, I was treating of the basin of the Atlantic, the imagination was disposed to regard the waters of the sea as a great cushion, placed between the air and the bottom of the ocean, to protect and defend it from these abrading agencies of the atmosphere.

The geological clock may, thought I, strike new periods; its hands may point to era after era; but so long as the ocean remains in its basin, so long as its bottom is covered with blue water, so long must the deep furrows and strong contrasts in the solid crust below, stand out raggedly and boldly rugged. Nothing can fill up the hollows there; no agent now at work, that we know of, can descend into its depths and level off the floors of the sea.

But it now seems that we forgot these oceans of animalculæ, that make the surface of the sea sparkle and glow with life. They are secreting from its surface solid matter for the very purpose of filling up those cavities below.

These little marine insects are building their habitations at the surface, and when they die, their remains, in vast multitudes sink down, and settle upon the bottom. They are the atoms out of which mountains are formed—plains spread out. Our marl-beds, the clay in our river bottoms, large portions of many of the great basins of the earth, are composed of the remains of just such little creatures as these, which the ingenuity of Brooke, and the industry of Berryman, have enabled us to fish up from the depth of more than two miles below the sea level.

These foraminifera, therefore, when living, may have been preparing the ingredients for the fruitful soil of a land that some earthquake or upheaval, in ages far away in the future, may be sent to cast up from the bottom of the sea.

The study of these "sunless treasures," recovered with so much ingenuity from the rich bottom of the sea, suggests new views concerning the physical economy of the ocean.

In the chapter on the *Saltness of the Sea*, p. 177, I endeavored to show how sea-shells and marine insects may, by reason of the offices which they perform, be regarded as compensations in that exquisite system of physical machinery by which the harmonies of nature are preserved.

The treasures of the lead, and revelations of the microscope, present the insects of the sea in a new light. We behold them now, serving not only as compensations by which the motions of the water in its channels of circulation are regulated, but also acting as checks and balances, by which the equipoise between the solid and the fluid matter of the earth is preserved.

Should it be established that these microscopic creatures live at the surface, and are only buried at the bottom of the sea, we may then view them as conservators of the ocean; for, in the offices which they perform, they assist to preserve its *status* by maintaining the purity of its waters.

It is admitted that the salts of the sea come from the land, and that they consist of the soluble matter which the rains wash out from the fields, and which the rivers bring down to the sea.

The waters of the Mississippi and the Amazon, together with all the streams and rivers of the world, both great and small, hold in solution large quantities of lime, soda, iron, and other matter. They discharge annually into the sea an amount of this soluble matter, which, if precipitated and collected into one mass, would no doubt surprise and astonish the boldest speculator with its magnitude.

This soluble matter cannot be evaporated. Once in the ocean, there it must remain; and as the rivers are continually pouring in fresh supplies, the sea, it has been argued, must continue to become more and more salt.

Now the rivers convey to the sea this solid matter mixed with fresh water, which, being lighter than that of the ocean, remains for a considerable time, at or near the surface. Here, the microscopic organisms of the deep-sea lead are continually at work, secreting this same lime and soda, &c., and extracting from the sea-water all this solid matter as fast as the rivers bring it down and empty it into the sea.

Thus, we haul up from the deep sea specimens of dead animals, and recognize in them the remains of creatures, which, though invisible to the naked eye, have nevertheless assigned to them a most important office in the physical economy of the universe, viz., that of regulating the saltness of the sea.

This view suggests many contemplations. Among them, one in which the ocean is presented as a vast chemical bath in which the solid parts of the earth are washed, filtered, and precipitated again as solid matter, but in a new form, and with fresh properties.

Doubtless, it is only a readaptation, though it may be in an improved form, of old, and perhaps effete matter to the uses and well-being of man.

These are speculations, merely; they may be fancies without foundations, but idle they are not, I am sure; for when we come to consider the agents by which the physical economy of this, our earth, is regulated, by which this or that result is brought about and accomplished in this beautiful system of terrestrial arrangements—we are utterly amazed at the offices which have been performed, the work which has been done, by the animalcula of the water.

But whence come the little calcareous shells, which Brooke's lead has brought up in proof of its sounding from the depth of two miles and a quarter? Did they live in the surface waters immediately above? or is their *habitat* in some remote part of the sea, whence, at their death, the currents were sent forth as pall-bearers, with the command to deposit their remains where the plummet found them?

In this view, these little organisms become doubly interesting. When dead, the descent of the shell to its final resting-place, would not, it may be supposed, be very rapid. It would partake of the motion of the sea-water in which it lived and died, and probably be carried along with it in its channels of circulation for many a long mile.

The microscope, under the eye of Ehrenberg, has enabled us to put tallies on the wings of the wind, to learn of them somewhat concerning "its circuits."

Now, may not these shells, which were so fine and impalpable that the officers of the Dolphin took them to be a mass of unctuous clay—may not, I say, these, with other specimens of soundings yet to be collected, be all converted by the microscope into tallies for the waters of the different parts of the sea, by which the channels, through which the circulation of the ocean is carried on, are to be revealed?

Suppose that the dwelling-place of the little shells which compose this specimen from that part of the ocean be ascertained, by referring to living types, to be the Gulf of Mexico—and of that from this part of the ocean, the regions about Cape Horn—of another, the Arctic Ocean, &c. The *habitat* and the burial-place, in every instance, we will suppose are far removed from each other. By what agency, except through that of currents, can we suppose them to come from the place of their birth, and to be transported to that of their burial?

It is in vain to attempt to answer the *cui bono* in all the bearings of facts like these. Suffice it to say they are physical facts; and in them, therefore, there is knowledge. They are facts that concern our planet, and touch the well-being or the rightly knowing of its inhabitants; and, therefore, renewed attention to this subject of deep-sea soundings, and the specimens of the bottom that may be brought up, cannot fail to be regarded but with increasing interest.

There is something peculiarly attractive and interesting about the mysteries of the sea. There is a longing desire to know more of them.

Man can never see, he can only touch, the bottom of the deep sea, and then only with the plummet. Whatever it brings up thence is to the philosopher matter of powerful interest; for by such information alone, as he may gather from a most careful examination of such matter, the amount of human knowledge concerning nearly all that portion of our planet which is covered by the sea, must depend.

Every specimen of bottom from the deep sea is, therefore, to be regarded as a valuable contribution to the sources of human knowledge. And it is, in the judgment of right-minded men, a glorious privilege to have an opportunity of increasing the stock of human knowledge.

As it regards the subject before us, the officers of the American Navy are peculiarly favored.

They especially have the means and implements for sounding the ocean in its greatest depths, for collecting specimens from its bottom as well as from its surface, and for trying its currents and its temperatures both at and below the surface.

The means of doing this are not only placed at their disposal by an enlightened government, but it is by that government made their duty, as I am sure it will be their pleasure, to use them.

I hope soon to have this interesting department of the physical geography of the sea enriched, not

only by specimens of bottom and soundings, but with various other materials and data collected by our ships afloat in the Indian and Pacific Oceans, the China Seas, and elsewhere.

PHYSICAL CHART OF THE SEA.

There is contained in the abstract logs kept for this office, a vast amount of information concerning various phenomena of the air and water.

This information may be called miscellaneous; inasmuch as it relates chiefly to subjects that, though interesting enough, yet do not constitute special objects of consideration; indeed, they are such generally as do not as yet come under any one of the various heads of research.

Among these, I may mention observations and remarks concerning gales of wind; notices of drift-wood, icebergs, and sea-weed; hailstorms, and tide-rips; flying-fish; colored water; phosphorescence of the sea, and the like.

The officers, who are engaged in examining the logs and co-ordinating from them, are required each one to keep a memorandum-book by him, in which he notes and refers to all such subjects, when mention is made of any of them in the logs.

These little memorandum-books have suggested the idea of constructing a physical chart of the ocean, to illustrate some of the principal phenomena and subjects that are visible on its surface.

Each officer, as he examines the log for the special object which he has in view, is now to keep by him a blank chart, upon which he is to put down by symbols, ice, sea-weed, flying-fish, &c. in the place where the abstracts report them. Thus, it is proposed, should the results when grouped together be found sufficient, to construct what may be called, in some sort, a topographical chart of the surface of the ocean.

GALES OF THE GULF STREAM.

Lieut. B. S. Porter has been engaged in constructing, for the last two years, Track Charts. During that time, and in the course of these labors, his attention has been called incidentally to the subject of storms as reported in the logs, particularly to the August storm of 1848, and to the September gale of 1852.

The abstracts afford quite a mass of information concerning these two gales, which he has carefully collected, and which, with some remarks of his own, he has kindly laid before me. I quote them:—

"So much has already been said upon the phenomena of gales, that little, it would seem, was left to say which can add to our knowledge of this subject; but that the accounts of disaster and shipwreck which we daily receive fill the mind with amazement, and call for an investigation of the cause. That investigation I have made, and I trust not without some success which will be of profit to seamen. The data upon which the charts have been constructed, representing these gales, was obtained from the log-books sent

to this office, which my duties in the construction of the *Wind and Current Charts* gave convenient opportunities to consult. The improved system of observation, and the care with which those log-books are kept, as also the interest felt by seamen in collecting information in regard to the phenomena of the ocean, placed me in possession of data which heretofore was entirely omitted, and essential to an investigation of this kind; so that nothing now seems wanted to insure satisfactory results. In my work upon the charts of the North Pacific Ocean, from the longitude of 110° E. to 140° E., I could not fail to observe that the action of the winds, along the eastern coast of China, during a gale, was the same as I have found it in corresponding parallels on this coast. We have the same conditions, and the gale travels the same course; this being the case, the conclusions in respect to the gales of the North Atlantic favor like conclusions of those of the North Pacific; if so, the observations of the weather on this coast will serve for the navigation of that coast.

But the field of my observation is not there, it is in the Gulf Stream, the great thoroughfare of commerce, and known to seamen as the most tempestuous part of the Atlantic Ocean. The amount of shipwreck and disaster there, in the month of September last, is perfectly appalling—for two months, the Commercial Intelligence of the port of New York, was filled with the accounts of wrecks committed by the gales of the 7th and 14th of September; and several vessels which sailed from the West Indies, about the time of those gales, remain to be heard from. The question is, how are we to account for this, and what is the remedy? I am convinced that many disasters are owing to a want of confidence in the barometer, arising from apparent inconsistency in its indications, with the phenomena of the weather. Thus, it is generally understood, that a *rising* barometer, is an index of *fair* weather; but there are certain circumstances under which it is the *precursor* of *foul* weather. Another cause of error is, in the prevailing belief that all gales are of one character; if this was so, the rules which have been furnished would be all that is necessary, but in the gales under notice they do not apply. By this, I do not mean to impute any deficiency to the rules of rotary gales; on the contrary, it is by consulting them that we give them an existence, and are able to distinguish one gale from another; they should be to the sailor what his compass and chart are, always before him, ready to be used upon all occasions of stormy weather. The veering of the wind, when in accordance with those rules, will indicate that the gale is of a rotary character; when they do not agree, I conclude it is of a different character.

In looking at the course which these gales have taken, it is apparent that they follow the Gulf Stream, from the beginning to the end, at every curve; some consideration, therefore, must be given to local influence, as whether it affects the character of the atmospheric phenomenon in question or not? The two atmospheres which border upon the Gulf Stream differ in temperature at times twenty degrees; and from the evidence which observation affords us, in nearly every day experience, all atmospheric disturbance originates from this cause; or perhaps it is only one of the causes. Electricity and magnetism may combine. Electrical phenomena, we learn from an examination of the log-books, is continually exhibited in one form or another, in the Gulf Stream; it is there that clouds and rain chiefly collect, and fogs and vapor.

In calm clear weather, heat lightning continues throughout the night; and when clouds form, and condensation takes place, the electricity is of a very striking character. This is more remarkable when a southerly wind blows, of high temperature, and high dew-point qualities, which the southwest winds, from the Gulf of Mexico, always possess. A loss in temperature of only a couple of degrees, will produce condensation when this wind blows. This fact I have from high authority, who, I cannot positively say, but I think Mr. Espy. As the Gulf Stream imparts a high temperature to the atmosphere, in contact with it, it is lighter than that on its northern side. In this respect, the cold atmosphere acts as a limit to the southwest wind, and the Gulf Stream as a channel. Here, the same phenomenon of atmospheric pressure is exhibited which we find on entering the tropics. The barometer in the tropics, or in the region of the trade-winds, falls, and on entering the Gulf Stream (for instance, from New York), it invariably falls, as their log-books show; and vessels when keeping the stream, on the passage from this side of the Atlantic, hardly ever have a steady barometer, twelve hours any day in the passage. An instrument so keenly sensitive as the barometer is to the least disturbance of the atmospheric pressure, cannot be too highly appreciated in a locality subject to momentary changes, which are remarkable for their violence. The weather on the north side of the Gulf Stream, when compared with that in the stream, and along the southern edge, is of a much milder character. The seas in the stream are terrific during a gale; opposite currents operate to break the direction given them by the wind, when a concussion takes place, causing them to run in all directions, while their height is the result of the diminished pressure of the atmosphere. This, and all the other characteristics of bad weather, such as rain, thunder, and lightning, make the north side of the stream preferable, during a gale.

As a knowledge of the indications of the weather about the Gulf Stream is important to seamen, who navigate without a barometer, or who have not much reliance upon it, a few observations may not be out of place. These conclusions are drawn from a comparison of a large number of observations, taken from the log-books, in which I have not met with what I can call an exception; I consider them, therefore, as sufficiently established to regard them as fixed facts, from which the navigator may determine the weather that he is to encounter. When a southerly wind springs up, and rain soon follows, it is a sure indication of a falling barometer; and if standing towards the stream, with increasing appearances of bad weather, he should not be at a loss to know how it will terminate; for, when the rain comes, the change of wind will soon follow. The rain always precedes the change, and unless it rains (in a gale from the south), it is not apt to be serious. By knowing the approach of rain, we know also that the storm is approaching. This can be ascertained by observing the dew-point several times during the day. The following method is given by Mr. Espy: "Take two thermometers which agree, or allow for the difference—cover one of them with a wet white rag, and swing them simultaneously in the air (for it will not do to let them be at rest), unless the wind is blowing fresh; when it is discovered that they cease to change by swinging, take 103 times their difference and divide it by the wet-bulb temperature, and subtract the quotient from the temperature of the naked bulb—the remainder will be the dew-point." Of the apparent inconsistency in the

action of the barometer,* which has at times led seamen into error, I would remark that, in the gale of 1852, before the wind set in from the N. E., the barometer ranged unusually high, and fell as the gale came on, while with a N. W. gale the barometer *rises as the gale increases.* Sometimes it *rises very suddenly*, and *falls very suddenly after the rise;* usually, in this case, a shift of wind takes place almost simultaneously with the fall, an instance of which is given in the following extract from the journal of the English vessel Alarm, bound from Barbadoes to Antigua. Alarm, July 10.—Wind N. E. and lightning in the eastward; force of wind 4 to 7; weather looking very wild, gale increasing steadily. Lat. at noon 16° 5′ N., long. 60° 55′ W.; barometer 29.92. At 2 P. M. the wind suddenly shifted to west, and in an hour the barometer fell from 29.95 to 29.57, and the wind began rapidly to increase in violence, shifting at 3 A. M. to S. S. W., and veering by 9 A. M. to south, remaining in that direction until midday, when its force was at its height 10, and barometer 29.60, with an irregular sea. Lat. at noon, 11th, 16° N.; long. 59° 57′ W. P. M., wind began veering to S. E. and abating; by 5 P. M. wind had veered to S. S. E., and by 11 P. M. to S. E., decreasing, and weather clearing."

This is a case similar to that of the I. R. Gardner, in the gale of 1848; both vessels were in front of a storm, and though sailing in different directions—one to the north and the other to the south—they experienced the same shift of wind; and the barometer on board of the Gardner must have rose also. It is to be inferred so, at least, from the remark in her journal, on the morning of the 25th of August, when it was observed: "At 5 A. M. the barometer began to fall; at half-past seven A. M. it stood 29.30; at 9 A. M. the wind had shifted to the N. W. in a terrible hurricane."

Sailors do not often notice the barometer when it ranges high, whether the weather be fair or foul; they consider that, so long as it stands high, they have every security for carrying a heavy press; the sudden rise is consequently unheeded or misunderstood. The importance of observing all fluctuations must be obvious to every one, particularly in the tropics, where the atmospheric disturbance begins. In the higher latitudes, I have never found the wind to shift suddenly from a *high barometer* to a *falling one;* this is owing no doubt to the spreading out of the storm; it however happens that, after blowing from the south with an extremely *low* barometer, the wind will shift suddenly to a *northern* quarter and blow much harder with a *rising* barometer than it did with a *falling* one. The north wind being of greater density, comes with greater violence, and at the same time causes a rise.† The *rise* which takes place in the

* "*Ship Silas Richards,* James Welsh, commander, bound from Baltimore to Liverpool.—Feb. 9. Lat. at noon, 45° 38′ N.; long. 38° 37′ W. Begins a gale from S. W.; at 2 P. M. it hauled suddenly to the N. W. and moderated, but the barometer fell 2.10. Reefed the foresail. At 7 P. M. moderate weather and clear; barometer up suddenly to 29.70; shook out the reefs of the foresail, and close-reef main-topsail. Up to midnight, moderate, and barometer rising. At 1 A. M. it came on to blow one of the heaviest gales that I ever saw from the west, for about three hours, with hard squalls, and this with the barometer rising. Ends more moderate, with a high sea. The freak of the barometer during this wind is rather a new one to me; I will place less implicit reliance on it hereafter. For about two hours, the wind blew furiously; taking in sail was out of the question, so I kept her before the wind and sea with the main-topsail settled on the cap, whole foresail, and close-reefed fore-topsail."

† "*Ship Guy Mannering,* February 26, 1851.—At the time, the falling of the mercury and the appearances of the weather indicated an approaching gale; the wind continued quite moderate; and, previous to its beginning to blow, the mercury was observed to be steadily rising again, and, as the sky to windward was again looking clear and settled, no danger was anticipated, and additional sail

front of a storm, is one which seamen should be very cautious of, as a sudden rise then is as much a departure from the natural conditions of the atmosphere as a fall is; it indicates a disturbing cause. The case of the Alarm is evidence in point; her barometer rose from 29.92 to 29.95, and in an hour fell to 29.57, nearly four-tenths of an inch. A correct solution of the cause of *this rise*, would be a great satisfaction to seamen, and until it is explained, I fear that the barometer will be regarded in no better light than it is at present;—whereas, it is the mirror of nature—where nothing lies secret of her operations in the atmosphere.

The gale of 1848 originated in the tropic east of the West Indies—so did that of 1852—and they seem to derive their course from the surface-winds, both in and out of the tropic. About the parallel of 30° N., where the S. W. wind is the surface wind, they move to the N. E. In the tropic, they move to the N. W. between the two trades, in the direction which the atmospheric pressure decreases. This diminished pressure follows, too, the course of the sun, as the trades do; the S. E. trade moving north in the summer, this *belt of diminished pressure* is pushed back, as, likewise, the N. E. trade. Hence, wherever the calorific effects of the sun are the most active in giving circulation to atmospheric currents, that seems to be the course of the storm; and where the atmospheric currents of the northern hemisphere meet in their passage from the equator to the poles and the poles to the equator, those localities are more susceptible to interruptions of bad weather than any others. In fact, the intermediate parts of the ocean present none of the phenomena which characterize the tropic and the Gulf Stream. The diminution of atmospheric pressure connects the character of the weather in the two places, and, operating as a pathway for the storm, it would seem that an Infinite Wisdom had established it in relation to other winds of the ocean, that all should be in harmony with one system, which weigheth out the winds, and gives to each hemisphere its due share according to the time and season. When the "east wind is scattered,"* it causeth the dry season to give place to the stormy and rainy.

With a view to account for the mysterious phenomenon we are endeavoring to explain, the possibility is suggested that the velocity of the wind from the poles to the equator would be increased by a sudden diminution of the atmospheric pressure at the equator, or a violent rush might take place, and, where the winds met, produce a whirl. In this case, only one part of the gale would be a whirl, and this about the centre. There is here an evident real cause, acting in the right direction.

I have seen it stated, in proof of the existence of whirlwinds in the northern hemisphere (termed rotary gales), that *waterspouts and whirlwinds* had been seen to revolve, "against the hands of a watch," the

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made. During the whole time of the gale, which blew for eight or ten hours with great violence, carrying away the fore and mizzen topsails, the latter sail being close-reefed, and the former in the act of close reefing, the mercury continued to rise.

"N. B. It was fully eight hours from the time that the mercury began to rise, during which time the winds were quite moderate, and even light at times, before the gale came on. At 10 A M. passed the ship Shannon, with loss of cut-water and head geer, foresail, mainsail, spanker, and fore-topsail. Winds in the first part southeast to east, moderate; middle and last northeast to north, heavy gale. Lat. at noon, 40° N.; long. 67° W. Barometer at noon, 29.8."

* Job, xxxviii. 24: "By what way is the light parted, which scattereth the east wind?"

same way which the gales revolved. If that can be taken as evidence, some must revolve in the opposite way, as will be seen by the following notice of one:—

"*Ship Plymouth Rock*, October 17, 1852.—First part, smart squalls of wind and rain, and sometimes hail. At 5 P. M. a whirlwind passed us, not a ship's length off, making a noise like the long blowing of a whale. It passed very rapidly, whirling with the hands of a watch. Middle and latter part moderate, with passing clouds and occasional showers. Lat. 43° 2′ N.; long. 62° 22′ W. Barometer, 29.90; winds W., W. by N., and W. N. W."

I have also heard it urged in proof of the existence of that class of gales, that the centre must be a calm as the consequence of a whirl. Here we have a report in which the centre passed directly over the ship and no calm:—

"*U. S. Ship Erie*, Sept. 24, 1848.—Wind from the S. S. E. for several days; gale gradually increasing and barometer falling; experienced a sudden shift from S. S. E. to N. N. W., and as suddenly back to S. S. E."

This was a gale of great severity, strewing wrecks everywhere along its path; the Erie was much crippled. I am of opinion that the calm in the centre of a gale is caused in the same way that the equatorial calms are between the two trades.

As regards the direction of the wind, or its mode of action in gales along our coast, there is a great difference of opinion; but among some of the intelligent and experienced seamen of the European trade, the opinion is that in the summer, and even in the winter, the winds on the opposite sides of the Gulf Stream, where it runs to the east of N. E., blow from opposite points; and this is so well an understood fact, that the voyage, both forward and back, is performed entirely with reference to the advantage which those winds offer. It is in accordance with this fact that I propose to consider the gales of the Gulf Stream. Before doing this, I wish to add in evidence, a letter I had the good fortune to meet with while in search of data for the gale of 1848. The circumstance under which it was written, one of those social meetings sailors occasionally have to talk over—the incidents of their voyages, will give it an interest, and commend to the notice of seamen, a mode of obtaining information useful, among themselves, and of great benefit to science. It is from the pen of Captain James Welsh, of the ship Silas Richards:—

"*Silas Richards*, Sept. 6, 1848.—Since we have left the vicinity of the George's Bank, we have had regularly, during the day, the wind from the northward, and clear. A ship working along inside the gulf could have done well by standing during the day to the south and west, and back to the northward with the squally westerly wind at night. That southerly winds prevail on the southern edge of the stream, where it runs to the east of N. E., every seaman knows. On the southern edge it rains pretty much day and night, with squalls, and every kind of bad weather. Two years ago last December, I was in company, at our hotel in Liverpool, with Captain James Rathbourn, then of the packet ship Oxford, since washed overboard in command of the packet ship Columbia, winter before last. We arrived about the same time, he before me; and, sailor-like, were talking over our passages; I from Baltimore, he from New York. I spoke of a very heavy gale that I had in the latter part of November, from south; which, after blowing exceedingly heavy for eight hours, hauled to the W. S. W., and moderated down to a decent

gale; before which, and keeping the line of the middle of the stream, had scudded for several days smartly and comfortably. We compared notes—he was one hundred and seventy-five miles north of me, due; at the same time that I had the gale from south, he had a gale from north; which, after eight hours, backed to the N. W.; he went along snugly on his course, crossing the Banks in 43° 30′, and had better weather than I had farther south." From the positions of these vessels, it is perfectly plain that this gale does not answer to the character of the rotary gale. In the rotary gale, in order to have the wind as they had it, their bearing would be due east and west. On the 4th of the same month, Captain Welsh remarks: "Fine, clear, strong breeze from the north; under our lee, dark, lowering, squally-looking weather. I should like to know how the vessels fifty miles S. S. E. of us have had the wind and weather the last twenty-four hours."

It is much to my regret that I have not been able to find a vessel to answer exactly to this bearing; but the ship Columbia, in that direction, forty-eight miles due east, has the wind N. N. W., fresh, squally, and cloudy, with barometer at 29.75. The weather which Captain W. here observes, reminds me of that I observed in the U. S. brig Pioneer, in October, 1844, while off Cape Hatteras; and I take occasion to notice it as illustrative of the effect of those antagonistic forces—heat and cold, which are ever in operation about the Gulf Stream. Our vessel was on soundings, where we could distinctly trace the line of demarcation between the stream and the inshore waters. The whole face of the heavens east of us was spread with a black mass of clouds, stretching N. E. and S. W., directly over the stream, and the lightning an incessant blaze, with sharp rolling thunder; the clouds swept rapidly before a strong S. W. gale, and lower than I ever saw them—when the lightning illuminated the scene, playing in the deep hollows of the sea, as we have seen thunderstorms among mountain gorges; it was full of grandeur, and, contrasting with our own position, brought to my mind that allusion in Scripture, which seems to apply so entirely to the wonderful purpose of the Gulf Stream: "Hitherto shalt thou come, but no further; and here shall thy proud waves be stayed." There, only a few miles distant, raged the storm and the ocean—here, was entire harmony.

In the foregoing remarks, I have endeavored to draw the attention of seamen to those important facts which indicate the weather, and forewarn its approach. If I have at times deviated from this, to give place to a sentiment inspired by the works of nature, it was an indulgence which the facts might fully justify without detracting from the interest. I have drawn as little from my imagination as possible, and courted no theories; if the form in which the information is expressed proves useful, I shall have accomplished my object with much gratification.

Data for the Gale of 1848.

"*Brig Sarah.* August 20.—Steering to the N. W., had a fresh gale from N. E. Lat. at noon, 16° 32′; long. 53°18′ W. Between the 20th and 23d, the wind veered to S. E. with the sun.

August 23. Winds still S. E. Lat. 20° 49′; long. 59° 00′ W.

August 31. Wind S. to S. W. All the night lightning from the N. W. to N. E. At 6 A. M. took a squall from W. S. W.

September 1. Wind W. and light, with a heavy sea from the N."

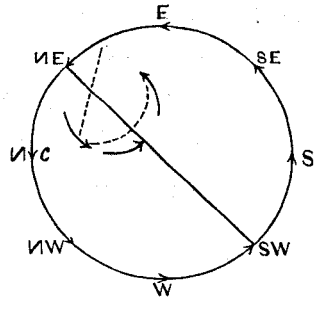
"*Bark I. R. Gardner.* August 24.—4 P. M. the wind commenced to haul from W. round to N. N. E. Lat. at noon 23°41′; long. 73°12′.

August 25. Course S. S. W.; at 6 P. M. Atwood's Key bore S. by W. ten miles. At 10 P. M. a great part of the S. and S. W. sky became dark, with heavy flashes of sheet lightning, and heavy, distant thunder. At 5 A. M. kept away for Mayaguana Island passage. At 6 A. M. the barometer began to fall; sent down yards, and housed mizzen topmast, and made ready for a hurricane. Commenced to rain and blow very heavy, with a terrible sea on. At 7 hours 30 minutes A. M. barometer 29.3. At 11 A. M. 29.00. The wind at 9 A. M. had shifted to the N. W. in a terrible hurricane. Near to the Island of Mayaguana; from the vessel running S. by W. kept off to the S. and E. to bring to on the port tack, and got round, head N. N. E. Vessel now under bare poles, and getting head up to the old sea—vessel run bow under, cut away head booms to ease her, which made a great difference, keeping head to wind, and no plunge into the terrible sea which now agitated the ocean. Wind kept hauling more to the W.; at past noon of the 25th, commenced to lull, and seemed past its dreadful height.

August 26. Hurricane from S. W., and heavy rains. At 1 P. M. weather getting more moderate. At 1h. 30m. P. M. barometer up to 29.2, and after that, kept going up very fast to 29.6, and the sea smooth and regular. At 5 P. M. it broke away in the southern quarter, set reefed foresail, and wore to the east, blowing a gale from S. S. W. At 4 A. M., wind S. E., stood to the S. S. W."

It should be noticed that the I. R. Gardner was running directly before the wind, towards the cloud, which is moving to the N. W. at right angles with the wind. As soon as the cloud reached her, the wind shifted to the N. W. This occurred while the barometer was falling.

In the rotary gale, with the wind N. W., her barometer would be at its lowest mark, and begin to rise when the wind veered west; but it continued falling for two hours after the shift, until the wind was at S. W., which was the hardest part of the hurricane; and the gale should have left her at this point; whereas, it veered to the S. E. Now, in the circular gale, we have *c* for the cloud, and the dotted line for the ship's course towards it, meeting the wind at the arrow. At this point, her distance from the centre would begin to increase, the centre at this time bearing N. E.; consequently, the barometer ought to have indicated a rise, unless the progressive motion was suspended, and it revolved in one spot. In this case she would be the same distance from the centre, where the arrow touches the line of progression, and the barometer, at the same height. But we know that it had a progressive motion of fifteen or twenty miles per hour.



Again, if we continue the course of the vessel to the S. E. point of the circle, there is no way in which the vessel could get there unless the progressive motion ceased; here, then, the centre would bear S. W.; but at this time it was near the Bahama Bank, bearing N. W. It follows, then, from the direction of the last wind, viz: S. E., that the wind from N. E., N. W., and S. W., blew towards the centre of the storm, and when the wind was at S. W. she was the nearest to the centre, at which time the barometer was lowest;

and from that point it kept rising, plainly showing that it had a progressive motion, which the observations confirm. As the equilibrium was restored, the wind veered into the usual trade-wind.

"*U. S. S. Marion*, Sept. 1. 8 P. M., lat. 42° 40′; long. 42° W.; under royals, with a fine steady breeze from the S. W.; sky perfectly clear, and barometer 29.95, with a S. W. swell. 10 P. M., wind increasing, it became necessary to shorten sail, until at midnight the topgallant sails, mainsail, jib, and spanker had been furled, and three reefs successively taken in the topsails. At this time the barometer stood 29.85, with the sky still free from clouds of any description.

At 2 A. M., Sept. 2, the wind had increased, when the topsails were close-reefed; the ship, however, continued on her course; the clouds now commenced rising in the S. W., and scudding rapidly in a N. E. direction. At 4 A. M. barometer 29.80. At daylight, every appearance of a strong gale; clouds in different strata flying in different directions, the sea running higher and higher, and the barometer gradually falling. The ship was hove to on the port tack under close-reefed foresail, topsails, main trysail, mizzen storm spanker, and fore storm-staysail; head up to W. S. W. and off to west; the wind, consequently, at this period of the gale, was about S. S. E. (S. E. as corrected for variation). At 8 A. M. it commenced raining, while the gale appeared on the increase; and during the forenoon, as there was every indication of its continuance, the ship was made as snug as possible, by sending down light yards, housing topgallant masts, and furling topsails. At noon Saturday, Sept. 2, lat. 42° 53′; long. 43° 40′; barometer, 29.25. The gale appeared to be gaining additional force from occasional squalls of wind and rain. At 12 hours 30 min., however, much to our surprise, the wind died completely away. The weather assumed a more favorable appearance, and the ship was left entirely without steerage way, and at the mercy of a most tremendous sea. This condition of things lasted about thirty minutes, during which time the barometer fell from 29.25 to 29.5, and then rapidly to its alarming minimum, 28.63."—Extracted from the remarks of R. W. Schufeldt, Acting Master, U. S. Navy.

The situation of the Marion must certainly be a new one, inasmuch as a similar case has never come to our knowledge, of the wind veering from S. W. to S. E. in a rotary gale, and the gale moving to the N. E. It is one too of extreme danger on all sides—first, the danger of springing the masts by heavy rolling, which induces sail to be made if there is the least wind, and favorable appearances. Secondly, that with a topsail on the ship—such is the violence of the wind—she will go over before the sail parts, and lying in the trough of the southerly swell, would swamp immediately.

Under such circumstances, every seaman will consult his barometer before he makes sail. This case suggests a great caution to be used in carrying sail with a falling barometer, and wind veering S. E.

If this gale had been a "whirlwind," then, when she had the wind at S. W. the centre bore N. W., and it ought to have been passing east of her, and the wind veering west. Had the gale been perfectly stationary, she would have passed west of it by her own rate of sailing; but give it the velocity which it really had, of forty miles the hour, at an angle of 45° degrees with the course the vessel made, it seems impossible to assign her a position so as to bring the centre to bear S. W. after having bore N. W.

"*Ship Liverpool*, New York to Liverpool. John Eldridge Commander.—August 31. Commences

moderate and pleasant; all sail set, and continues so throughout. We have been set one degree to the east the last twenty-four hours. Our latitude yesterday being 39° 56′, and longitude 63° 49′.—To-day it is 40° 25′ and 60° 00′. For the first twelve hours, course E. ½ N. and east, with the winds N. W. and W. by N.; distance run twenty-nine miles. Barometer 29.78. to 29.74.—For the last twelve hours, course east, and E. by S.; wind west. Distance run thirty-seven miles. Barometer 29.71 to 29.70.

Sept. 1. Commences brisk breezes and gloomy weather. At 5 P. M. commenced raining; shortened sail. At 10 P. M. had double-reefed topsails on, and blowing very hard, with rain in torrents, and sharp lightning. At midnight, it blew very hard; furled everything, but close-reefed fore and main topsails. At 6 A. M. the fore-topsail blew away; we stopped the rags for awhile. At 9 A. M. wore ship to the S. E. It blew violently, with a tremendous sea. Ends strong gales and cloudy weather.

No observation; latitude by D. K. 40° 53′; longitude 58° 40′. For the first six hours the course was E. by S.; wind S. W. Barometer, 29.68; distance nineteen and a half miles; the next four hours, the course was east, wind S. S. E.; barometer, 29.48. The next two hours, the course was E. N. E., wind S. E.; barometer, 29.30; distance for the last six hours fifteen miles. From midnight till two, course N. N. E., wind east, barometer, 29.20. From two to six, course N. N. E., wind east, barometer every two hours 29.20—29.10—29.04. At six, 29.04, when the fore-topsail blew away. At 8, barometer 29.10; at 10, 29.14; course S. E., and wind E. N. E. At twelve, noon, barometer 29.20, wind E. N. E., hauling northerly and barometer rising."

In this example, we have the course and distance run, with the corresponding direction of the wind and the changes in the barometer; and the winds and courses cannot be made to agree with the diagram of the rotary gale. The whole number of courses, if reduced to one, make it nearly in a line with the storm. She was on the right-hand side of its path, on the *starboard tack* (according to rule), in which case, she should have *come up*, but was headed off. The Marion was on the same side, upon the *port tack*, and came up. This makes an entire reversion of the rotary rules. If the Liverpool had been moving faster than the storm, then the veering of the wind would have been in accordance with the rule; but, as we know that it travelled at a much greater rate, the veering of the wind was in opposition to it. This change of wind can only happen when the storm has a southeast progression; yet, in the words of Mr. Redfield, "such southeastern course in a great storm of the northern hemisphere, so far as I know, has not yet been established."

"*Barque Marcella.* On the 2d, the wind, which had veered from southwest to south, changed to north-northwest in a hard gale. Lat. 40°; long. 50° 6′."

"*Geneva*, Aug. 30. Had the wind S. W. by S., which, on the 2d of September, had veered to a gale from the south, and suddenly changed to the north in a *furious* gale. Barometer, at the time of change, 29.1. Lat. 30th, 37° 38′; long. 58° 50′. September 2, lat. 39° 30′; long. 56° 20′."

As another instance of hurricanes veering from S. W. to N. E. I have the following notice:—

"*Brig Oliver* (French). Havana, thirty-eight days; bound to Bordeaux; put in here in distress, having, on the 8th instant, in lat. 36° 37′ N., long. 69° W., experienced a hurricane from S. W. to N. E.;

carried away mainmast, fore topmast, sprung bowsprit, stove bulwarks, and received other damage."—*New York Herald* of September, 1853. This is a newspaper report, but as newspaper reports are often so incorrect, I have never placed much reliance upon them. All the data which I have used have been obtained from the log-books, where mistakes are easily detected.

"*Brig Mary Ann*, Sept. 2. Begins with fine weather, wind S. W. Middle and latter parts, heavy gale from southwest, inclining to west, and high sea from west-northwest. Lat. 37° 46′; long. 44° 30′.

Sept. 3. All this day brisk breeze from west to northwest and very heavy swell from northwest. Many land birds and water fowl around. Lat. 44° 23′; long. 45° 15′."

"*Ship Saranake*, Aug. 31. Winds from west to southwest, strong, with heavy squalls. Lat. 43° 46′; long. 36° 50′.

Sept. 1. Southwest winds, moderate and variable. Lat. 44° 14′; long. 38° 50′.

Sept. 2. Winds, first part, south-southwest; during the night, heavy gale from north northwest. Lat. 44° 24′; long. 42° 7′."

"*Bark Kathleen*, Aug. 30. Course to the S. E., with brisk breezes from the south to S. W. Lat. 33° 00′; long. 64° 04′. Barometer, 30.05.

Aug. 31. Wind S. to S. S. W., strong breeze and fine weather. Barometer, 30.00. Lat. 31° 33′; long. 61° 15′.

Sept. 1. Strong breeze from S. W. Barometer, 30.00. Lat. 29° 42′; long. 57° 37′.

Sept. 2. Moderate from S. W. by S. Barometer, 30.00. Lat. 28° 18′; long. 54° 48′."

In this course, the barometer rose with the S. W. wind.

Now let us compare this with the Creole.

"*Creole*, Aug. 31. S. W. and S. S. W. gales, ends W. S. W., light airs with a confused cross sea. Lat. 45° 15′; long. 38° 19′.

Sept. 1. Wind S. W. and foggy—thence to N. and calm; a high rolling sea in all directions. Lat. 45° 25′; long. 38° 45′.

Sept. 2. Wind S., with squalls and rain; by 11 A. M. it veered to N. E. in a violent gale—close-reefed. Lat. 45° 00′; long. 42° 20′.

Sept. 3. Heavy gales from N. N. E. to N. N. W. with rain; latter part from N. to N. N. W. With this vessel it veered from S. W. to N. E., as it did with the Liverpool and Marion. With the Kathleen, it was steady at S. W."

The information which seamen wish most, is that which they can put in practice the moment it is called for. On the approach of a storm, they wish to know what winds may be anticipated from a falling barometer, and how that wind will veer according to the course steered. In Plate X., the diagram for the tropic shows the prevailing winds as surface winds. It must be evident to every one, that, if any other wind appears on the surface, the conditions which sustain the equilibrium of that region are changed, and the barometer must fall. In this case, the upper currents must find their way to the surface; which, according to the diagram for the tropic, will be from the N. W. or W., and the W. or S. W. Now, it is easy to

see how the wind will veer. It must go back to its former condition, as the N. E. and S. E. trade, to restore the equilibrium. On one side it will veer from the west (by the south) to the eastward, and on the other, from the west (by the north), to the eastward. If, then, a vessel be steering to the northward, with the wind S. W., veering westerly and north, she must be crossing the course of the storm (if the storm is travelling in a western direction). It is plain, that his course ought to be to the south as soon as possible, in order to get out of the line of the storm's path. This requires but a short run off of the course to place a vessel beyond the reach of danger; and is certainly worth the sacrifice. The same reasoning holds good on the other side—north side. The diagram on the Plate, for the gale of 1852, represents the surface winds in the higher latitudes.

Data for the Gale of 1852.

The geographical character of this gale is represented on Plate XVII., beginning at the parallels of thirty north, and about seventy-two west, travelling in a N. W. direction towards the Gulf Stream, where it turns to the north and east, and becomes identified with the course of the stream. Due west of this, about the meridian of 80°, appears another gale moving to the N. E. with the wind from N. E. The track of the "United States" separates the two; without her track, many difficulties would have occurred in tracing the one which I have carried out; and as it would be impossible, even on a larger scale, to represent both on the same plate, I have thought it would conduce much more to the interest of the phenomenon, by laying down that portion of it only which marks the distinction. It is remarkable that the distance between the two, on the 29th, is but little over three hundred miles; at which time, and nearly on the same parallel, one wind is from the east, and the other from the west; and by a comparison of the barometrical observations, there appears a diminished pressure on the 29th to the east of the "United States," and a diminished pressure to the west of the Oxford. On the 29th, the "United States" has it blowing towards the Fawn; as this gale passed off, her barometer rises, and the wind turns to the N. E., blowing towards a point of depression somewhere between the positions of the Oxford on the 30th, and the 1st. The heights of the barometer are only put down to point out this feature, my object being as much as possible to avoid a confusion of observations, in order to give a precise and clear understanding of the progress and action of the wind, as vessels were affected by it; to attempt to give every fact, would defeat the design; and as it does not sacrifice any of the information which it is intended to express, I am satisfied it will be found the most convenient for practical use. Vessels not noted on the Chart, are marked omitted. The winds are given by compass. Our first report is from the schooner Fawn, from Baltimore, for Jamaica. "From midnight of the 26th of September, to the 28th, a fresh S. W. wind, and the sea rolling from N. E. and E. N. E.; course to the S. E. Barometer, 30.50—very high indeed. On the 28th, at 2 P. M., the wind suddenly died away. At 4 P. M. it came out from E. N. E. Towards 6 and 7 P. M., the sea came from S. E., and the wind changed from E. N. E. to E. S. E. in a heavy thunderstorm; took in all sail; sea increasing fast; constant lightning observed from S. E. to S. W., of a pale blue color; the sea meeting from all directions, causing the vessel to be very uneasy, and sending columns of spray from thirty to twenty feet high.

At 8, wind increasing; barometer, 30.00. (*During the afternoon, a heavy bank extended from east to* S. W.) At 10 hours 30 min. P. M. hove to under two reefed foresail. At midnight, barometer 29.1. Schooner heading S. by E. and S. S. E. on the port tack, and barometer falling half an inch every three hours. At 9 A. M. wore to the N. E. and furled foresail, blowing violently, and the sea in a most awful commotion, filling the vessel fore and aft. At noon, no change; if possible blowing harder, with torrents of rain. Barometer, 28.00.

On the 29th, continued gales, sometimes little lulls, when the wind would come again with increasing force, wind steady at E. S. E; schooner heading from N. E. to N. E. by E. My wife in the cabin states the barometer still falling. Between 5 and 6 P. M. wind had veered, schooner heading S. E. by E. The change must have been sudden, as I had looked at the compass only about half an hour previous. At 7 hours 30 min. P. M. heading S. S. E., from which hour until 10 P. M. a gradual change took place in the wind, and my wife told me, after I went below, that the barometer had not fallen since 10 P. M., at which time it stood but very little above 27 inches, say one-hundredth. At midnight some clearing seen in the horizon, and it cleared and moderated, in less than half an hour, leaving me with the wind due west. The barometer rose in five hours to 30.5, and rising more, and the wind went round to the ordinary trade. I saw at daylight the heavy bank, and took the bearing; east end, N. N. E.; west end, S. W. by W. I must have been very near the centre, and I consider that I owe my safety to standing to the N. E." It will be observed that, from the 26th to the 28th, it blew fresh from the S. W. The S. W. wind is here the surface wind of the Atlantic Ocean; the sea did not rise with this wind, and the barometer stood extraordinarily high. At the same time that the wind was blowing from the S. W. a heavy swell set from the N. E., indicating a N. E. wind to the N. E. of the vessel. Again, from the bearings of the storm-cloud, it is very evident that it moved at that time to the N. W. In the rotary gale, this line of progression does not explain the veering of the wind from a S. W. quarter to a N. E. quarter. According to Mr. Redfield's statement, we should expect the veering of the wind from the southern or southwestern quarter, to the northeastern, when the storm has a S. E. progression. I refer you to page 366, the third line from the bottom, of the *American Journal of Science*, second series, vol. i. 1846. Such southeastern progression might serve to explain the veering of the wind from the southern or southwestern quarter to the northeastern, which appears in some of the above European reports, and was also found in the extremely violent hurricane of December 12, 1844, in the Eastern Atlantic, in which two of the New York packet ships were lost by foundering, a fact unexampled in the history of our navigation. But such southeastern course, in a great storm of the northern hemisphere, so far as I know, has not yet been established.

Its progress to the N. W. was not far from the Fawn's position, for on the 29th we find it moving to the N. E.

"*U. S. Ship Relief*, Sept. 28, civil time. Wind S. S. W. to S. by E.; force 4. Barometer, 30.12. Weather, blue sky with clouds. Lat. 39° 40′; long. 71° 32′ W.

Sept. 29. During the 24 hours, weather, blue sky with clouds; wind S. by W. and N. E. At 8 P. M. reefed topsails. Lat. 39° 25′; long. 70° 30′.

Sept. 30. First part weather, blue sky, with clouds; wind N. E., force 6. Middle part, weather cloudy, close-reefed topsails, reefed foresail. Barometer, 30.07. Lat. 38° 06′; long. 68° 06′.

Oct. 1. Cloudy all this day; wind N. E., force 7 and 8, with a heavy, irregular sea on, and ship lying-to on port tack. Lat. 37° 49′; long. 67° 08′. Barometer, 29.82.

Oct. 2. All this day weather the same as yesterday; a rough sea from the northward and eastward; wind N. E. and N. N. E.—force, 7 and 8. Barometer, 29.91. Lat. 37° 34′; long. 66° 20′."

"*Ship Iconium*, September 26. At meridian discharged the pilot; wind fresh from N. W.; ship moving heavy, being very deep, drawing 19½ feet water.

Sept. 27. First part fresh from N. W.; last, moderate, with fine weather, ship under all drawing sail; a heavy head beat sea with ripplings. Lat. 39° 33′; long. 71° 41′. Barometer, 29.85.

Sept. 28. Begins with pleasant breezes from the north, middle and last variable; among tide-rips and drift stuff. Lat. 39° 29′; long. 70° 15′. Barometer, 30.00.

Sept. 29. (In the stream.) Begins pleasant, middle and last part baffling to S. W. winds throughout; S. S. E., S. and S. W.; ends calm. Barometer, 29.90. Lat. 39° 50′; long. 68° 45′.

Sept. 30. (In the stream.) Begins calm; at 4 P. M. a sudden change to the N. E., and overcast. Barometer falling; middle part fresh; shortened sail; ends a fresh gale with small rain. At 6 A. M. passed through a body of cold water; no change in color, it being deep blue. Ends with all appearances of a severe gale; ship under double reefs; wind N. E. Lat. 32° 00′; long. 67° 00′. Barometer, 29.00.

Oct. 1. (In the stream.) Begins with a furious gale; ship under close reefs, the sea breaking in upon us in every direction, and the ship making water fast; one pump constantly going. Middle part ship under a close reef main topsail; both pumps going all night with four feet water in the hold. At 6 A. M. all hands came aft, requesting me to bear away for a port, not considering the ship seaworthy. Put the ship before the wind; steering S. W., our decks flooded with water. Stove the bulwarks and quarter boat. Ends a furious gale, ship laboring hard, and all hands, with the officers, at the pumps; wind throughout N. E. Lat. 38° 30′ N.; long. 66° W. Barometer, 28.00." (The situation of this vessel shows the danger of steering to the S. E. in a N. E. gale, with a falling barometer.)

"Oct. 2. (In the stream.) Ship under a close reef main topsail, steering W. S. W. with much rain. At 4 A. M. shipped a sea, which stove the cabin doors and windows, filling the cabin with water; middle part less wind. At 4 A. M. freed the ship, ends moderating; made sail as required, wind hauling northerly from N. E. Lat. 37° 49′; long. 67° 30′. Barometer, 28.05—rising slightly." It will be seen that there was nothing gained by bearing up, but, on the contrary, it was increasing the danger.

The rule in a similar case would be, before the gale has come to a crisis, to stand to the north until the barometer rises. We have authority for this, by referring to the position of the Gallia, north of the Iconium. She, by keeping her latitude, made fine weather. The Iconium, whose barometer is the lowest 28 inches, taken as the centre of the gale, gives the wind at positions N. E. of her blowing towards her, with a mathematical exactness. And the Comet, E. S. E. from her, has the wind on the first and second S.

E. and E.—blowing towards her. In a rotary gale, vessels N. E. of her would have the wind S. E., and those E. S. E. of her would have it S. S. W.

"*Ship Comet*, Sept. 28. Wind light and moderate, with fine, clear weather. Lat. 39° 54′; long. 69° 55′ W. Barometer, 30.13; wind S. S. W.

Sept. 29. Moderate and clear, wind S. S. E. and S. Lat. 40° 00′; long. 68° 00′. Barometer, 30.20.

Sept. 30. Begins calm. Wind sets in from north, veering N. E. and E. N. E.; course to the S. E.; cloudy weather. Barometer now falling. Strong wind, and bad-looking weather. Lat. 38° 10′; long. 63° 15′. Barometer, 30.05.

Oct. 1. Wind E. N. E. to S. E., strong gales, and squally weather; latter part moderating, but not settled. Barometer still falling. Lat. 37° 20′; long. 13°. Barometer, 29.85.

Oct. 2. Wind E. and E. S. E.; strong and heavy gales, with squally, bad-looking weather. Lat. 37° 02′; long. 62° 20′. Barometer, 29.45.

Oct. 3. Wind E. to N.N.E. and N. At 1 P. M. commenced blowing a hurricane, which lasted about four hours, and then settled to a steady strong gale from the north. At 1 hour 30 min. blew the foretopmast staysail from the bolt-rope. At 2 hours 30 min. P. M. the foretopmast went over the side, taking the main-top-gallantmast with it. The ship behaved admirably. Lat. at noon, 36° 43′; long. 61° 40′. Barometer 30.05." Her barometer, at noon of the 2d, stood 29.45; as it was only one hour after that the hurricane commenced, it must have been much lower, though no mention is made of it. When the next observation is made it is at noon of the 3d, when it stands at its former height.

"*Brig Eolus*, Sept. 28. At 12 P. M. sailed from Boston with a fine breeze from N. W. and clear; barometer 30.00. From 6 to 8, wind hauled gradually to N. E.; barometer rises a trifle. Middle part, light airs, and pleasant. Latter part, strong and cloudy. Barometer, at noon, 30 in. (in the stream.) Lat. 41° 35′; long. 68° 25′.

Sept. 29. Lat. 41° 10′ N.; long. 68° 11′. Barometer 30.20; continues strong wind and cloudy. Middle quite moderate; wind hauled to the west; latter part fresh from the N.N.E. and rainy.

Sept. 30. Fresh from the N.E. by N. and rainy. Barometer falls a tenth; middle part strong wind from N.E. and very threatening. Latter part, wind increasing. Lat. 39° 25′; long. 67° 03′. Barometer, 30.10.

Oct. 1. Wind strong with a high sea; middle and last part the same, with increasing wind from E.N.E. Lat. 38° 05′; long. 66° 17′. Barometer, 30.

Oct. 2. *In the stream*, with a furious gale from E.N.E. and bad sea. Lat. 37° 43′; long. 63° 35′. Barometer, 29.8.

Oct. 3. Heavy gales and high sea. Barometer rises one-tenth, middle part wind moderate, and hauls north. Latter part fresh gales from N.N.E. and very gusty. Lat. 37°; long. 60° 32′.

Oct. 4. First part fresh gales from N.N.E. and squally; middle part the same; latter part, light and clear. Barometer, 30.2. Lat. 36° 40′; long. 59° 56′.

"*Bark Annie Bucknam*, Sept. 27. 1 P. M. passed the light-ship, good breezes and pleasant. Barometer, 29.8; winds N. W. N. and N. N. W. Lat. 38° 57′; long. 70° 12′.

Sept. 28. Fresh breezes and cloudy—all sail set. Barometer, 30.00; winds N. N. W., E. N. E., E. N. E. Lat. 36° 56′; long. 67°. Crossed the Gulf Stream without experiencing any perceptible easterly current.

Sept. 29. Lat. 35° 28′; long. 64° 52′. Barometer, 29.9; wind fresh from E. N. E. to E. S. E., S. S. E. to S. S. W. At 5 A. M. tacked to the eastward, latter part quite moderate.

Sept. 30. Light and baffling, with showers; latter part strong breezes from E. to S. E. by S. First and middle part from S. W. to W. and N. to E.; barometer, 29.8. Lat. 35° 12′; long. 63° 08′.

Oct. 1. Hard breeze with rain, two reefs in middle; and end moderate and pleasant. Lat. 35° 17′; long. 60° 16′. Barometer, 29.9; wind S. S. E., S. by E., S. by W."

"*Bark Francis*, Sept. 25. Light breezes and pleasant; winds from the E. S. E., S. S. W. and S. E.; barometer, 29.8. Lat. 20° 10′; long. 53° 47′.

Sept. 26. Cloudy and squally weather; wind from S. to N. and E. N. E. light, S. W. fresh. Lat. 22° 27′; long. 55° W. Barometer, 29.7.

Sept. 27. Winds light and pleasant from E. S. E. Lat. 24°; long. 56° 5′. Barometer, 29.7.

Sept. 28. Winds E. S. E. first part light, latter fresh. Lat. 25° 33′; long. 56° 53′. Barometer, 29.9.

Sept. 29. Wind throughout E. S. E. fresh and pleasant. Lat. 27° 34′; long. 58° 31′. Barometer, 29.9.

Sept. 30. Wind first part S. E. light, latter part S. S. W. and cloudy. Lat. 22° 04′; long. 59° 40′. Barometer, 29.9.

Oct. 1. Winds S. W. fresh throughout and cloudy. Lat. 31°; long. 60° 41′. Barometer, 29.9.

Oct. 2. Heavy gales and squally, with heavy sea from northward. Wind, first part, S. W.; middle, W. S. W. heavy; last, W. heavy. Lat. 33°; long. 61° 47′. Barometer, 29.6.

Oct. 3. First part, wind W. N. W. light; middle part, N. N. W. light; last part, N. E. light and squally. Lat. 33° 30′; long. 62°. Barometer, 29.6."

"*Ship Element*, Sept. 25. Brisk breezes, and cloudy; a rough chop sea on. Wind N. N. W. and N. Lat. 29° 08′; long. 65° 10. Barometer, 29.85.

Sept. 26. Light airs and calms, with a heavy rolling swell from N. N. E. Lat. 29° 31′; long. 66° 16′. Barometer, 29.85.

Sept. 27. Light airs and fine weather; heavy northerly swell. First and third part calm; last, wind S. E. Lat. 29° 49′; long. 66° 49′. Barometer, 30.

Sept. 28. First part, light breeze; latter part, fresh and cloudy. Winds S. E. throughout. Lat. 30° 58′; long. 68° 02′. Barometer, 29.90.

Sept. 29. Brisk breezes, and dark, cloudy weather; heavy swell. Winds S. S. E., S. E., and N. E. Lat. 32° 20′; long. 69° 10′. Barometer, 29.90.

Sept. 30. Strong breezes, and squally weather, with thunder and lightning. Winds N. E., E. N. E., and N. by E. Lat. 33° 47′; long. 71° 04′. Barometer, 29.80.

Oct. 1. First part, heavy gale; last part, moderate. Wind N. throughout. Lat. 34°; long. 72° 37′. Barometer, 29.40.

Oct. 2. Begins strong breeze and cloudy; ends strong, with high sea. Winds N. by E., N. E., and N. E. by N. Lat. 34° 34′; long. 72° 53′. Barometer, 30.

Oct. 3. First and mid parts, strong breeze; latter parts moderate. Winds N. N. E. Lat. 35° 54′; long. 73° 54′. Barometer, 30.10."

"*Steamer United States*, from Kingston to New York, Sept. 25. At Kingston. Wind N. W., N.; light breeze and calm.

Sept. 27. Wind fresh from N. W., and clear. At 6 P. M. left Kingston. Barometer, 29.7; air, 81°; water, 83°; current west, 1 knot. Lat. 19° 32′; long. 74° 50′.

Sept. 28. Winds fresh from N. N. W., N., and N. W., and squally. At 6 hours 45 min. P. M., Cape Mayse bore west five miles. At midnight, the west end of Great Inagua bore east four miles. At 8 hours 30 min. A. M., west end of Mayaguana, N. E. five miles. At 11 A. M. passed S. S. Sierra Nevada, hence for Aspinwall. Meridian, strong N. W. and squally. Lat. 22° 52′; long. 73° 18′. Current, W. S. W. 1; barometer, 29.7.

Sept. 29. Winds from N. N. W., N. W., and W. N. W.; strong and squally, with a heavy head swell; washed out the head-boards. Lat. 26° 8′; long. 73° 28′. Barometer, 29.50; air, 81°; water, 80°.

Sept. 30. Strong breezes and squally, with a heavy swell. Wind N. W. and N. Lat. 29° 24′; long. 73° 36′. Barometer, 29.70; air, 78°; water, 79°.

Oct. 1. Winds N. N. W., N., and N. N. E.; strong and clear, with a very heavy swell from N. N. E. At meridian, strong from N. N. E. and cloudy. Lat. 32° 53′; long. 74° 7′. Barometer, 29.8; air, 72° to 77°.

Oct. 2. Winds strong from N. N. E. and clear, with heavy swell. At 10 P. M., entered the gulf, in long. 74° 15′; at 8 A. M. came out in 74° 17′. At meridian, strong breeze and heavy swell from N. E. Lat. 36° 19′; long. 74° 18′. Barometer, 29.9; air, 67°; water, 67°.

Oct. 3. Strong breeze from N. and clear. At 2 hours 30 min., made the light-ship on the five-fathom bank. At 11 A. M., passed Sandy Hook. Winds throughout, N. N. W., N., and N. E."

"*Ship Anstis*, Sept. 29. Light breezes; wind S. E., S., W. Lat. 36° 56′; long. 75° 09′.

Sept. 30. First part, fresh; latter part, a gale. Winds, N. N. W., N. E., S. E. Lat. 36° 05′; long. 72° 16′.

Oct. 1. A gale of wind. Lat. 35° 27′; long. 70° 30′. Winds, N. N. E. throughout.

Oct. 2. First part, a gale; latter part more moderate. Lat. 35° 47′; long. 68° 43′. Winds N. N. E. throughout.

Oct. 3. Fresh gales; winds throughout N. E. Lat. 34° 37′; long. 67° 10′.

Oct. 4. Fresh and squally; baffling. Lat. 33° 26′; long. 67° 00′."

"*Ship Siddons*, Sept. 29. Light breezes; fine and pleasant weather. Winds, S. by W.; calm, N. by W. Barometer, 30.5. Lat. 40° 20′; long. 73 °25′.

Sept. 30. Begins fresh winds and clear; middle, strong winds; last part, strong gales; double reefed the topsails. Winds, N. E., N. E., N. E. Lat. 38° 59′; long. 72° 43′. Barometer, 30.1.

Oct. 1. All this day strong gales, with a very heavy sea on; close-reefed the topsails, and reefed courses. Weather clear. Lat. 38° 21′; long. 72° 00′. Barometer, 30.00.

Oct. 2. All this day strong gales, and very heavy sea; running under close reefs, and reefed courses. Barometer, high and steady. Lat. 38° 04′; long. 71° 15′. Barometer, 30.5. Winds the same as the 1st, N. N. E., N. N. E., N. N. E.

Oct. 3. Strong winds, but inclining to moderate; weather clear; made all sail; still rugged; heavy swell coming from east. Winds, N. N. E. Lat. 38° 01′; long. 66° 15′. Barometer, 30.1.

Oct. 4. Light and clear; pleasant weather. Winds, N. E., N. E., N. E. Lat. 37° 13′; long. 64° 45′. Barometer, 30.1."

"*Ship Gallia*, Sept. 28. First part, light; middle and last, fresh and squally. Lat. 42° 50′; long. 58° 52′. Barometer, 30.00. Winds, S. S. W. and N.

Sept. 29. Light and pleasant throughout. Winds, N. by E; calm, S. S. E. Lat. 42° 42′; long. 60° 26′. Barometer, 30.1 Current, S. E. two knots.

Sept. 30. Light and cloudy; winds south to north, and N. E. by N. Lat. 42° 22′; long. 63° 40′. Barometer, 30.1.

Oct. 1. Throughout pleasant. Winds, N. E., E. N. E., E. N. E. Lat. 42° 05′; long. 68° 02′. Barometer, 30.1.

Oct. 2. Begins light; ends fresh and pleasant. Lat. 41° 15′; long. 71° 20′. Barometer, 30.1. Winds, E. N. E., E. N. E., E. N. E."

"*U. S. Ship Vandalia*, Sept. 26. Wind light, with passing clouds. Lat. 28° 07′; long. 63° 19′. Barometer, 29.91. Wind, N. N. E., and N. E. by N.

Sept. 27. Wind light from east, and E. by S. Lat. 29° 15′; long. 64° 35′. Barometer, 30.18.

Sept. 28. Moderate breezes, and hazy, threatening weather. Wind, S. E., variable, S. E. to S. W., variable, S. W. to N. W. Lat. 31° 19′; long. 66° 24′. Barometer, 30.11.

Sept. 29. Frst part, light breezes; middle part, fresh and squally; latter part, fresh gales and cloudy, with rain. Barometer, 29.74, at midnight. Lat. 32° 46′; long. 67° 49′. Barometer, 30.07. Winds, variable, southward and eastward; variable, southward and eastward; variable, southward and eastward.

Sept. 30. Heavy gales, and squally. At 4 A. M. barometer 29.66. Gale heaviest at 6 A. M., with rising barometer, 29.68, with the wind N. by E. Lat. 34° 29′; long. 69° 40′. Barometer at noon, 29.92. Winds throughout variable, northward and eastward, N. E., and N. by E.

Oct. 1. Moderate gales, and squally. Winds, N. N. W.; N. and N. by E. Lat. 34° 31′; long. 69°. Barometer, 20.90."

"*Brig Shawmut*, Sept. 27. At noon, off Sandy Hook; wind N. N. E.; calm; south. Barometer, 30.10.

Sept. 28. Light winds all day from S. S. E. Barometer, 30.20. Lat. 40° 2′; long. 69° 28′.

Sept. 29. Strong wind all day. Winds S. W., W. N. W., and N. E. Barometer, 30.20. Lat. 40° 16′; long. 67° 50′.

Sept. 30. Strong winds; double reefed; wind N. E. Barometer, 30.05. Lat. 39° 54′; long. 65° 30′.

Oct. 1. No change; winds N. E., E. N. E., N. E. Barometer, 30. Lat. 39° 29′; long. 65° 18′.

Oct. 2. Laying to; very heavy sea on; wind E. N. E. to N. E. Barometer, 30.10. Lat. 40° 5′; long. 64° 48′.

Oct. 3. Moderate from N. N. E. Barometer, 30.18. Lat. 39° 37′; long. 64° 27′.

Oct. 4. Moderate winds from N. E. by N., N. E. and E. N. E.; all sail set. Barometer, 30.15. Lat. 39° 40′; long. 62° 55′.

Oct. 5. Heavy rain squalls; calm; wind S., S. S. W., strong. Barometer, 29.85. Lat. 40° 8′; long. 60° 32′.

Oct. 6. First part squally; last, heavy gale. Barometer, 29.80. Lat. 41° 30′; long. 58° 15′. Winds S. S. W., N. W., N. N. W.

Oct. 7. Winds N. W., calm, W. N. W., light; all sail set. Barometer, 30. Lat. 40° 28′; long. 56° 25′."

"**Ship E. Z.* New York to Liverpool, Sept. 30. Winds moderate and pleasant; middle part calm; change from S. S. E. to N. E. Lat. 41° 48′; long. 60° 24′. Current, three-quarters of a knot per hour east. Barometer, 29.8.

Oct. 1. First part moderate; middle fresh; and ends moderate; winds N. E. by E. to E. N. E. Barometer, 29.8. Lat. 40° 29′; long. 57° 24′. Current the same.

Oct. 2. Moderate and pleasant; winds N. E. and E. N. E. Barometer, 29.8. Lat. 40° 25′; long. 55° 40′. Current E. S. E. three-quarters of a knot.

Oct. 3. First part moderate; middle, heavy gale; ends, heavy gale. Lay to; wind N. E. to N. E. by E. Lat. 39° 22′; long. 53° 45′. Barometer, 29.7.

Oct. 4. Begins with strong gale; ends moderate and pleasant; winds N. by E. and N. Lat. 39° 30′; long. 52°. Barometer, 29.7. Current, east half knot. Ends, barometer rising."

"*Barque A. F. Janness*, Sept. 28. First part, wind N. N. W.; second part, S. S. E.; third part, S. S. E. Lat. at noon 38° 38′; long. 72° 30′.

Sept. 29. First part, wind S. S. E.; second part, S. E.; third part, S. E., light and fine. Lat. 38° 48′; long. 71° 20′.

Sept. 30. Throughout, winds S. W. and light. Lat. 37° 50′; long. 69° 25′ W. Current, two knots N. E. by E.

Oct. 1. First part light, S. W.; middle and last, blowing a very heavy gale from the N. E. Current, one and a half knots N. E. by E. Lat. 37° 10′; long. 68° 30′.

Oct. 2. First and middle parts, wind N. E. and N. E. by E.; latter part, N. E. blowing a heavy gale, with a large sea on. Lat. 36° 30′; long. 68°. Current, one and a half knots.

Oct. 3. Winds throughout N. N. E. and N. E.; moderate gale. Lat. 35° 51′; long. 67°."

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* Omitted.

"*Ship Mortimer*, New York to London, Sept. 30. Moderate gales; middle and last part, strong gales. Lat. 39° 23′; long. 68° 44′. Winds N. N. E., N. E. by N.

Oct. 1. Very heavy gale throughout. Wind N. E. by N. Lat. 38° 52′; long. 67° 37′.

Oct. 2. Very heavy gale, with very heavy boisterous sea; ship laboring hard. Lat. 38° 21′; long. 67° 46′ W. Wind N. E. by N. throughout.

Oct. 3. Wind and sea both moderate to a topgallant breeze; wind N. E. by N., N. N. E., N. E. by N. Lat. 38° 36′; long. 67° 26′ W.

Oct. 4. Moderate and light gales. Wind N. E. by N. Lat. 38° 5′; long. 65° 14′."

"*Ship John Haven.* This abstract I invite your attention to, particularly the manner in which it is kept, and the information it contains does great credit to Captain Ricker.

'*Ship John Haven.* From New York bound to New Orleans.

Sept. 24, 1852. Moderate and pleasant; at noon cloudy; winds N., N. E., E. N. E. Barometer, 30.20; air, 64°; water, 66°. Lat. 38° 58′; long. 72° 18′ W.

Sept. 25. Moderate weather; winds E. N. E., E., E. Barometer, 30.05; air, 66°; water, 78°. Current 26 miles E. N. E. for 48 hours. Lat. 36° 19′; long. 71° 39′ W.

Sept. 26. Moderate. Entered the gulf in lat. 38° 15′; long. 72° 5′. Left in lat. 35° 47′; long. 71° 15′. Winds east, calm, S. S. W. Barometer, 30; air, 70°; water, 76. Lat. noon, 35° 30′; long. 70° 53′.

Sept. 27. Great quantities of gulf-weed about. Winds S. S. W., S. S. W., S. S. W. Barometer 30.10. Lat. 32° 48′; long. 68° 38′. Air, 75°; water, 77°.

Sept. 28. Heavy swell from the west, and strong tide-rips. Winds S. S. W., S. S. W., south. Barometer, 30.10. Air, 80°; water, 77. Lat. 32° 33′; long. 69°. Current N. E., one knot per hour.

Sept. 29. Throughout the 24 hours, baffling and squally, with torrents of rain and heavy thunder, with very sharp and constant lightning; wind through the night, from all points of the compass, in flaws, succeeded by calms. At daylight, rain cleared off, and a moderate breeze succeeded from N. E. Six ships in company.* Barometer steady at 30 inches. Lat. 32° 11′; long. 69° 45′. Winds calm, calm, N. E. moderate.

Sept. 30. Commences squally, more rain than wind, but weather looking threatening. Took in light sails. 4 P. M. single-reefed, raining and wind getting up. Barometer commenced to fall. At 5 the weather looking bad, but not much wind; close-reefed the fore and main-topsails, and set them; also set foretopmast staysail. Furled every other sail in the ship snug; the wind steady at N. N. E. and increasing. At 6 blowing harder and glass going down; ship running nine knots S. S. W. ½ W. At 10 blowing a storm; lost foretopmast staysail, and foretopsail; braced up main-yard, and hove to; in twenty minutes the main-topsail blew away (nearly a new sail), also all three topgallant masts by the caps, studding-sails out of the tops, mainsail, and main-spencer, both of which were snugly furled. At 10 P. M. it was a most fear-

* The Nathaniel Kimball and Ann Jarvis, also a barque, all dismasted, except lower masts, in this hurricane, arrived at New Orleans some time after us.

ful hurricane, at which time the barometer reached its lowest point and began to go up; the wind blew with great violence until 1 A. M., when it began to moderate, and continued to moderate until noon, leaving a high turbulent sea. Ends moderate, fine weather; employed bending other sails, and repairing damage. Barometer at 4 P. M., 29.90; at 6, 29.80; at 7, 29.70; at 8, 29.65; at 9, 29.45; at 10, 29.15; at 11, 29.20, and rising. Winds, throughout, steady at N. N. E., moderating at N. E. Lat. at noon, 30° 51′; long. 71°. A southwesterly current, one knot per hour.'

Here we have every evidence that these gales exhibited their greatest violence in the Gulf Stream, as will be seen by all the vessels which steered towards it. The Iconium was very near being lost, and the Comet was dismasted, though the latter is reported to have behaved admirably. The vessels on the south side committed a like error by steering to the N. W., with falling barometers, although they did not meet with any damage; but it would be difficult to say which made the narrowest escape; having the wind at S. E., their great danger was in being struck aback by a sudden shift to the north. Deeming it rather premature to lay down any specific rules of action, more than those I have given, I thought it safer that the examples which the two gales afford, should be received as references which are free from any likelihood to mislead.

Having investigated all the data which has come to hand of the gales of 1848 and 1852, and traced the phenomenon to causes connected with the general system of atmospheric circulation, there I leave it for the author of that system to determine more fully those relations. The information to be gathered from the system of observation now in practice, should interest every seaman and make him zealous in the cause. The ship-builder constructs the ship to outsail those of every other nation—the philosopher points out the "wind-roads of *the ocean*," and by the skill of the navigator, our vessels perform achievements which are among the wonders of the age. The spirit of knowledge at home and abroad sees this, and no information is more valued, or more sought for, than those records which contain the phenomena of the ocean.

B. S. PORTER.

Lieut. U. S. Navy."

List of Vessels in the Gale of* 1852.

1. The schooner Fawn.
2. " steamer "United States."
3. " Oxford.
4. " Element.
5. " United States ship Vandalia.
6. " Austis.
7. " Eolus.
8. " Comet.
9. " Iconium.
10. The United States ship Relief.
11. " Siddons.
12. " Francis.
13. " Gallego.
14. " A. F. Janniss.
15. " John Haven.
16. " Shawmut.
17. " Mortimer.

* For the purpose of distinguishing the tracks of the Comet, Iconium, Eolus, and Relief, the Comet has an unbroken line, the Iconium a broken one, the Relief a broken one with a dot between, and the Eolus a dotted line.

THE STORM AND RAIN CHART.

Letter E of the series—the Storm and Rain Chart—was commenced for the North Atlantic by Lieutenant Wm. Rogers Taylor, U. S. N.; and in his absence at sea in the Albany, it has been continued by Lieutenant Wm. H. Ball, and in his absence in the U. S. ship Portsmouth, by Lieutenant George Minor.

The object of these Charts is to show the total number of observations that have been discussed for each month in every space of 5° square in the ocean; and then to show for every square and month, the number of days each in which there was rain, a calm, a fog, thunder and lightning, or a storm, and the quarter from whence it blew.

The manner in which these observations are collected from the quarry of log-books—brought together and discussed, and the officers at work upon them, reminds one of the sculptor; any single stroke of the chisel, however well directed, does but little towards developing the figure, which in due time is to stand out from the rude mass upon which he is engaged. So with these observations; any single one, however accurate, is in itself worth but little. It is only by oft-repeated observations, multiplied and brought together in sufficient numbers to express their own meaning, that satisfactory and significant results can be obtained. Then, like the piece of statuary to the repeated touch of the chisel, the charts speak for themselves, and all at once stand out before the compiler, eloquent with facts which the philosopher never dreamed were lurking so near.

Among the various phenomena presented in the course of these investigations, some have pointed to the moon, and suggested the inquiry: Has the declination of the moon any influence upon the bands of trade-winds and calms, by moving the edges of their zones up and down the ocean, or by accumulating an excess of atmosphere, first in one hemisphere, then in the other, according as the declination be north or south?

The abstract logs will, in the course of time, afford observations enough probably to enable me to answer this question; for it is one of those questions to which a satisfactory reply, either in the affirmative or negative, is equally desirable.

The investigation of this problem was assigned to Passed Midshipman Matthews. His researches relate entirely to the Atlantic. Before he had completed it he was ordered away to sea; and I have not had force since to continue them. But I am apprehensive that the true answer to the question will be so masked by the effects of other causes in moving these trade-wind bands up and down the ocean, that its purport will not be perceived.

Perhaps the Pacific Ocean, when there shall be observations enough made in it, will enable me to put this question to rest.

Plate III. is a sample of the Storm and Rain Chart.

As in the other case, so in this: the ocean is divided out into districts of 5° of latitude by 5° of longitude for these investigations, and whatever phenomenon is reported as occurring in one part of a district, is assumed to occur in all parts of that district.

Between each pair of meridians having a space of 5° between them, are 12 lines, for the twelve months, always beginning with December, the first winter month; and horizontally between each pair of parallels for each 5° there are 13 lines, eight of which are for gales from the eight semi-quadrants—one for the calms—one for rain—one for thunder and lightning—one for fogs, and the other for the number of observations called days, which have been observed for each month and district. These last are expressed in figures (see Plate III.), and the others according to the method of "fives and tallies," already explained for other Charts.

Three observations make a day; so, in order to see how many days of observation have been discussed for any month, it is necessary to divide by three the number which stands in the column for the months, and on the line marked "days."

The object of this Chart was to show the exceptions to what may generally be considered the prevailing condition of the weather at sea, and to determine from what quarter storms are most liable to occur for each month in every district.

It may be that mariners do not *always* record in their logs rain, fog, thunder, or lightning. They do always mention gales and calms, and the quadrant whence the wind blows. It may, therefore, be probable that both rains and lightning occur at sea more frequently than it would appear by the Charts they do; if so, I have at present no means of knowing. But it may be presumed that mariners generally are not more apt to neglect to mention rains, thunder, and fogs in one part of the ocean than another; and that, therefore, the relative frequency with which they occur may be supposed to be fairly indicated on the chart.

But as the Chart is a fair exponent, according to the data from which it is constructed, as to the frequency of the phenomena to which it relates, we are bound to give it as much faith and credit in one respect as in another, and, therefore, to assume, until we have reason to suppose it otherwise, that the occurrence of rain, fogs, and lightning, is fairly represented in point of frequency.

The scores designate not the times that it thunders, or rains, or blows a gale, but simply the number of days on which such phenomena have been reported to occur; as an example, a gale may be accompanied with fog and rain, thunder and lightning, in which case a score would be made in the appropriate places for each.

The districts represented in Plate III. by A, B, and C, extend from 30° to 45° N., and from 55° to 60° W. Those represented by D, E, and F, extend from the equator to 15° N., between the meridians of 25° and 30° W.

This Plate also affords matter that is interesting to sailor philosophers.

Examining district F, it appears that rains and calms, and N. W. gales, abound from December to May inclusive; that lightning is never seen, nor thunder heard there, from April to September inclusive; that in October there is an occasional gale from the eastward; and that from June to September may be called a rainless season, during which period there is rarely a calm, and never a gale nor a thundercloud to disturb the air.

This is because the equatorial calms, and their train of atmospherical disturbances, have gone up, as shown per trade-wind charts, into district E. The rainy season in E, is the dry one of F. It may be said that E has two rainy reasons—one for about two and a half months before August, the other for three months after.

It appears from D, that the rains commence before the calms, and continue after them; that from December to March is a rainless period; and that an electric display from the clouds is a rare occurrence at any time of the year in this district.

Now going to A, the first thing that strikes us is the prevalence of fogs, the regularity of precipitation, the almost total absence of gales in June and July, the scanty rains in the former month, and the abundance of the materials from which these facts are drawn.

Contrasting this with B, we find that July and August are the months which are most exempt from storms and rain, fogs and thunder; that calms rarely occur in January, February, March, April, July, August, October, and November.

In district C, storms and rains seldom occur in April, May, June, and July. But it is needless to repeat what the Chart tells so plainly at a glance. Unavoidable circumstances conspired to delay until the fall of 1853 the publication of this interesting Chart.

THE PILOT CHARTS.

Letter C of the series is a Chart of the Winds; it shows the point of the compass from which the wind blows in all parts of the ocean, and for every month in the year. The numbers of this series are called the "Pilot Charts," of which the North and South Atlantic, in two sheets each, and "Coast of Brazil within the Trade-Wind Region," in one sheet, sheets five and six North Pacific, and the sheet of the South Pacific, have been published. Several other sheets, both of the Pacific and Indian Oceans, are in press. See Plate I. as an illustration of the manner in which the figures for Plate V. are obtained.

Sheets of this series are also in hand for the entire Pacific and Indian Oceans. Two, illustrative of the Cape Horn passage have also been published.

The officers employed upon them from time to time have been Lieutenants Herndon, Dulany, H. N. Harrison, Ball, and Forrest; Passed Midshipmen Davenport, Powell, De Koven, Wainwright, Balch, Roberts, De Krafft, Woolley, Jackson, Murdaugh, Semmes, Johnson and Lewis, Brooke, Wells, Terrett, and Professor Benedict.

The "Brazil Pilot" is on a scale, to the square, of 2° of latitude by 1° of longitude, and extends from the equator to 23° S.

The rest of the series, except the Cape Horn Pilots, is on a scale of 5° to a square: that is, the ocean is divided off into districts of 5° of latitude by 5° of longitude. The Pilot Charts, therefore, consist of a number of engraved squares, without regard to the figure of the earth, with four inscribed concentric

circles in each; and in these circles are radii, drawn so as to represent every alternate point of the compass-card, thus: N., N. N. E., N. E., E. N. E., E.; and so on around the compass. See Plate V.

After all the log-books within reach have been examined, and the observations collated for this letter of the series as in Plate I., the results are collected for each district, arranged according to months, and entered, each set in its *wind-rose*, Plate V., as the circumscribed square, with its concentric circles and points of the compass, is called. These entries are made in such a manner as to show at a glance the prevailing winds for any month in any part of the ocean. Not only so, the navigator sees at a glance how many days of observation have been discussed for each month in any district; and of these he sees the number of times calms have been found, and the number of times the winds have been reported as coming from each of the sixteen points of the compass.

Thus, in the wind-rose for the district between 5° and 10° N., 15° and 20° West, and marked A, Plate V., he would observe that in August 705 observations as to the course of the wind had been made here, and 13 as to the calms; *i. e.* out of $\frac{718}{3}$ days, or parts of days, passed by ships in this district during the month of August of various years, the prevailing condition of the weather for consecutive periods of eight hours' duration each, was found to be calm thirteen times; and the winds were observed to blow from E. 4 times;* E. S. E., 17; S. E., 5; S. S. E., 165; S., 280; S. S. W., 171; S. W., 23; W. S. W., 26; W., 8; W. N. W., 2; N. W., 1; N. N. W., 2; N. N. E., 1; and the other points 0.

The object has been to get for these Charts at least one hundred observations for each month in every square of the ocean; this would require for the three great oceans 1,669,200 observations upon the direction of the winds alone.

In some of the wind-roses, or districts of 5° square, we have obtained more than a thousand observations for a single month; whereas, in neighboring districts and for other months, we are left without a single observation—so limited and marked are the commercial paths over the ocean, according to the seasons.

In the South Atlantic, between the route to and fro around Cape Horn, and the route to and fro around the Cape of Good Hope, there is a part of the ocean of immense extent, that is seldom traversed by any vessel. The Pilot Charts, therefore, are silent with regard to the winds there.

As the wind is found to blow in any part of any given district or division of 5° square, so it is assumed to blow at that time in all other parts of that district.

The Pilot Charts, therefore, give us the number of times that the wind, in any part of the ocean, is found in a given number of times to come from each point of the compass; and consequently, by studying the pilot chart, we see the ratio between the number of winds from any one point, and the number of winds from all the other points of the compass.

With such data it is practicable to calculate, according to the doctrine of chances, the track which will give the shortest average passage under canvas from port for any month.

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* Taking "time" to mean a period of eight hours, or three "times" to make a day.

This I have done for the routes generally, between Europe and America; and from the ports of the United States, as far south as the parallel of Rio de Janeiro.

In order to select the best average track, from one place to another, as from the ports of the United States to Rio, or to those of Europe, the Pilot Charts have been discussed in the following manner:—

Blank charts on a scale of 5° to an inch at the equator, Mercator's projection, are constructed and lithographed for the whole ocean, twelve times over, so as to have one complete set for each month.

In every space, of 5° square, a sort of compass-card is drawn as in Plate VI.

In the centre of this card are written two numbers—the upper number shows the times—counting 8 hours as "a time"—the winds have been observed in that square, for the given month, which in this case is July (see A—Plate VI.), and the lower number shows the per cent. of "the times" in which calms, according to the number of observations made, and the principles of averages, ought to prevail for as much as 8 hours at a time. Thus, in said square A, there have been discussed for the Pilot Charts, in the month of July, 433 observations, and of these, 8 in all, or 2 per cent. of the whole, represent calms as the prevailing condition of the atmosphere for that month and part of the ocean.

These two quantities are thus stated in order to enable me as well as those who take the Charts for their guide, to form some estimate as to the degree of confidence due, or as to the weight to be attached to, the courses recommended and the routes proposed for vessels.

Thus, more weight is attached to a course that should be recommended through square A, than to one through square B; because, in A, average results are derived from 433 observations; whereas in B, they depend upon only 21; and calms, it appears, prevail there 11.1 per cent. of the time, which is probably out of proportion.

The object, however, is to show the proportion according to the ratio of percentage, of the winds from each point of the compass, and the percentage by which, according to that showing, a vessel in attempting to sail 100 miles, or any other distance through that square on any given course, would on the average have to increase that distance on account of the average prevalence of adverse winds.

Thus, suppose a vessel should wish to sail west through square B in July; an inspection of the Plate will show, supposing the 21 observations give a fair average as to the winds in that square for that month, that 16.5 per cent. of the winds there, are from the west; that 11 per cent. are from W. S. W.; 3.5 from W. N. W.; 16.5 from S. W.; and 5.5 from N. W.; all these winds are adverse for a west course, and consequently they would compel her to turn off from a west course so as to increase the distance required 37.4 per cent.

In truth, it appears from those 21 observations, that 49.5 per cent. of all the winds that blow here in July, are between W. and S. S. W., inclusive; that it is calm 11.1 per cent. of the time; and that, consequently, it is an unfavorable part of the ocean for a vessel to pass through, that wants to get from Europe to the United States, *i. e.* that wants to get to the southward and westward; it moreover appears that a vessel would have no difficulty except on account of the calms, in getting to the eastward through this same region.

Again, the square C, which is between two lower parallels, and in which we have the experience of 41 vessels to guide us; a vessel to make a W. S .W. course through this square, in July, would have to contend against 53.7 per cent. of winds directly ahead, with the chances of having to increase her distance 93.7 per cent. Here we again see the prevalence of head winds for vessels bound to the United States, and perceive that it is a bad part of the ocean for a vessel so bound to be in, though there are no calms.

It is thus that the Chart for July, for the whole ocean, is filled up from the Pilot Chart, with the per cent. of calms and head winds for each month. This is an operation which involves an immense amount of labor.

This being done, the next step in the process is, to find out the best course for a vessel bound in any other direction, to proceed in any given month.

To do this, it is necessary to find out that track, which, with the average per centum of increased distance on account of head winds, and the increase on account of detour, shall give the shortest distance from port to port—for when that is found, it is called the shortest average route. This route, when thus found, is the route which vessels are recommended in the *Sailing Directions* to take for the several months, to and from Europe to the equator, &c.

This is a tedious operation; for a satisfactory solution of this problem is not to be attained without many trials. For instance, after crossing the meridian of 25° W., bound from Liverpool to New York, it is comparatively easy, in July, as a mere inspection of Plate VI. shows, to make westing between the parallels of 40° and 45°. But the head winds, and the detour they cause a vessel to make, when she comes to try it, may involve such an increase of distance as to make it better to take the chances by some other route; so that it is not the difficulty of getting through one square alone that has to be considered at a time, but the difficulties of getting through all united.

It may turn out, after this tentative process has been repeated again and again, that when we come to examine and compare such results, we may find two routes widely differing, yet each requiring nearly the same distance to be accomplished. In that case, each track is traced from port to port; the percentage of head winds and detour got at carefully for each square through which it passes, and then in the *Sailing Directions* the preference is given to that track which is least liable to calms, to adverse currents, and to other collateral drawbacks, perplexities, and delays; and which track also has in its favor the shortest distance, and the greatest number of chances for fair winds.

The centre figures in each square, Plate VI., stand as before marked, for the whole number of observations and the per centum of calms. The next figures which are arranged along the inner circle, and the per centum of head-winds for the courses on which they stand, and the outer circle of figures express the number of miles that adverse winds will compel a vessel to turn out of the way, if she attempt to sail 100 miles direct on the course on which these figures stand.

Thus it will be perceived, that no navigator can reasonably expect that the new routes which I recommend, are to give the short passages *always*, and in every individual case. They give the shortest passages on the average, and thus offer the best chances for a short passage at all times—that's all. Those chances, as

the Charts show, may, and sometimes will, turn up adversely. Thus, a vessel trading to Europe, may be told in the *Sailing Directions*, that her best route in July passes through square D, and that her course through it is east. Once in a hundred times, however—and just once in a hundred on the average—the Pilot Chart to which she is referred for a guide, tells her the wind in that square comes from the east; and she may find it when she gets there directly in her teeth;—she may be the unfortunate hundredth vessel; we cannot tell. All that I pretend to tell the navigator in such cases, is where he will find the greatest number of chances in his favor, and what is the best route for him to pursue. In like manner, he may be recommended, not to attempt to stand W. S. W. through C., for then the chances are 54 in a hundred that he will have the wind directly in his teeth; still, a vessel may pass through this square 7 times, and each time find, as the Chart shows it is possible, though hardly probable she may find, the wind exactly in the opposite direction.

With this full explanation as to the process by which the new routes here recommended are discussed and discovered, the intelligent navigator who adopts them, will perceive that these discoveries and these routes are no matter of opinion with me, but that they are the results of the experience of all the navigators combined, whose observations have been used in the construction of the Charts.

In the European voyages, I have found not much room for improvement as to routes, except to those shipmasters who are just entering that trade; to them, these Charts give all the information as to winds, currents, and routes that is possessed by the oldest and most experienced "Packet Captain."

When navigators generally shall agree to follow these new routes, the average sailing passage between Europe and America will, it is believed, from what has already been done, be considerably shortened.

But the new routes which these Charts have suggested to the equator, and which lead through parts of the ocean in which the winds and currents were not so well understood as they are along the tracks to Europe, have been attended with more decided advantage, and the most signal success. Practically, they have brought the markets of India and the southern hemisphere many days nearer to our doors.

The route of all vessels bound into the southern hemisphere, whether their destination be the markets of South America, of the Pacific or Indian Ocean, is the same as far as the equator; and these Charts have actually shortened the average passage hence to the equator, from two days to two weeks, or more, according to the season of the year; this is shown by the results of actual trial. More than a hundred passages have been made by these Charts, and according to the routes prescribed. The average length of passage by the old route from the ports of the United States to the line is forty-one days. The average passage by the new routes has been so far, for January, 31 days; for February, 25; for March, 27½; April, 28½; May, 34; June, 33 July, 40 (by the old route in this month the passage is 48 days); for August, 41; for September, 39; for October, 37; November, 32, and December, 34, against 38½ by the old route for December.

As I write, I receive the abstract logs of the U. S. S. Saratoga (Captain Walker), and of the merchant barque Dragon (Captain Andrew).

They sailed at the same time, both in the month of September last (1850); the Saratoga took the old

route, went as far as 19° of west longitude, and crossed the equator the forty-second day out. The Dragon took the new route; crossed the equator the thirty-fourth day, and had passed the parallel of Rio de Janeiro in 23° S. before the Saratoga had reached the line; thus making a gain of 1,500 miles upon her competitor, with a saving that far of ten days or two weeks on the passage.

Thus, the importance of the undertaking to collect and embody the experience of every navigator as to the winds and currents of the sea, and so to present the results of all this information that each may have the benefit of the experience of all, is brought home to our merchants; they reap benefits from it daily. Encouragement is therefore given for the vigorous prosecution of the work.

Upwards of 40,000 sheets of these Charts have been distributed, and the demands for them are daily increasing.

THE THERMAL CHARTS.

Letter D of the series designates the Thermal Charts; they show the temperature of the surface water of the ocean, wherever and whenever it has been observed. These temperatures are characterized by colors and symbols, in such a manner that, by a mere inspection of the Charts, the temperatures for any one month may be recognized and distinguished from the rest. The scale is Fahrenheit; and the temperatures are put down just as they are given in each log-book, without any attempt to correct for error of thermometer. The Thermal Chart of the North Atlantic, compiled by Lieutenant Gantt, in eight large sheets, is published; also that of the South Atlantic, constructed by Lieutenant Gardner, upon the same scale.

The isothermal lines for 80°, 70°, and so on, for every 10° of ocean temperature, have been drawn for each month upon these Charts by Professor Flye.

They afford to the navigator and the philosopher much valuable and interesting information touching the circulation of the oceanic waters, including the phenomena of the cold and warm currents; they also cast light upon the subject of the hyetographic and climatic peculiarities of various regions of the earth; they show that the profile of the coast line of intertropical America assists to give expression to the mild climate of Southern Europe; they increase to a marked extent our stock of knowledge concerning the Gulf Stream—that great phenomenon of the ocean—for they show that the warm waters of this stream, as it pursues its course to Europe, have a vibratory motion, so to speak, across its course, like a pendulum slowly propelled by heat on one side, and repelled by cold on the other. It vibrates to and fro with the season, preserving in the mean time a peculiar system of convolutions that calls to mind the graceful wavings of a pennon as it floats gently to the breeze. Indeed, if we imagine the head of the Gulf Stream to be hemmed in by the land in the Straits of Bemini, and to be stationary there, and then liken the tail of the stream itself to an immense pennon floating gently in a current; such a motion as such a streamer may be imagined to have, very much such a motion do these Charts show the tail of the Gulf Stream to have.

These Charts were prepared for the press in four sets—each set showing the temperatures for one season—but they are published with the temperatures of all four seasons on the same sheet. I have, owing to the numerous official demands upon my time, not yet had an opportunity to study them except in sets for one season at a time—therefore, I cannot give as complete an account of all the facts which they develop, as I shall be able to do when I shall have time and opportunity to give them the close study which their importance claims at my hands.

In 1844, I read before the National Institute a paper "On the Gulf Stream and Currents of the Sea." Up to that time but little was known of this "river in the ocean," except that it exists, and conveys an immense body of warm water from the Gulf of Mexico through the Straits of Florida into the Atlantic Ocean, thence along the coast of the United States towards the shores of Europe by the way of the Grand Banks. Beyond this* little or nothing was known with regard to it. But since the appearance of that paper, attention has been very much directed to the Gulf Stream.† The Coast Survey has been at work

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* "Upon a correct knowledge of the force and set of currents in the ocean often depends, not only the safety of vessel and cargo, but the lives of all on board; and, owing to the want of this knowledge, hundreds of vessels, thousands of persons, and millions of property are annually cast away or lost at sea.

"I do not intend to occupy the time of members with a recapitulation here of what we do know with regard to ocean currents; that indeed might soon be told; for we know little or nothing of them, except that they are to be met with here and there at sea, many of them sometimes going one way and sometimes another; and that the waters of some of them are colder and of others warmer than the seas in which they are found. That we should have a better knowledge of them, and of the laws which govern them, is not only an important matter to those who follow the sea, or make ventures abroad, but it is also a matter of exceeding interest to all those whose enlarged philanthropy or ennobling sentiments prompt in them a desire to diffuse knowledge among their fellows, or in any manner to benefit the human race. The mere fact that this meeting is held at all, is evidence ample and complete that it is composed altogether of such. I, therefore, submit it as a question for the consideration of the meeting, whether it be not competent for the National Institute to devise and set on foot a plan for multiplying observations and extending our information upon these interesting phenomena. A subject of vast importance in the business of commerce and navigation, the currents of the ocean seem to me to be altogether worthy the attention of this Society—a series of well-conducted observations upon them would be in perfect unison with the great objects of usefulness for which it was created and now exists, and for which its distinguished members and guests have been invited, and are here assembled from all parts of the country.

"Before such an assemblage of mind and intelligence, it is necessary only to mention the meagre state of our information, even with regard to that great anomaly of the ocean, the Gulf Stream; and there will be—there can be, but one mind, as to the importance of making farther observations, and of multiplying facts with regard to it. In simply reminding the Society that all we know of this wonderful phenomenon is contained chiefly in what Doctor Franklin said of it more than fifty years ago, that his facts were collected by chance, as it were, and his observations made with but few of the facilities which navigators now have, I feel that enough, and all has been done that is necessary to be done in order to impress the Institute with the importance of farther observations upon it." * * —*Paper on the Gulf Stream and Currents of the Sea. Read before the National Institute, April* 2, 1844, *by M. F. Maury, Lieut. U. S. N.*

† "Linked thus with other geological agents, the currents of the sea cannot fail to present themselves to the mind of the geologist as important and interesting subjects for investigation. How much more so are they in the eyes of the navigator; with him, the source of this coast current is a matter of conjecture, and its cause a mystery. And as to its strength, its fluctuations, and the laws which govern them, his nautical books are all but silent. Nor has the history of navigation recorded the first series of systematic observations upon it.

"Proceeding farther into the Atlantic, we find a vast stream of warm water running counter to this. It is the Gulf Stream, bound from the Straits of Florida to the Banks of Newfoundland, and thence to the shores of Europe. What its breadth or its depth may be, we know not. We are told, indeed, that even at the same place, it runs sometimes at the rate of two knots the hour, sometimes at five, and we know that it may always be found within certain broad limits, varying in this too at the same place, from 140 to 340 miles.

upon it, and the information collected by that establishment and the officers of the navy, with regard to it, added to that afforded by these charts, may be said to exceed in philosophical extent and value all that was previously known about it.

These investigations confirm, to a remarkable extent, the speculations put forth in that paper; they have converted many of the suggestions of theory into philosophical facts, and given increased importance to the views which I had the honor to present in 1844.

In the paper which, as already mentioned, was read before the National Institute eight years ago, and repeated, by request, before the Association of American Geologists and Naturalists the same year, it was remarked with regard to the Gulf Stream and its counter-current, the ice-bearing current from the north:—

"The Gulf Stream, as it issues from the Straits of Florida, is of a dark-indigo blue; the line of junction between it and the *roily* green waters of the Atlantic, is plainly seen for hundreds of miles. Though this line is finally lost to the eye as the stream goes north, it is preserved to the thermometer for several thousand miles; yet to this day the limits of the Gulf Stream, even in the most frequented parts of the ocean, though so plainly marked, are but vaguely described on our charts. Thousands of vessels cross it every year; many of them make their observations upon it; and many more, if invited, would do the same. But no one has invited co-operation;* consequently, there is no system; and each one that observes, observes only for himself; and when he quits the sea, his observations go with him, and are to the world as though they had not been. * *

"Supposing the pressure of the waters that are *forced* into the Caribbean Sea by the trade-winds to be the *sole* cause of the Gulf Stream, that sea and the Mexican Gulf should have a much higher level than the Atlantic. Accordingly, the advocates of this theory† require for its support 'a great degree of elevation.' Major Rennell likens the stream to 'an immense river, descending from a higher level into a plain.' Now, we know very nearly the average breadth and velocity of the Gulf Stream in the Florida Pass. We also know, with a like degree of approximation, the velocity and breadth of the same waters off Cape Hatteras. Their breadth here is about 75 miles against 32 in the Narrows of the Straits, and their mean velocity is three knots off Cape Hatteras against four in the Narrows. This being the case, it is easy to show that the depth of the Gulf Stream off Hatteras is not so great as it is in the Narrows of Bemini by nearly fifty per cent., and that, consequently, instead of *descending*, its bed represents the surface of an inclined plane from the north, *up* which the lower depths of the stream *must* ascend. If we assume

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With this, our knowledge of it ends; though more accurate information as to it and its offsets would many a time have saved the mariner from disaster and shipwreck, and even now, would add not a little to the speedy and safe navigation of the Atlantic.

"Though navigators had been in the habit of crossing and recrossing the stream, almost daily, for the space of nearly 300 years, its existence even was not generally known among them, until after Dr. Franklin discovered the warmth of its waters, about 70 years ago. And to this day, the information which he gave us, constitutes the basis, I had almost said the sum and substance of all we know about it."—*Ibid.*

* The Wind and Current Charts have called forth the co-operation here proposed.

† That the Gulf Stream is caused by the trade-winds.

its depths off Bemini to be two hundred fathoms, which are thought to be within limits, the above rates of breadth and velocity will give one hundred and fourteen fathoms for its depth off Hatteras. The waters, therefore, which in the straits are below the level of the Hatteras depth, so far from descending, are actually *forced up* an inclined plane, whose submarine ascent is not less than ten inches to the mile!

"The Niagara is an 'immense river, descending into a plain.' But instead of preserving its character in Lake Ontario, as a distinct and well-defined stream for several hundred miles, it spreads itself out, and its waters are immediately lost in those of the lake. Why should not the Gulf Stream do the same? It gradually enlarges itself, it is true; but instead of mingling with the ocean by broad-spreading, as the 'immense rivers' descending into the northern lakes do, its waters, like a stream of oil in the ocean, preserve their distinctive character for more than 3,000 miles.

"Moreover, while the Gulf Stream is running to the north from its supposed elevated level at the south, there is a cold current coming down from the north; meeting the warm waters of the gulf midway the ocean, it divides itself and runs *by the side of them* right back into those very reservoirs at the south, to which theory gives an elevation sufficient to send out entirely across the Atlantic a jet of warm water said to be more than three thousand times greater in volume than the Mississippi River. This current from Baffin's Bay has not only no trade-winds to give it a head; but the prevailing winds are unfavorable to it, and for a great part of the way it is below the surface, and far beyond the propelling reach of any wind. And there is every reason to believe that this polar current is quite equal in volume to the Gulf Stream. Are they not the effects of like causes? If so, what have the trade-winds to do with the one more than the other?

"Nay more. At the very season of the year when the Gulf Stream is rushing in greatest volume through the Straits of Florida, and hastening to the north with the greatest rapidity, there is a cold stream from Baffin's Bay, Labrador, and the coasts of the north, running to the south with equal velocity. Where is the trade-wind that gives the high level to Baffin's Bay, or that even presses upon or assists to put this current in motion? The agency of winds in producing currents in the deep sea must be very partial.

"These two currents meet off the Grand Banks, where the latter is divided. One part of it underruns the Gulf Stream, as is shown by the icebergs which are carried in a direction tending across its course. The probability is, that this 'fork' *continues on towards the south*, and runs into the Caribbean Sea, for the temperature of the water at a little depth there, has been found far below the mean temperature of the earth, and quite as cold as at a corresponding depth off the arctic shores of Spitzbergen. * * *

"More water cannot come from the equator or the pole than goes to it. If we make the trade-winds to cause the former, some other wind must produce the latter; but these cold currents, for the most part, and for great distances, are *submarine*, and therefore beyond the influence of winds. Hence, it should appear that *winds* have little to do with the general system of aqueous circulation in the ocean.

"The other 'fork' runs between us and the Gulf Stream to the south, as already described. As far as it has been traced, it warrants the belief that it too runs *up* to seek the so-called *higher* level of the Mexican Gulf. * * * * * * * * * * *

"Therefore, this immense volume of water, in passing from the Bahamas to the Grand Banks, meets with an opposing force in the shape of resistance, sufficient in the aggregate to retard it two miles and a half the minute, and this only in its eastwardly rate. There is, doubtless, another force quite as great, retarding it towards the north, for its course shows that its velocity is the resultant of two forces acting in different directions. If the former resistance be calculated according to received laws, it will be found equal to several atmospheres. And by analogy, how inadequate must the pressure of the gentle trade-winds be to such resistance, and to the effect assigned them? If, therefore, in the proposed inquiry, we search for a propelling power nowhere but in the higher level of the gulf, we must admit, in the head of water there, the existence of a force capable of putting in motion and driving over a plain, at the rate of 5 miles the hour, all the waters as fast as they can be brought down by 3,000 such streams as the Mississippi River—a power at least sufficient to overcome the resistance required to reduce, from two miles and a half to a few feet per minute, the velocity of a stream that keeps in perpetual motion one-fourth of all the waters of the Atlantic Ocean.

"But, in addition to this, may there not be a peculiar system of laws not yet revealed, by which the motion of fluids in such large bodies is governed when moving through each other in currents of different temperature. That currents of sea-water, having different temperatures, do not readily commingle, is shown by the fact already mentioned—that the line of separation between the warm waters of the gulf and the cold waters of the Atlantic is perfectly distinct to the eye for several hundred miles; and even at the distance of a thousand miles, though the two waters have been in contact and continued agitation for many days, the thermometer shows that the *cold water on either side still performs the part of river banks* in keeping the warm waters of the stream in their proper channel.

"In a winter's day off Hatteras, there is a difference between these waters of near 20°. Those of the gulf being warmer, we are taught to believe that they are lighter; they should, therefore, occupy a higher level than those through which they float. Assuming the depth here to be 114 fathoms, and allowing the usual rates of expansion, figures show that the middle of the Gulf Stream here should be nearly 2 feet higher than the contiguous waters of the Atlantic. Were this the case, the surface of the stream would present a double inclined plane, from which the water would be running down on either side, as from the roof of a house. As this ran off at the top, the same weight of colder water would run in at the bottom; and thus, before this mighty stream had completed half its course, its depths would be brought up to the surface, and its waters would be spread out over the ocean. Why, then, does not such a body of warm water, flowing and adhering together through a cold sea, obey this law, and occupy a higher level? If it did, the upper edges of its *cold banks* would support a lateral pressure of at least 100 lbs. to the square foot; and vessels in crossing it would sail over a ridge, as it were; on the east side of which they would meet an easterly current, and on the west side a westerly current. * * * * * * *

"The maximum temperature of the Gulf Stream is 86°, or about 9° above the ocean temperature due the latitude. Increasing its latitude 10°, it loses but 2° of temperature. And, after having run 3,000 miles towards the north, it still preserves, even in winter, the heat of summer. With this temperature it crosses

the 40th degree of north latitude, and there, overflowing its *liquid banks*, it spreads itself out for thousands of square leagues over the cold waters around, and covers the ocean with a mantle of warmth that serves so much to mitigate in Europe the rigors of winter. Moving now more slowly, but dispensing its genial influences more freely, it finally meets the British Islands. By these it is divided, one part going into the polar basin of Spitzbergen, the other entering the Bay of Biscay, but each with a warmth considerably above ocean temperature. Such an immense volume of heated water cannot fail to carry with it beyond the seas a mild and moist atmosphere. And this it is which so much softens climate there. * *

"May there not exist between the waters of the stream and their *fluid banks*, always heaving and moving to the swell of the sea, a sort of *peristaltic* force, which, with other agents, assist to keep up and preserve this wonderful system of ocean circulation? * * * * * * * * * *

"The line of meeting between the waters of the Gulf Stream and the Atlantic, is distinct to the naked eye for several hundred miles. This unreadiness of cold and tepid sea-water to commingle, has been often remarked upon, and seems to impart to one current the power of dividing and turning others aside. Thus the Gulf Stream bifurcates the Labrador current, one part of which underruns the Gulf Stream, and the other takes a southwestwardly direction along the coast. * * * * * * * *

"*It would be curious to ascertain the routes of these undercurrents on their way to the tropical regions*, which they are intended to cool. One has been found at the equator 200 miles broad, and 23° colder than the surface water. Unless the land or shoals intervene, it, no doubt, comes down in a spiral curve. *

"What time more fit—what occasion more suitable than the present, for maturing a plan of operations, and for setting on foot a system of observations upon the Gulf Stream, and its kindred phenomena of the sea."*

Thus, by a process of reasoning and argument, it was shown, more than nine years ago, that the Gulf Stream, as far as the Banks of Newfoundland, flows through a *bed* of cold water, which cold water performs to the warm the office of *banks* to a river;† and which "cold banks" thus pointed out, were discovered with the deep-sea thermometer, by Lieut. George M. Bache, U. S. N., in 1846, while operating in connection with the Coast Survey. They partake so decidedly of the character of *banks of a river*, that in the annual re-

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* From this question may be traced the origin of the undertaking which has resulted in the "Wind and Current Charts." The Association, appreciating the importance of the subject, and the suggestions connected with it, readily came forward and used their influence in behalf of the undertaking. It was remarked to them then:—

"Gentlemen here, and good men everywhere, can do much to aid in this plan, by giving it their countenance, and using their influence with masters, by inducing them to send to Washington an abstract of their logs, though it contain only the track of the vessel, with the winds and temperatures. Even this would be valuable, and anything additional would be much more so. Our whalemen do collect, and have it in their power to give much truly valuable information. That which they collect concerns the meteorologist, the naturalist, and others, not less than the navigator and geologist. Indeed, the ocean, with its almost unsealed book of mysteries, presents to the votary of science, whatever be the name of his association, a common highway, upon which each society, like every nation, may make its ventures, and return in vessels laden with treasures to enrich the mind and benefit the human race."—*Extract from a Paper on the Currents of the Sea, as connected with Geology, read before the Association of American Geologists and Naturalists, May* 14, 1844—*by M. F. Maury, Lieut. U. S. N.*

† "The cold water on either side, still at the distance of a thousand miles, performs the part of *river banks* in keeping the warm water of the (Gulf) Stream in the proper channel."—*Paper on the Gulf Stream and Currents of the Sea.*

ports of the Coast Survey for 1846, and elsewhere, these banks were likened to a "cold wall;" and by Lieut. Bache, in his report to the superintendent of the survey, to "a bank of cold water against which the Gulf Stream butts up."*

It was also theoretically shown that the Gulf Stream actually flows up hill:†

That its bottom is a bed of cold water:‡

That it bifurcates a cold stream from the north, near the Banks of Newfoundland, and that one fork of this stream pursues thence, on the other side of the Gulf Stream, a *southwestwardly* course as a current of cold water, for the most part submarine:§

That it is bifurcated by the British Isles:‖

And that its surface is a double inclined plane, having the ridge, or line of meeting of the two planes, near the axis of the stream—from which the surface water, like the rain from the roof of a house, runs off towards each side.¶

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* "Here, on the left, we have the main currents of the (Gulf) Stream turned to the eastward by Cape Hatteras, and *butting up against a bank of cold water*, which it overflows."—*Report of Coast Survey*, 1846, *Appendix*, No. 4, page 50.

† "It is easy to show that the depth of the Gulf Stream off Hatteras, is not so great as it is in the "narrows" off Bemini by nearly 50 per cent.; and that, consequently, instead of *descending*, its bed represents the surface of an inclined plane from the north, up which the lower depths of the stream *must* ascend. If we assume its depth off Bemini to be 200 fathoms,[1] which are thought to be within limits, the above rates of breadth and velocity will give 114 fathoms for its depth off Hatteras. The waters, therefore, which in the Straits, are below the level of the Hatteras depth, so far from descending, are actually forced up an inclined plane, whose submarine ascent is not less than 10 inches to the mile."—*Paper on the Gulf Stream and Currents of the Sea, read before the National Institute, by M. F. Maury, Lieut. U. S. N., April* 2, 1844.

‡ "As this," (the warm water of the Gulf Stream made specifically lighter by its temperature,) "ran off at the top, *the same weight of cold water* would run in at the *bottom*."—*Paper on the Gulf Stream and Currents of the Sea, read before the National Institute, by M. F. Maury, Lieut. U S. N., April* 2, 1844.

"The Gulf Stream bifurcates the Labrador current; one part of which *underruns* the Gulf Stream."—*Paper on the Currents of the Sea, as connected with Geology; read before the Association of American Geologists and Naturalists, May* 14, 1844, *by M. F. Maury, Lieut. U. S. N.*

§ "Apparently, in obedience to the laws here hinted at, there is a constant tendency of polar waters towards the tropics, and of tropical waters towards the pole."—*Lieut. Maury on the Gulf Stream.*

"It would be curious to ascertain the routes of these undercurrents on their way to the tropical regions, which they are intended to cool. One has been found at the equator, 200 miles broad, and 23° colder than the surface water. Unless the land or shoals intervene, it no doubt comes down in a spiral curve; meeting the warm waters of the Gulf midway the ocean, (the cold current) divides itself and runs by the side of them right back into those very reservoirs of the south."—*Ibid.*

‖ "It finally meets the British Islands. By these it is divided—one part going into the polar basin of Spitzbergen; the other entering the Bay of Biscay."—*Ibid.*

¶ "In a winter's day off Hatteras, there is a difference between these waters of near 20°. Those of the gulf being warmer, we are taught to believe that they are lighter; they should therefore occupy a higher level than those through which they float. Assuming the depth here to be 114 fathoms, and allowing the usual rates of expansion, figures show that the middle of the Gulf Stream here should be nearly two feet higher than the contiguous waters of the Atlantic. Were this the case, the surface of the stream would present a double inclined plane, from which the water would be running down on either side, as from the roof of a house. As this ran off at the top, the same weight of colder water would run in at the bottom; and thus, before this mighty stream had completed half its

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[1] Its depth in the Florida Pass has been ascertained by the officers of the United States ship Albany, Commander Platt, acting under the instructions of Commodore Warrington, to be 500 fathoms. That is, bottom has been obtained at that depth. Whether the Gulf Stream water reaches all the way to the bottom, is another question.

Thus most, if not all the conditions which the study of the subject induced me in 1844 to announce as theoretically to exist, have since, as already remarked, been converted into physical facts by the operations of the Coast Survey, or by the navigators who have been observing in connection with the *Wind and Current Charts.*

The observations made in 1846 by Lieut. George M. Bache, U. S. N., for the Coast Survey,* and continued in 1847† and 1848,‡ by Lieutenants S. P. Lee and Richard Bache, upon the deep sea and surface temperatures in and about the Gulf Stream, and confirmed as to the surface temperatures by these Charts, as well as by the observations of Lieut. J. C. Walsh, U. S. N., while observing in connection with them in 1850—this mass of careful observations, thus collected—all goes to confirm the theoretical suggestions of 1844, with regard to the *cold banks* and currents of cold water over or through which the Gulf Stream finds its way to the northward.

The officers of the Coast Survey already alluded to, announced the banks of the Gulf Stream off the coast of North Carolina and Virginia, to be a "wall of cold water." They also found, as had already been predicted, the water at great depths to be a very low temperature—38° Fahrenheit.

They also found on the surface of the ocean, east of the Gulf Stream, layers or streaks of warm water. It was inferred by them that this warm water comes from the Gulf Stream—that it sent off a branch in the direction of the Island of Bermuda. It was concluded, therefore, that here was a bifurcation of this stream.

In 1850, Lieut. Walsh, who was sent out in the U. S. schooner Taney, to make certain observations which Congress had authorized the Secretary of the Navy to have made, in connection with my researches concerning the winds and currents of the sea, found like layers or streaks of warm and cold water, and came to a like conclusion as to this bifurcation or "off-set" of the Gulf Stream.

In a letter giving me an account of his cruise, which was unfortunately interrupted by his vessel proving to be unseaworthy, he says: "We discovered the *hot waters of the Gulf Stream* extending as far east as 72° 10′, in a latitude so far south as 33° 30′. The column of water temperature in the Abstract, from May 23 to 29, while engaged in the search for Ashton Rock, will satisfy you of this interesting and important fact; for you will notice that whenever we reached that longitude, in our various tracks between the latitudes of 33° 30′ and 34° north, we experienced a sudden change of as much as 5° and 6° in the surface temperature—70° to 76°; this must be a branch or off-set from the Gulf Stream." This "discovery" is claimed by the Coast Survey.

Now, these Charts do not show that the temperature of the ocean between these parallels beyond the usual limits of the Gulf Stream is permanently any higher than it is between the same parallels generally, until you approach the coast of Africa. The isotherms of 70° for each month, generally, after leaving the

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course, its depths would be brought up to the surface, and its waters would be spread out over the ocean. Why, then, does not such a body of warm water, flowing and adhering together through a cold sea, obey this law, and occupy a higher level?"

* *Vide* Annual Report of the Coast Survey for 1846. † *Ibid.* 1847. ‡ *Ibid.* 1848.

Gulf Stream, stretch off to the eastward, going up as high, in some months, as the parallel of 45°. Recrossing the parallel of 40° north, between the meridians of 15° and 20° W., they then make a sharp turn to the southward and eastward, showing all the surface water between these lines and the equator to be permanently 70° and upwards. It is not probable, therefore, that the Gulf Stream can supply such an extent of ocean with its warm waters; nor is it clear that the warm water of the cool and warm streaks, reported as above, comes from the Gulf of Mexico. The cool water is probably the intruder from below; indeed, these Charts have revealed a natural process of heating and cooling the surface of the ocean, which I am not aware has been discovered before. It is exceedingly beautiful, and goes far to explain this phenomenon of the streaks: when the rays of the sun are operating with their greatest intensity in the northern hemisphere, they then raise the temperature of the equatorial surface of the ocean to the highest pitch. Its waters thus becoming lighter, flow to the north in a gentle surface current of warm water; and this current is probably too feeble to be detected by vessels in the ordinary course of navigation.

Thus the isotherm of 80°, for example, will pass from its extreme southern to its extreme northern declination—near 2,000 miles—in about three months.

Being now left to the gradual process of cooling by evaporation, atmospherical contact, and radiation, it occupies the other eight or nine months of the year, in slowly returning south to the parallel whence it commenced to flow northward. How natural that in flowing north it should go in layers; and in cooling, that some parts should cool faster than the others; also, that the cool water from below should now and then be forced up through the mantle of warm water with which the heat has covered certain parts of the ocean. When we come down to the lower temperatures—the isotherm of 60°, for example—the reverse takes place. In this case, the most rapid motion of this isotherm is due to a movement of the waters from the hyperborean regions.

Between the meridians of 25° and 30° west, the isotherm of 60° in September, ascends as high as the parallel of 56°. In October, it reaches the parallel of 50° north. In November, it is found between the parallels of 45° and 47°, and by December, it has nearly reached its extreme southern descent between these meridians, which it accomplishes in January, standing then near the parallel of 40°. It is all the rest of the year in returning northward to the parallel whence it commenced its flow to the south in September.

Now, it will be observed, that this is the season—from September to December—immediately succeeding that in which the heat of the sun has been playing with greatest activity upon the polar ice. Its melted waters, which are thus put in motion in June, July, and August, would probably occupy the fall months in reaching the parallels indicated.

These waters, though cold, and rising gradually in temperature as they flow south, are probably fresher; and if so, probably lighter than the sea-water; and therefore it may be, that both the warmer and cooler systems of these isothermal lines are made to vibrate up and down the ocean by a gentle surface current in the season of quick motion; and in the season of the slow motion, by a gradual process of calorific absorption in the one case, and by a gradual process of cooling in the other.

We have the same phenomena exhibited by the waters of the Chesapeake Bay during the winter.

At this season of the year, the Charts show that water of very low temperature is found projecting out and overlapping the usual limits of the Gulf Stream. The outer edge of this cold water, though jagged, is circular in its shape, having its centre near the mouth of the bay. The waters of the bay being fresher than those of the sea, may, therefore, though colder, be lighter than the warmer waters of the ocean. And thus we have repeated here, though on a smaller scale, the phenomenon as to the flow of cold waters from the north, which force the surface isotherm of 60° from latitude 56° to 40° during three or four months.

We have, in the making of ice, and in the melting of it again, examples of this irregularity of outline on a still smaller scale. In the freezing of an ordinary pond, the fascicles of ice shoot out, and represent with their spires, the jagged edges, or the cold and warm streaks alluded to. They perfectly illustrate, in freezing, the manner in which a gentle current of warm water, overflowing a surface of cold water, may be supposed to send out its couriers or advance streams ahead; and, in melting, the reverse, or the case of the cold water intruding upon the warmer.

Changes in the color or depth of the water, and the shape of the bottom, &c., would also cause changes in the temperature of certain parts of the ocean, by increasing or diminishing the capacities of such parts to absorb or radiate heat.

From these facts, and in the view which I am induced to take of them, I am led to infer that the mean temperature of the atmosphere between the parallels of 56° and 40° north, and over that part of the ocean in which we have been considering the fluctuations of the isothermal line of 60°, is at least 60° of Fahrenheit—and upwards, from January to August, and that the heat which the waters of the ocean derive from this source, atmospherical contact and radiation, is one of the causes which move the isotherm of 60° from its January to its September parallel.

It is well to consider another of the causes which are at work upon the currents in this part of the ocean, and which tend to give the rapid southwardly motion to the isotherm of 60°.

We know the mean dew-point must always be below the mean temperature of any given place; and that, consequently, as a general rule at sea, the mean dew-point due the isotherm of 60°, is higher than the mean dew-point along the isotherm of 50°, and this again higher than that of 40°—this than 30°, and so on.

Suppose, merely for the sake of illustration, that the mean dew-point for each isotherm be 5° lower than the mean temperature; we should then have the atmosphere which crosses the isotherm of 60°, with a mean dew-point of 55°, gradually precipitating its vapors until it reaches the isotherm of 50°, with a mean dew-point of 45°. By which difference of dew-point, the total amount of precipitation over the entire zone between the isotherms of 60° and 50°, has exceeded the total amount of evaporation from the same surface.

Now, as a general rule in the Atlantic Ocean, and it may be inferred in the Pacific also, the prevailing direction of the winds, to the north of the 40th parallel of north latitude, is from the southward and westward; in other words, it is from the higher to the lower isotherms. Passing, therefore, from a higher to a lower temperature over the ocean, the total amount of vapor deposited by any given volume of atmosphere,

as it is blown from the vicinity of the tropical towards that of the polar regions, is greater than that which is taken up again. How the land may modify this position, is another question. I speak of the rule at sea, not of the exceptions on the land.

Now, then, these investigations have brought out prominently before us the fact that there is, near the tropics, both of Cancer and Capricorn, a belt of calms across the great oceans. That, on the equatorial side of these belts, the winds at the surface of the sea blow permanently towards the equator—*i. e.* they come from a cooler, and go to a warmer region; thus increasing their capacity for moisture, and consequently taking up more vapor in this part of their circuit than they precipitate down upon it again.

On the polar side of these calm belts of the tropics, the prevailing direction of the wind on the surface of the ocean is towards the poles—*i. e.* from a warm to a colder temperature; and, therefore, in this part of their circuit, these winds must deposit more vapor than they can take up again.

These facts, though they be not new, yet they are pressed by the Charts so forcibly upon us, that we are led irresistibly to the theoretical conclusion, that the trade-wind regions of the ocean are the evaporating regions; and that, as a general rule, in all other regions of the world, except the deserts, and a few others, mostly on the land, the evaporation is less than the precipitation, and that the excess is returned by the rivers and the rains, in the shape of currents, from towards the poles to the evaporating regions of the torrid zone; and that the total amount of rain and river water discharged into the sea, without the limits of the evaporating region, expresses the volume by which the cold currents exceed the warm currents of the sea —designating as cold currents all those which run into the torrid zone; and all those as warm, which bring their waters from it.

These Charts indicate that, upon the ocean, the area comprehended between the isotherms of 40° and 50° Fahrenheit, is less than the area comprehended between the isotherms 50° and 60°; and this, again, less than the area between this last and 70°; for the same reason that the area between the parallels of latitude 50° and 60° is less than the area between the parallels of latitude 40° and 50°; and they indicate that, *theoretically*, more rain to the square inch ought to fall upon the ocean between the colder isotherms of 10° difference, than between the warmer isotherms of the same difference.

Thus, to make myself clear: the aqueous isotherm of 50°, in its extreme northern reach, touches the parallel of 60° N. Now, between this and the equator there are but three isotherms; 60°, 70° and 80°, with the common difference of 10°. But between the isotherm of 40° and the pole, there are at least five others, viz: 40°, 30°, 20°, 10°, 0°, with a common difference of 10°. Thus, to the north of the isotherm 50°, the vapor which would saturate the atmosphere from zero, and perhaps far below, to near 40°, is deposited, while to the south of 50° the vapor which would saturate it from the temperature of 50° up to that of 80°, can only be deposited. At least, such would be the case if there were no irregularities of heated plains, mountain ranges, land, &c., to disturb the laws of atmospherical circulation as they apply to the ocean.

Having therefore theoretically, at sea, more rain in high latitudes, we should have more clouds; and therefore it would require a longer time for the sun, with his feeble rays, to raise the temperature of the

cold water, which, from September to January, has brought the isotherm of 60° from latitude 56° to 40°, than it did for these cool surface currents to float it down.

After this southward motion of the isotherm of 60° has been checked in December by the cold, and after the sources of the current which brought it down have been bound in fetters of ice, it pauses in the long nights of the northern winter, and scarcely commences its return till the sun recrosses the equator, and increases its power, as well in intensity as in duration.

Thus we have here, for the first time, beautifully developed, the effects of night and day, of clouds and sunshine, upon the currents of the sea. These effects are modified by the operations of more powerful agents which reside upon the land; nevertheless, feeble though those of the former class may be, a close study of the Thermal Charts will indicate that they surely exist.

Now, returning towards the south: we may, on the other hand, infer that the mean atmospherical temperature for the parallels between which the isotherm of 80° fluctuates, is below 80°, at least, for the nine months of its slow motion. This vibratory motion suggests the idea that there is, probably, somewhere between the isotherm of 80° in August, and the isotherm of 60° in January, a line, or belt of invariable or nearly invariable temperature, which extends on the surface of the ocean, from one side of the Atlantic to the other. This line, or band, may have its cycles also, but they are probably of long periods.

Theoretically, such a line ought to be found for any given year; but its place for one entire year may not coincide with its place for another, though the motion of such a belt from year to year would probably be very small.

The observations upon which these Charts are founded run through a period of half a century; consequently, they show the temperature for the months only, without regard to the year; and therefore they do not enable us to decide satisfactorily as to the existence of such a belt of uniform, or nearly uniform, ocean temperatures for any one year.

Taking the isotherms of 50° and 60° to illustrate the manner generally, in which the waters of different temperatures run into each other, we shall find that their line of separation is not smooth, but jagged. The line of junction between the warm and cold waters of the sea, is not unlike the sutures of the skull bone on a grand scale. The waters of one temperature are dovetailed and fitted into those of another, in apparently the most irregular manner; but, nevertheless, like the sutures of the skull when they come to be examined closely, these lines of articulation clearly indicate traces of symmetry. They have their laws.

Now a vessel—when waters of marked differences of temperature meet—that sails along near their line of junction, will come across layers or streaks of water, at one time warmer, at another cooler. Where a jagged point of warmer water is found in one month to thrust itself up into a body of cooler water, perhaps the next month it will be found that this obtruding of the warm water has disappeared, and given place to the intrusion from the cooler water—of an articulating surface equally irregular in its outlines. Such layers of cooler and warmer streaks of water are generally to be found along that

part of the usual sailing route between New York and the north of Europe, which runs with the Gulf Stream.

There is on this route a peninsula or island of cold water, which hangs down into the Gulf Stream like a curtain dropped from the north. Its position, as well as its dimensions, vary. It often covers several degrees in extent—and it affords instances of the greatest and most sudden changes that are known to take place in the temperature of the surface waters of the sea. It is generally found about the parallel of 45°, and the meridian of 50°. Covering frequently an area of hundreds of miles in extent, its waters differ as much as 20°, 25° 30°; and in rare cases even as much as 35° of temperature from those about it.

These waters, doubtless, come down from the cold regions of the north, and are perhaps in the strongest part of that current.

The bottom of the sea in that region—the Grand Banks—assists, no doubt, in forcing this mass of cold waters to the surface; and the fact that they penetrate far down across the usual track of the Gulf Stream, at times almost cutting it in two, as it were, seems to indicate that their momentum here is greater than the momentum of the warm waters of the Gulf Stream, which they push aside; or it may be that this part of the ocean is very shallow. It would be interesting to ascertain as to this with lead and line.*

Between this peninsula of cold water and Newfoundland, there is a layer or branch of warm waters; perhaps these are brought there by a bifurcation of the Gulf Stream. Here, we have clearly and unexpectedly 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° N.; for there, in the dead of winter, a thunderstorm is not unusual.

Reviewing now what has been said concerning the layers of cold and warm water along the European route of the Gulf Stream, and returning to the cool and warm streaks mentioned by Lieut. Walsh, and claimed by the Coast Survey as the discovery of a "branch" from the Gulf Stream, it appears probable that the warm waters which that survey encountered, and reported as coming from the Gulf Stream, are the warm waters properly due the latitude, and the effect of the South America shore line as far as Cape St. Roque, in sending north its warm waters. The difference of temperature may be partly due, also, to the warm waters of the surface being separated into streaks by the cooler waters of the submarine current, which, by the agitation of the ocean, are here and there brought to the surface through the thin layer of warm surface water.

If we draw a line of a degree or two in breadth from the capes of the Chesapeake and the Delaware Bays towards Cape St. Roque in Brazil, we shall find in this direction, after crossing the Gulf Stream, a

* Berryman's experiments have proved these conjectures to be well founded.

remarkable layer of cool water. This layer extends to the equator, and it is more clearly marked at some seasons of the year than at others; so much so, that I have been at a loss to account for it. Like an immense lake, it is surrounded with water of a higher temperature. It cannot therefore be brought there by a cold surface current. It is strictly a *layer*, in contradistinction to a current.

The only idea that has suggested itself in explanation of this phenomenon, is in the conjecture that there may be, stretching off in this direction, a submerged mountain range or ridge at the bottom of the sea, across which the cold waters of this submarine current, as it forces itself down towards the equator, are brought to the surface by the agitation of the waves.

Standing out like peaks in this range, are, the islands of Fernando de Noronha, the Penedo de San Pedro, and the Bermudas. The islands and mountains of Cuba occupy a position which a mountain spur from this sunken range might be supposed to occupy.

Lieuts. Walsh, and S. P. Lee, were directed to run across this supposed submarine range of mountains a zigzag line of deep-sea soundings, from the equator to the Capes of Virginia. (P. 217.) But unfortunately circumstances proved unfavorable, and they each had to abandon this interesting part of his work.

It was announced by Dr. Bache, before the American Association at Cleveland, last summer, that Lieuts. Craven and Maffit, U. S. N., had discovered, to the east of the Gulf Stream, off the shores of the Carolinas, and S. W. of the region indicated, a remarkable elevation or ridge in the bottom of the sea, thus tending to prove the correctness of this theoretical deduction.

The following letter from Lieut. Berryman is interesting:—

"We brought across, in a zigzag course, very satisfactory and uniform soundings, until we reached the meridian of about 48° west, where the water *deepened*, and the temperature at 400 fathoms fell to 60° from 65°; this, I suppose, must be that cold stream which you mentioned (in one of your papers on the Gulf Stream), as underrunning that stream after coming from the north over the Grand Banks. This deep water, too, was south of our deepest cast on our outward-bound course, and must be the valley of your submarine mountain, the side of which we have already ascended high enough to have only 1,300 fathoms. I shall try hard to find the top. The winds and the treacherous sea are serious obstacles. We are already driven from our line two or more degrees south of false Bermuda, and hardly a hope of getting back. I was particularly anxious to give it a sounding, for I am now convinced Walsh's wire cast was similar to one I had with 6,600 fathoms, without knowing whether bottom was had or not. The experiment was made with Brooke's sounding-ball, and the line parted in hauling it in. I think the *weight* of *wire* would keep it running 'forever and a day,' and feel confident Mr. Walsh's would have been considerably cut short by our mode of sounding with twine.

"In the position assigned, the deep cast of Captain Barron, of the John Adams, we found only 2,550 fathoms, about one mile south. We had excellent weather, and were fortunate in sounding it at a period of the day when both latitude and longitude were obtained on the spot.

"Our cast of 1,300 fathoms is only 180 miles south of Mr. Walsh's 5,700, and ascending the east side of your submarine mountain. When our boat is sounding, two or more oars are kept going, to keep the

line up and down, and when bottom is found, the oars stopped, and the boat suffered to *ride* by the twine, and then hauled up to the mark at which the line stops running. This is repeated several times, to make sure of having bottom. I have had no chance of sounding from the vessel, and, indeed, I should never do it unless without boats entirely. The soundings taken on board any of our cruising ships, where there is any drift, *I* think, cannot be depended on when the water is over 1,500 fathoms deep, and scarcely then.

"The weather is so boisterous here, and so little to be depended on, that I fear I shall be obliged to pass over much very interesting ground, for our provisions are nearly gone; indeed, some parts of our rations are already consumed, and in a few days our grog will be stopped short, from the same cause.

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"Passing over this submarine mountain of yours, suggests to my mind the possibility of its having something to do with the growth of the *fucus natans.* We pass increased quantities of it here, and in more compact masses. May not the sides of your mountain be covered with it? Yesterday, I gave Brooke's lead or 'sounding-ball' another trial; and I am sure it reached bottom, and that the shot became detached. We hauled in several hundred fathoms, when the line parted. I am not established in the belief of recovering the line at all, for it evidently twists off, no matter how slow we haul it in. Yesterday, it was hauled in by hand very slow, giving every relief possible, when the brig rolled; but it parted under water. The water has deepened from 1,300 to 3,000 fathoms; so I apprehend we have passed the great mountain ridge. I see upon the English Chart we are passing several casts by a vessel called Harvest, from 366 fathoms to 744. To-day we are within 70 miles, and yesterday only 40 miles of the 366 cast, and find 3,000 fathoms. Those casts were taken in 1850, by what means I do not know.* Only one opportunity has offered for ascertaining current by experiment. By our observations, they are, in this region, very uncertain. At this season of the year, I have no doubt that but few opportunities offer for any satisfactory experiments."

The isotherms of 60°, 50°, and 40°, take a northeastwardly direction across the Atlantic, and show the waters of the ocean to be as warm, indeed warmer, between latitude 60° and 65°, off the shores of Europe, than they are on this side, near the parallels of 40° and 45°.

The Gulf Stream *is* roof-shaped; that is, it is higher in the middle and lower at the edges—and has a roof-current running from the middle or axial line to either edge, as suggested in 1844. That it is so, has been proved by experiments since made with regard to it, by officers of the Navy.

Thus, in lowering a boat to try a current, they found that the boat would invariably be drifted towards one side or other of the stream, while the vessel herself was drifted along in the direction of it. Now, were it possible to make a vertical section across the Gulf Stream, the top of it would appear convex, and the bottom concave, unless where the bottom of it reaches the bottom of the sea.

This feature of the Gulf Stream, throws a gleam of light upon the *locus* of the gulf-weed, by proving that its place of growth cannot be on this side (west) of the middle of that stream. No gulf-weed is ever found west of the axis of the Gulf Stream; and, if we admit the top of the stream to be higher in the

* With shoe-thread, tied to scraps of old iron.—M. F. M.

middle than at the edges, in consequence of the expansion due the difference of temperature of the water in the middle and at the edges, it would be difficult to imagine how the gulf-weed should cross it, or get from one side of it to the other.

The inference, therefore, would be, that as all the gulf-weed which is seen about this stream is on its eastern declivity, the *locus* of the weed must be somewhere within or near the borders of the stream, and to the east of the middle. And this idea is strengthened by the report of Captain Scott, a most intelligent shipmaster, who informs me that he has seen the gulf-weed growing on the Bahama Banks. I have specimens of it which he had the kindness to send me, with seed-vessels, plucked up from the bottom while at anchor on the edge of the Gulf Stream. Hence, we account for the fact that the gulf-weed should be seen on the eastern and not on the western borders of the Gulf Stream.

A study of the Thermal Charts will reward the student with new and better ideas as to the system of oceanic circulation. Plate VII. exhibits the mean geographical position of the isotherms for various degrees of Fahrenheit from 80° down for each month. These lines are taken from the Thermal Charts, series D.

Let us take the isotherm of 80° for September as an illustration; the greatest effect of the solar heat is produced upon the land during the month of August; but this Chart shows that it is September before the North Atlantic Ocean is fully supplied with its annual store of heat for the winter.

We see clearly enough, by the monthly isotherm for 80°, that the western half of the Atlantic Ocean is heated up, not by the Gulf Stream alone, as is generally supposed, but by the great equatorial caldron to the west of longitude 35°, and to the north of Cape St. Roque, in Brazil. The lowest reach of the 80° isotherm for September—if we except the remarkable equatorial flexure, which actually extends from 40° to 2° N., and rises up again to 35° N.—to the west of the meridian of Cape St. Roque, is above its highest reach to the east of that meridian. And now that we have the fact, how obvious, beautiful, and striking is the cause?

Cape St. Roque is in 5° S. Now study the configuration of the Southern American Continent from this cape to the Windward Islands of the West Indies, and take into account, also, certain physical conditions of these regions: The Amazon, always at a high temperature, because it runs from west to east, is pouring an immense column of warm water into this part of the ocean. As this water and the heat of the sun raise the temperature of the ocean along the equatorial sea-front of this coast, there is no escape for the liquid element, as it grows warmer and lighter, except to the north. The land on the south prevents the tepid waters from spreading out in that direction as they may do to the east of 35° W., for here there is a space, about 18° of longitude broad, in which the sea is clear both to the north and south.

They must, consequently, flow north. A mere inspection of the Thermal Chart is sufficient to make obvious the fact, that the warm waters which are found east of the usual limits assigned the Gulf Stream, and between the parallels of 30° and 40° N. do not come from the Gulf Stream, but from this great equatorial caldron, which Cape St. Roque blocks up on the south, and which forces its overheated waters up to the 40th degree of north latitude, not through the Caribbean Sea and Gulf Stream, but over the broad surface of the left bosom of the Atlantic Ocean.

Here we are again tempted to pause and admire the beautiful revelations which, in the benign system of terrestrial adaptation, these researches unfold and spread out before us for contemplation. In doing this, we shall have a free pardon from those at least who delight "to look through nature up to nature's God."

What two things in nature can be apparently more remote in their physical relations to each other, than the climate of Western Europe and the profile of a coast line in South America? Yet this Chart reveals to us, not only the fact that these relations between the two are most intimate, but makes us acquainted with the arrangements by which such relations are established.

The barrier which the South American shore line opposes to the escape, on the south, of the hot waters from this great equatorial caldron of St. Roque, causes them to flow north, and, in September, as the winter approaches, to heat up the western half of the Atlantic Ocean, and to cover it with a mantle of warmth above summer heat as far up as the parallel of 40°. Here heat to temper the winter climate of western Europe is stored away, as in an air-chamber to furnace-heated apartments; and during the winter, when the fire of the solar rays sinks down, the westwardly winds and eastwardly currents are sent to perform their office in this benign arrangement. Though unstable and capricious to us they seem to be, they nevertheless "fulfil His commandments" with regularity, and perform their offices with certainty. In tempering the climates of Europe with heat in winter, that has been bottled away in the waters of the ocean during summer, they are to be regarded as the flues and the regulators for distributing at the right time, and at the right places, in the right quantities.

By March, when "the winter is passed and gone," the furnace which had been started by the rays of the sun in the previous summer, and which, by autumn, had heated up the ocean in our hemisphere, has gone down. The caldron of St. Roque, ceasing in activity, has failed in its supplies, and the chambers of warmth upon the northern sea, having been exhausted of their heated water, which has been expended in the manner already explained, have contracted their limits. The surface of heated water which, in September, was spread out over the western half of the Atlantic, from the equator to the parallel of 40° north, and which raised this immense area to the temperature of 80°, and upwards, is not to be found in early spring on this side of the parallel of 8° N.

The isotherm of 80° in March, after quitting the Caribbean Sea, runs along parallel with the South American coast, towards Cape St. Roque, keeping some 8° or 10° from it. Therefore, the heat dispensed over Europe from this caldron falls off in March. But at this season, the sun comes forth with fresh supplies; he then crosses the line and passes over into the northern hemisphere; and the Charts show that the process of heating the water in this great caldron, for the next winter, is now about to commence.

In the mean time, so benign is the system of cosmical arrangements, another process of raising the temperature of Europe commences. The land is more readily impressed than the sea, by the heat of the solar rays; at this season, then, the summer climate due these transatlantic latitudes is modified by the action of the sun's rays directly upon the land. The land receives heat from them, but, instead of having the capacity of water for reserving it, it imparts it straightway to the air, and thus the proper climate, because it is the climate which the Creator has, for his own wise purpose, allotted to this portion of the

earth, is maintained until the marine caldron of Capè St. Roque is again heated and brought into the state for supplying the means of maintaining the needful temperature in Europe during the absence of the sun in the other hemisphere.

In like manner the Gulf of Guinea forms a caldron and a furnace, and spreads out over the South Atlantic an air-chamber for heating up in winter, and keeping warm, the extra-tropical regions of South America. Every traveller has remarked upon the mild climate of Patagonia and the Falkland Islands.

"Temperature in high southern latitudes," says a very close observer who is co-operating with me in collecting materials for the Charts, "differs greatly from the temperature in northern. In southern latitudes there seem to be no extremes of heat and cold as at the north.

"Newport, R. I., for instance, latitude 41° N., longitude 71° W., and Rio Negro, latitude 41° S., and longitude 63° W., as a comparison:—

"In the former, cattle have to be stabled and fed during the winter, not being able to get a living in the fields on account of snow and ice.

"In the latter, the cattle feed in the fields all the winter, there being plenty of vegetation and no use of hay.

"On the Falkland Islands (latitude 51-2° S.), thousands of bullocks, sheep, and horses are running wild over the country, gathering a living all through the winter."

We should therefore have, on the eastern side of the South Atlantic, the counterpart of the warm isotherms which stretch up on the western side of the north.

The water in the equatorial caldron of Guinea cannot escape north; the shore line will not permit it. It must therefore overflow to the south, as that of St. Roque does to the north, carrying to Patagonia and the Falkland Islands, beyond 50° S., the winter climate of Charleston, South Carolina, on our side of the North Atlantic; or of the "Emerald Island," on the other.

From this source and from the Lagullas current, which receives its heat from the Indian Ocean, the South Atlantic is covered with a mantle of warmth which tempers to such a remarkable degree the climate of South America.

Because western Europe had a mild climate and an ocean to the westward, and the eastern shores of North America a severe winter climate and an ocean to the eastward, a generalization has been deduced as to the climates of countries which have an ocean to the west, and of those which have an ocean to the east, which does not hold good.

The caldron in the Gulf of Guinea and the Indian Ocean, which heats water for the South Atlantic, causes this rule, so far as the extra-tropical climate of South America is concerned, to have its exceptions.

All geographers have noticed, and philosophers have frequently remarked upon, the conformity as to the shore-line profile of equatorial America and equatorial Africa.

It is true, we cannot now tell the reason, though explanations, founded upon mere conjecture, have been offered, why there should be this sort of jutting in and jutting out of the shore line, as at Cape St. Roque

and the Gulf of Guinea, on opposite sides of the Atlantic; but one of the purposes at least, which this peculiar configuration was intended to subserve, is without doubt now revealed to us.

We see that, by this configuration, two cisterns of hot water are formed in this ocean; one of which distributes heat and warmth to western Europe; the other, at the opposite season, tempers the climate of eastern Patagonia.

Phlegmatic must be the mind that is not impressed with ideas of grandeur and simplicity as it contemplates that exquisite design, those benign and beautiful arrangements, by which the climate of one hemisphere is made to depend upon the curve of that line against which the sea is made to dash its waves in the other. Impressed with the perfection of terrestrial adaptations, he who studies the economy of the great cosmical arrangements, is reminded that not only is there design in giving shore lines their profile, the land and the water their proportions, and in placing the desert and the pool where they are, but the conviction is forced upon him also, that every hill and valley, with the grass upon its sides, have each its office to perform in the grand design.

Returning now to the study of Plate VII., and to the contemplation of the isotherms of 80°, for the different months, we are struck with the remarkable bending of all these lines towards the equator, on the eastern side of the Atlantic. This feature in them indicates, more surely than any direct observations upon the currents can do, the presence, along the African shores, of a large volume of cooler and running waters.

These are the waters which, heated up in the caldron of St. Roque, in the Caribbean Sea and Gulf of Mexico, have been made to run to the north, loaded with heat, to temper climates there. Having performed this office, they are obedient still to the "Mighty Voice" which the winds and the waves obey. They are returning by this channel along the African shore to be again replenished with warmth, and to keep up the system of beneficent and wholesome circulation designed for the ocean.

The Thermal Charts abound with beautiful results and instructive facts, all of which are expressed, by the Charts themselves, much more clearly and forcibly than my pen can utter them.

It is proposed to construct from the same journals which have afforded the materials for these Thermal Charts of the Atlantic, which journals give the temperature of the air, also another set of Thermal Charts, which shall relate to the temperature of the atmosphere over the ocean; though Professor Dové, by means of his valuable Thermal Charts of the atmosphere, has rendered this labor much less interesting than in the absence of his exquisite work it would have been; for it has already been shown by this series of Charts, in connection with his, that the remarkable bending of his isotherms, as they enter the land along the western shores of Northern Europe and America, is owing, in a great degree, to the manner in which the aqueous curves of equal temperature approach those shores.

These Charts will show very conclusively, and in a manner the most striking, that the mean temperature of the ocean at the surface is higher than that of the atmosphere.

THE TRACK CHARTS.

The Charts, numbered series A, are the *Track Charts.* Charts of this letter have been published for the North Atlantic, in eight large sheets; for the South Atlantic, in six; and for the west coast of America, in four. The remaining number of this series, both for the Indian and Pacific Oceans, are in process of construction. They are all on a scale of 0.8 in. to a degree at the equator.

The different sheets of this series show at a glance the frequented and unfrequented parts of the ocean; they inform the navigator as to the general character of the wind and weather, the force and direction of the currents encountered by those who have preceded him in the same part of the ocean, and at the same season of the year.

This series, as far as published, is the work of Lieutenant Whiting, Passed Midshipmen Wyman, Gibbon, Beaumont, Temple, and Woolley; and of Professors Flye and Benedict, all of the Navy.

THE TRADE-WIND CHARTS.

The Charts of the series, marked letter B, are illustrative of the trade-winds and the regions of calms and monsoons contiguous thereto. They are constructed according to a peculiar system of engraved squares.

This series, published only for the Atlantic, shows that the N. E. trade-winds occupy a belt or zone extending in length from east to west across that ocean, having a variable breadth of from 17° to 35° of latitude. Its average mean breadth is about 23°; and in its extreme range, it extends from 3° south to 35° north, according to the season of the year.

This zone makes two vibrations in a year. It reaches its extreme northern declination usually in September. Then returning, and following the sun, it reaches its southern extreme in March and April. Being stationary for two or three months, between 3° and 4° north, it commences to return north, and in the months of August, September, and October, its other stationary period, it is seldom or never found to the south of the parallel of 9° N. The parallel of 9° N. may be taken as the mean limit of the equatorial border of the zone of N. E. trades.

The S. E. trade-winds occupy a similar zone in the South Atlantic, with a like vibratory motion. The mean equatorial limit of this zone, instead of being near the parallel of 9° south, to correspond with the zone of the northern hemisphere, is in about 3° north.

It is a remarkable phenomenon, discovered in the course of these investigations, that the S. E. trade-winds blow with more force than do their congeners of the northern hemisphere. They have force enough to push the latter with their belt back towards the north, intruding occasionally in the late summer, and in the early fall months, as far as the parallel of 9° north. Whereas, out of many thousands of

records examined, it does not appear that the belt of N. E. trade-winds is ever found to cross the parallel of 3° south.

The two zones of winds are characterized by a like difference of strength in the Pacific. The S. E. trade-winds of the Atlantic Ocean have force enough to push their equatorial limits over into the northern hemisphere, and to maintain them there during the greater part of the year. The reverse is never the case; the N. E. trades have not the force to crowd out the S. E. trades, and to maintain themselves for any month of the year in the southern hemisphere.

The prevailing direction of what are called the N. E. trade-winds is, as nearly as the observations which mariners usually furnish enable me to determine, about E. N. E.

By resolving the forces which it is supposed are the principal forces that put those winds in motion, viz: calorific action of the sun and diurnal rotation of the earth, we are led to the conclusion that the latter is much the greater of the two in its effects upon the trade-winds of the northern hemisphere. But not to such an extent is it greater in its effects upon those of the southern. We have seen that those two opposing currents of wind are so unequally balanced that one recedes before the other, and that the current from the southern hemisphere is larger in volume; *i. e.* it moves a greater zone or belt of air. The S. E. trade-winds discharge themselves over the equator—*i. e.* across a great circle—into the region of equatorial calms; while the N. E. trade-winds discharge themselves into the same region over a parallel of latitude, and consequently over a small circle. If, therefore, we take what obtains in the Atlantic as the type of what obtains entirely around the earth, as it regards the trade-winds, we shall see that the S. E. trade-winds keep in motion more air than the N. E. do, by a quantity at least proportioned to the difference between the circumference of the earth at the equator and the circumference of the earth at the parallel of latitude of 9° N. For if we suppose that those two perpetual currents of air extend the same distance from the surface of the earth, and move with the same velocity, a greater volume from the south would flow across the equator in a given time than would flow from the north over the parallel of 9° in the same time; the ratio between the two quantities would be as rad. to the sec. of 9°. Besides this, the quantity of land lying within and to the north of the region of the N. E. trade-winds is much greater than the quantity within and to the south of the region of the S. E. trade-winds. In consequence of this, the mean level of the earth's surface within the region of the N. E. trade-winds is, it may reasonably be supposed, somewhat above the mean level of that part which is within the region of the S. E. trade-winds. And as the N. E. trade-winds blow under the influence of a greater extent of land surface than the S. E. trades do, the former are more obstructed in their course than the latter, by the forests, the mountain ranges, unequally heated surfaces, and other such like inequalities.

As already stated, the Charts show that the momentum of the S. E. trade-winds is sufficient to push the equatorial limits of their northern congeners back into the northern hemisphere, and to keep them at a mean, as far north as the 9th parallel of north latitude. Besides this fact, our investigations also indicate that while the N. E. trade-winds, so called, make an angle in their general course of about 23° with the equator (E. N. E.), those of the S. E. make an angle of 30° or more with the equator (S. E. by E.). I speak

of those in the Atlantic; thus indicating that the latter approach the equator more directly in their course than do the others, and that, consequently, the effect of the diurnal rotation of the earth being the same for like parallels, north and south, the calorific influence of the sun exerts more power in giving motion to the southern than to the northern system of Atlantic trade-winds.

That such is the case in nature is rendered still more probable from this consideration: All the great deserts are in the northern hemisphere, and the land surface is also much greater on our side of the equator. The action of the sun upon these unequally absorbing and radiating surfaces in and behind, or to the northward of the N. E. trades, probably tends to retard these winds, and to draw large volumes of the atmosphere, that otherwise would be moved by them, back to supply the partial vacuum made by the heat of the sun, as it pours down, with active intensity, its rays upon the vast plains of burning sands and unequally heated land surfaces in our overheated hemisphere. The N. W. winds of the southern are stronger than the S. W. winds of the northern hemisphere.

The Charts show that the influence of the land upon the normal directions of the wind at sea, is an immense influence. It is frequently traced for a thousand miles or more out upon the ocean.

For instance: The action of the sun's rays upon the great deserts and arid plains of Africa, in the summer and autumnal months, is such as to be felt nearly across the Atlantic Ocean between the equator and the parallel of 13° north. Between this parallel and the equator, the trade-winds are turned back by the heated plains of Africa, and are caused to blow a regular southwardly monsoon for six months.

This monsoon is a discovery which has been fully and completely developed by the Charts and the investigations connected with them. They (the monsoons) blow towards the coast of Africa from June to November, inclusive. They bring the rains which divide the season in these parts of the African coast. The region of the ocean embraced by the monsoons is cuneiform in its shape, having its base resting upon Africa, and its apex stretching over till within 10° or 15° of the mouth of the Amazon.

Indeed, when we come to study the effects of South America and Africa (as developed by these Charts), upon the winds at sea, we should be led to the conclusion—had the foot of civilized man never trod the interior of these two continents—that the climate of one is humid; that its valleys are for the most part covered with vegetation, which protects its surface from the sun's rays; while the plains of the other are arid and naked; and for the most part act like furnaces in drawing the winds from the sea to supply air for the ascending columns which rise from its overheated plains.

Pushing these facts and arguments still farther, these beautiful and interesting researches seem already sufficient almost to justify the assertion, that, were it not for the Great Desert of Sahara, and other arid plains of Africa, the western shores of that continent within the trade-wind region would be almost, if not altogether, as rainless and sterile as the desert itself.

These investigations, with their beautiful developments, eagerly captivate the mind; giving wings to the imagination, they teach us to regard the sandy deserts, and arid plants, and the inland basins of the earth, as compensations in the great system of atmospherical circulation. Like counterpoises to the telescope, which the astronomer regards as incumbrances to his instrument, these wastes serve as make-

weights, to give certainty and smoothness of motion—facility, and accuracy to the workings of the machine.

The meteorological and physical researches with which the *Wind and Current Charts* are connected, relate only to the sea. Already, the mariner has felt and acknowledged the importance of them. Commerce and navigation are reaping benefits from them of great moment. The merchants of Bombay, and American navigators, with that regard for the practical and useful which adorns their character and makes them renowned, have nobly stepped forward, and volunteered to co-operate with me in collecting facts for the farther prosecution of the work. More than a thousand ships are now daily and hourly occupied in all parts of the ocean in making and recording, each a prescribed series of observations upon the winds and the currents, the rains, the calms, the storms, the thunder and the lightning; the fogs, and clouds, and drift—the temperature of the air and water; and all other subjects and objects, facts and phenomena, which are of interest to navigation and to science. By a recent order of the Board of Admiralty also, every captain and master in the English Navy is required to keep a Track Chart of the ship.

Enough of abstract logs has already been collected at this office to make upwards of two hundred large manuscript volumes, averaging each from two to three thousand days' observations, and the number is constantly increasing; indeed, the materials increase faster than I have force to discuss them.

When we travel out upon the ocean, and get beyond the influence of the land upon the winds, we find ourselves in a field particularly favorable for studying the general laws of atmospherical circulation.

Here, beyond the reach of the great equatorial and polar currents of the sea, there are no unduly heated surfaces, no mountain ranges, or other obstructions to the circulation of the atmosphere; nothing to disturb it in its natural courses. The sea, therefore, is the field for observing the operations of the general laws which govern its circulation. Observations on the land will enable us to discover the exceptions. But from the sea we shall get the rule. Each valley, every mountain range and local district, may be said to have its own peculiar system of calms, winds, rains, and droughts. But not so the surface of the broad ocean.

In this connection, I beg leave to call the attention of meteorologists on shore to the importance of introducing a special column in their journals, to show what are the rainy winds at each station, and for each season of the year.

Upon every water-shed which is drained into the sea, the precipitation may be considered as greater than the evaporation for the whole extent of the shed so drained, by the amount of water which runs off into the sea. In this view, all rivers may be regarded as immense rain-gauges; and the volume of water annually discharged by any one, as an expression of the quantity which is annually evaporated from the sea, carried back by the winds, and precipitated throughout the whole extent of the valley that is drained by it. Now, if we knew the rain-winds from the dry, for each locality and season generally throughout such a basin, we should be enabled to determine, with some degree of probability at least, as to the part of the ocean from which such rains were evaporated. And thus, notwithstanding all the eddies caused by mountain chains, and other uneven surfaces, we might detect the general course of the atmospherical

circulation over the land as well as the sea, and make the general courses of circulation in each valley as obvious to the mind of the philosopher as is the current of the Mississippi, or of any other great river, to his senses. That river so abounds with eddies, that it is difficult to tell by regarding small portions of its surface only, which way the water is flowing. But when we come to regard the drift-wood and the whole river, we are left in no doubt as to the onward course of the main stream itself, with all its eddies and whirlpools.

These investigations as to the winds at sea indicate that the vapors which supply the sources of the Amazon with rain, are taken up from the Atlantic Ocean by the N. E. and S. E. trade-winds.

These investigations show that the trade-wind regions of the ocean, beyond the immediate vicinity of the land, are, for the most part, rainless regions; and that the trade-wind zones may be described, in an hyetographic sense, as the evaporating regions.

They also show, or rather indicate as a general rule, that, leaving the polar limits of the two trade-wind systems, and approaching the nearest pole, the precipitation is greater than the evaporation, until the point of maximum cold is reached.

They also indicate, as a *general* rule, that the S. E. and N. E. trade-winds which come from a lower and go to a higher temperature, are the evaporating winds, *i. e.* they evaporate more than they precipitate; while those winds which come from a higher and go to a lower temperature, are the rain-winds, *i. e.* they precipitate more than they evaporate. That such is the case, these Charts indicate; reason teaches it to us; and philosophy tells us it is so.

The results of these Charts, therefore, suggest the inquiry as to the sufficiency of the Atlantic, after supplying the sources of the Amazon, and its tributaries with their waters, to supply also the sources of the Mississippi and the St. Lawrence, and of all the rivers, great and small, of North America and Europe.

A careful study of the rain winds, in connection with the *Wind and Current Charts*, will probably indicate to us the "springs in the ocean," which supply the vapors for the rains that are carried off by those great rivers.

"All the rivers run into the sea; yet the sea is not full; unto the place from whence the rivers come, thither they return again."

Returning now to the trade-winds of the Atlantic: there is between the two systems, a region of calms, known as the equatorial calms. It has a mean average breadth of about six degrees of latitude. In this region, the air, which is brought along to the equator by the N. E. and S. E. trades, ascends.

If we liken the belt of equatorial calms to an immense atmospherical trough, extending, as it does, entirely around the earth, and if we liken the N. E. and S. E. trade-winds to two streams discharging themselves into it, we shall see that we have two currents perpetually running in at the bottom; and that, therefore, we must have as much air as the two currents bring in at the bottom, to flow out at the top. What flows out at the top is carried back north and south, by these upper currents, which are thus proved to exist and to flow counter to the trade-winds.

Using still farther this mode of illustration; if we liken the calm belt of Cancer, and the calm belt of

Capricorn, each to a great atmospherical trough extending around the earth also, we shall see that in this case the currents are running in at the top and out at the bottom; here the current from the equator meets, in the upper regions, the current from the poles; the two descend; and the atmosphere which they thus pour into these belts, runs out at the bottom—on one side towards the equator, as the perpetual trade-winds; on the other, towards the poles, as the prevailing winds of the regions between these belts and the polar circles.

The belt of equatorial calms is a belt of constant precipitation. Captain Wilkes, of the Exploring Expedition, when he crossed it in 1838, found it to extend from 4° N. to 12° N. He was ten days in crossing it, and during those ten days, rain fell to the depth of 6.15 inches, or at the rate of 18 feet and upwards during the year.

This belt of calms vibrates up and down the ocean as the belts of the trade-winds do. In the summer months it is found between the parallels of 8° and 14° of north latitude, and in the spring between 5° S. and 4° N.

By this Chart, the navigator can tell what places within the range of this zone, have, during the year, two rainy seasons, what one, and what are the rainy months for each locality.

Were the N. E. and the S. E. trades, with the belt of equatorial calms of different colors, and visible to an astronomer in one of the planets, he might, by the motion of these belts or girdles alone, tell the seasons with us.

He would see them at one season going north, then appearing stationary, and then commencing their return to the south. But though he would observe that they follow the Sun in his annual course, he would remark that they do not change their latitude, as much as the Sun does his declination; he would, therefore, discover that their extremes of declination are not so far asunder as the tropics of Cancer and Capricorn, though in certain seasons the changes from day to day are very great. He would observe that these zones of winds and calms have their tropics or stationary nodes, about which they linger near three months at a time; and that they pass from one of their tropics to the other in a little less than another three months. Thus, he would observe the whole system of belts to go north from the latter part of May, till some time in August. Then they would stop and remain stationary till winter, in December; when again they would commence to move rapidly over the ocean, and down towards the south, until the last of February or the first of March; then again they would become stationary and remain about this, their southern tropic, till May again.

The zone of the S. E. trade-winds would present to him its northern edge inclined somewhat to the equator; commencing near the coast of Africa, and tracing the usual outlines of this edge over towards South America, he would discover that it approached the equator at an angle of about 18°; and our supposed astronomer would announce that the equatorial edge of the zone of S. E. trades in the Atlantic is inclined towards the equator at an angle of 15°—that it lies W. 15° N., and E. 15° S.

Turning his attention now to the belt of N. E. trade-winds, he would observe the equatorial edge of this zone to be somewhat, though not altogether, symmetrical with the equatorial edge of the S. E. trade-

wind zone of the other hemisphere. On the African side it is farthest from the equator, which it approaches at an angle of about 10° (W. by S.), until it reaches the meridian of about 40° west. Here it is deflected to the north, and trends off in the direction of W. N. W. Here we begin to experience the effect of the North American continent upon the trade-winds at sea. The rarefication caused by the lands of northern Texas and the arid plains in that quarter, is sufficient in summer to convert the N. E. trades of the Gulf of Mexico into a prevailing wind from the southward and eastward.

In the Pacific, and within a certain distance from the land, the N. E. trade-winds are, by the same influences, as these researches into the winds and currents of the sea have revealed, converted into a southerly monsoon.

By tracing on a Chart the equatorial limits of the N. E. and S. E. trade-winds, as herein described, it will be perceived that there is left between the two systems a wedge-shaped band, having its broadest part on the African side of the Atlantic. The region of the ocean which the Planetary Astronomer would observe this band or belt to cover, is the region which is occupied by the equatorial calms and the African monsoons that fall between the systems of N. E. and S. E. trade-winds. And were the belt which represents these calms different from the rest as to color, the imaginary astronomer would see it as somewhat of an irregular curve, not having the northern and southern edges concentric. The concave side of this curved belt is turned to the E. of N., and has its centre near the shores of Greenland.

As before remarked, the newly discovered monsoons of the North Atlantic Ocean also come within the belt of equatorial calms. They give the peculiar wedge-shaped form to the regions between the two systems of trade-winds.

Having completed the physical examination of the equatorial calms and winds, if the supposed observer from some distant sphere should now turn his telescope towards the poles of our earth, he would observe a zone of calms bordering the N. E. trade-winds on the north, and another bordering the S. E. trade-winds on the south. These calm zones also would be observed to vibrate up and down with the trade-wind zones—partaking of their motions, and following the declination of the sun.

On the polar side of each of these two calm zones there would be a broad band extending up into the polar regions, the prevailing winds within which are the opposites of the trade-winds, viz., S. W. in the northern and N. W. in the southern hemisphere.

The equatorial edge of these calm belts is near the tropics, and their average breadth is 10° or 12°. On one side of these belts the winds blow perpetually towards the equator; on the other, their prevailing direction is towards the poles.

These belts, therefore, may also be considered as nodes in the general system of atmospherical circulation.

The atmosphere which the N. E. and S. E. trade-winds keep in perpetual motion towards the equator has for its node the equatorial calms. Here it ascends, boils over, divides, and flows off in the upper regions of the atmosphere, one part going to the northern, the other to the southern hemisphere, to complete the "circuit of the winds," and to supply the sources of the trade-winds with air.

Arrived near the Tropic of Cancer, the northern current meets, in the upper regions of the atmosphere, the return current, which the prevailing winds of the north temperate zone have carried as a surface current to the hyperborean regions of the north. These two currents produce another node or calm region, in which the atmosphere descends, and from which it issues both to the north and south, assuming, on one side, the character of N. E. trades; on the other, the character of the S. W. passage winds.

This node has its fellow in the southern hemisphere, where there is a like meeting of upper currents; only from one side of the zone of the calms of Capricorn, the wind issues as the S. E. trades; from the other as the N. W. passage winds of that part of the southern hemisphere which is extra-tropical. See Plate II., in which the two outer lines, marked A, B, and so on, are drawn to represent the vertical, and the arrows on the shaded ground the horizontal, motion of the atmosphere.

Along the polar borders of these two calm belts, we have another region of precipitation, though generally the rains here are not so constant as they are in the equatorial calms. The precipitation near the tropical calms is nevertheless sufficient to mark the seasons; for whenever these calm zones, as they go from north to south with the sun, leave a given parallel, the rainy season of that parallel, if it be in winter, is said to commence. Hence, we may explain the rainy season in Chili at the south, and in California at the north.

This letter of the series of the Charts will enable any one who consults it, to tell to what places the tropical calms bring rain, and in what months the rainy season commences and ends for any parallel.

To complete the physical examination of the earth's atmosphere, which we have supposed an astronomer in one of the planets to have undertaken according to the facts developed by the *Wind and Current Charts*, it remains for him to turn his telescope upon the icy regions of the poles. (For, that *we* should complete the examination in this respect, it would be necessary to obtain the log-books of ships in the anti-commercial regions of the ocean, which we cannot do. As the sea is most open near the south pole, the principle of the general law of atmospherical circulation would be better developed probably by observations in the antarctic, than in the arctic regions.)

For the want of such observations, but with the light which these Charts throw on the subject for our guide, let us pursue the S. W. passage winds of the northern hemisphere into the arctic regions, and see theoretically, with the imaginary telescope, how they get there; and, being there, what becomes of them.

From the parallel of 40° up towards the north pole, the prevailing winds in the northern hemisphere, as already remarked, are the S. W. passage winds, or, as they are more generally called by mariners, the "westerly" winds; these, in the Atlantic, prevail over the "easterly" winds in the ratio of about two to one.

Now, if we suppose, and such is probably the case, these "westerly" winds to convey in two days a greater volume of atmosphere towards the arctic circle than those "easterly" winds can bring back in one, we establish the necessity for an upper current by which this difference may be returned to the tropical calms of our hemisphere. Therefore, there must be some place in the polar regions at which these S. W. winds cease to go north, and from which they commence their return to the south, and this locality must

be in a region peculiarly liable to calms. It is another atmospherical node in which the motion of the air is upward, with a decrease of barometric pressure. It is marked P, Plate II.

If we now return to the calm belt of the northern tropic, and trace theoretically a portion of air that, in its circuit, shall fairly represent the average course of these S. W. passage winds, we shall see that it approaches the pole in a loxodromic curve; that as it approaches the pole it acquires, from the spiral convolutions of this curve which represents its path, a whirling motion, in a direction *contrary* to that of the hands of a clock; and that the portion of atmosphere whose path we are following, would gradually contract its gyrations, until it would finally ascend, turning against the hands of a watch, as it whirls around.

After reaching the upper regions of the atmosphere, through this whirl, its course would be to the southward; or rather, owing to the effect of the axial rotation of the earth, its course would be from the northward and eastward, until it should meet also in the upper regions a like portion from the ascending node formed in the calms near the equator. This place of meeting in the upper regions of the atmosphere, as already remarked, takes place in the zone of the calms of Cancer. Here the two currents, the one from the poles, the other from the equator, balance each other, produce a calm, or the descending node for the northern hemisphere, with an increase of barometric pressure.

In the southern hemisphere a like process is going on; only there, the N. W. passage wind would, as it arrives near the antarctic calms, acquire a motion with the sun, or in the direction of the hands of a watch.

That such is the case, the investigations that are carried on here do not prove; but they, and a process of reasoning guided by analogy, derived from what they do show, suggest that such is *probably* the case.

The general course of the circulation of the atmosphere, as partly established and partly suggested by these researches and other sources of information is, an upper current from the poles, as far as the tropical calms, towards the equator; thence a descent and a surface current (N. E. and S. E. trades), to the equatorial calms. Here an ascent takes place, through which air is supplied for an upper current each way towards the poles, as far as the zone of tropical calms. Here there is a descent; and a continuation towards the polar regions as a surface current (S. W. passage winds in the northern, N. W. in the southern hemisphere), until it approaches, in part, the calms of the arctic and antarctic regions. Here it commences to whirl about in the manner already stated, forming the supposed polar calms, in which it ascends, and so commences its return towards the equator by reversing the circuit just described. *Vide* Plate II.

The following is a part of the history connected with these investigations as to the circuit of the winds: *Extract from a letter to the Prussian Minister, Baron Von Gerolt, dated, National Observatory, June* 20, 1850.

Speaking in advance somewhat of my publication, but leaning, nevertheless, upon the indications already given by the investigations which are in progress at this office with regard to the winds and currents of the sea, and the phenomena connected therewith, I may remark that certain conclusions have been forced upon me, with such verisimilitude, that it only remains for Professor Ehrenberg, with his microscope, to write the final Q. E. D. to them.

For instance, my investigations of the winds at sea, so far as they bear upon the subject, seem to indi-

cate that the rivers and fresh water of the northern, temperate, and frigid zones, are, for the most part, evaporated from the south torrid; or, more properly speaking, that they are taken up from the sea by the S. E. trade-winds. Such, at least, is the indication; and certain facts so tend in their bearings, as to convert this indication into a conclusion that does not appear altogether forced.

As a general rule, most of the land is in the northern, and most of the water in the southern hemisphere. But, notwithstanding the absence of evaporating surface in the northern hemisphere, most of the precipitation takes place there, if we regard the waters that are discharged into the ocean by the rivers as an expression of the excess of the precipitation over the evaporation that takes place in the basins drained by these rivers. The basin of the Amazon is in both hemispheres; it is, therefore, common, and should not be counted as peculiar to either. The Rio de la Plata is the only great river then in the southern hemisphere; whereas, in the northern, are all the rivers, great and small, which give drainage to Europe, Asia, and America.

The question then comes up: Does the Atlantic afford evaporating surface sufficient to supply all the rivers of Europe and America with rain water? and, if so, by what winds do the vapors, that make these rains, travel both east and west from the same place?

Very little of America and no part of Europe is within the region of the N. E. trade-winds; and the trades, because they come from a colder and go to a warmer climate, are eminently evaporating winds. But how is it to the north of the N. E. trade-winds, where, on the surface of the earth, the S. W. are the prevailing winds? Here, as a general remark, the winds are going from a warmer to a colder climate, and, therefore, ought, it would seem, to precipitate more than they evaporate. Thus, take the isotherm of 60° Fahr. in the Atlantic, as an example; the mean dew-point, we will suppose along this line, is between 50° and 60°, or at any other degree below 60°—suppose 55°—that we may choose for the illustration.

Now, let us proceed still farther north in this ocean until we reach the isotherm of 30°; on this line the mean dew-point must be below 30°, how much we cannot say, nor is it material for the illustration that we should say. It is certainly below the mean dew-point of 60°. Now, what becomes of the vapor that has caused the mean dew-point of the isotherm of 60° to change to that which belongs to the isotherm of 30°? It has been precipitated, and the capacity of the air to retain moisture has been lessened proportionably. In thus viewing the case, the question arises: Whence are the vapors taken which supply with rain the sources of the rivers of the north temperate and frigid zones?

You will understand me as speaking in general terms, without regard to any of the exceptions caused by anomalies, such as the Gulf Stream and the like.

Where the N. E. and S. E. trade-winds meet, they produce what is known as the belt of equatorial calms. This is one of the valves in the great atmospherical machine, through which the air that is brought from the north and the south by these trade-winds, rises and escapes into the upper regions of the atmosphere, and thence returns to supply the sources of the trades with fresh air to make more winds of.

Now the question is: Does the air which is brought to this valve by the S. E. trades continue on towards the north in the upper regions of the atmosphere, while that which comes down as the N. E. trades

continues on towards the south in like manner? or does the air which the S. E. trades bring to this calm place, rise up and return to the south? or does the air of the two trades intermingle here, and go, a part of it indiscriminately, either to the north or to the south as chance may determine?

I am inclined to favor an affirmative reply to the first of these interrogatories; and for these reasons, in addition to those already alluded to:—

1. Winter, late fall, and early spring, are the seasons of our greatest precipitation; and this is the time when the sun is pumping up the vapor with the greatest energy from the southern, and with the least from the northern oceans—and so too when the sun is pumping up vapor from the northern hemisphere with all his energies, precipitation is most active in the southern.

2. The belt or band over which the S. E. trades prevail is much broader than that over which the N. E. trades prevail; consequently, supposing the velocity of each trade-wind to be the same, or nearly the same, the S. E. trade takes up more moisture because it sweeps over a broader belt of ocean; and sweeping over a broader belt, it remains longer in contact with the evaporating surface; and consequently, it may be supposed, it brings more moisture to the belt of equatorial calms whence the ascent takes place.

A large portion of this moisture is deposited in the equatorial calms, which we know is a region of constant precipitation. But where is the rest precipitated—in the northern or southern hemisphere? In the former, I suppose; because the rivers and the rain-gauge, as far as it has been observed, tell us that the total amount of precipitation in the northern, is greater than that in the southern hemisphere; indeed, it is not necessary to consult the rain-gauge to learn this; the rivers themselves are sufficient rain-gauges for this purpose; for we have only to consider the volume of water annually discharged into the ocean by northern rivers, to see in it an expression for an amount by which the total precipitation is in excess of the total evaporation which takes place in the whole extent of valleys drained by such rivers. Search the southern hemisphere for a like quantity, and the search will be in vain.

Seeing, moreover, that the southern hemisphere has more water and less land than the northern; that it has less rain and fewer rivers, it seems as though, in likening the atmosphere to an immense machine, we might call the southern seas the boiler, and the northern continent, the condenser for the mighty engine.

There is, perhaps, another point upon which an argument, not altogether without plausibility, may be turned in favor of this hypothesis.

The grounds for this argument are drawn from probability, and the argument itself rests on the degree of belief and faith we have in the perfection of terrestrial adaptations.

To state the argument in this point of view, we must consider the atmosphere, not only as a great condensing machine, but as an immense sewer, in which vast quantities of corrupt animal and vegetable matter are continually being cast for re-elaboration, purification, rearrangement, and readaptation to the purposes of the animal and vegetable kingdoms.

Notwithstanding the quantity of matter that the plants and animals of the earth are continually taking from the atmosphere on the one hand, and are as continually casting into it on the other, so admirably

arranged is it, and so perfect its system of circulation, now across the seas, now through forests, and again over deserts, burning sands, and frozen heights, that its proportions are never destroyed.

In this system of purification and preservation, we know that vegetation in active growth has much to do.

Now, then, if we consider that the N. E. trade-winds, when they arrive at the equator, ascend, return to the north in the upper regions until they reach the parallel of 30° or 40° north, where they descend to the surface, and are known as what the Germans style the S. W. passage winds; if, I say, this be the course of atmospherical circulation, we shall see that the air in our winter time, when vegetation is asleep with us, would probably not be exposed to the process necessary for its purification; and finally, if such were the system of circulation, the atmosphere of the northern hemisphere would, in the process of ages, probably become different from that of the southern hemisphere.*

We have no reason to believe in the existence of any such change in the components of the atmosphere; and I had almost said, *therefore*, in any such partial system of circulation.

On the other hand: If we maintain that the S. E. trade-winds flow north after ascending into the upper regions of the atmosphere through the equatorial calms, and that it is those winds, and not the N. E. trades, that in their circuit blow our S. W. passage winds; if, I say, we maintain this, we shall see the beautiful

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* The extra-tropical regions of the north have much more land, and therefore it may be supposed many more organs than the south to breathe, consume, and vitiate the atmosphere; consequently in any given time, as in a northern winter, the demands upon the atmosphere are very unequal on opposite sides of the equator. On one side, the animal kingdom is exacting from it in excess; on the other—the southern summer—the vegetable.

Speaking in general terms, it may be said that man, with his retinue of domestic animals, counts in the south but as one in a thousand to his hosts at the north. These myriads of warm-blooded animals in the northern hemisphere, with the fires kindled by man in our winter, leave us to infer that more air is required for animal consumption and combustion on one side of the equator than on the other, especially in the northern winter.

The air thus used, loses the proportions of gaseous combinations required to make it wholesome; whence, therefore, is it purified? Not by the vegetation of the extra-tropical north, certainly, for its vegetation is then asleep.

But if we make this air return to the south by the route suggested, it will pass through the N. E. trade-wind regions, and be partly replenished by the perpetually active vegetation there. Then rising in the equatorial calms, and overleaping, in the upper regions, the S. E. trades, it descends to the surface in the extra-tropical south, where it is summer, and where the forces of vegetation are in their most active operation.

Returning in the upper regions towards the north, still more refreshed from this part of its circuit, it first strikes the surface again as the S. E. trades, where vegetation is again perpetually active. Being now completely purified, it rises up again in the equatorial calms, overleaps, in the upper regions, the N. E. trades, and descends in the extra-tropical north, fresh with supplies in wholesome proportions for breathing lungs and winter fires.

And thus, though we cannot tell the reason why this earth was provided with zones of perpetual summer, alternate winter, and opposite seasons, we may nevertheless see through the atmosphere one of the purposes for which this arrangement of seasons, combination of climates, and proportion of vegetable surface was intended to subserve.

In this view, we see room for the harmony of nature. We have not a single physical fact going to prove that such is *not* the course of the circulation of the atmosphere about the surface of the earth; but we have many facts and circumstances which, though they do not prove, yet they suggest, that such is the course.

Thus, using a figure of speech, we may liken these evergreen places through which the winds go and return, to the lungs of the earth, with their three lobes; one in each of the trade-wind regions, and one now at the north, now at the south, changing from one side to the other, as the summer comes and goes.—M. F. M.

adaptation for exposing them to the proper and wholesome vegetable agencies; our winter is the southern summer; then the S. E. trades blow through the southern forests, which are then in their stage of activity.

Arrived at the equator—properly prepared for the use of the inhabitants of the north temperate and frigid zones—they ascend into the clouds; and, after reaching the parallel of 30° N., they descend, and are then felt as the vigorous, wholesome, and healthful S. W. passage winds of the northern winter; continuing on towards the north frigid zone, they perform their office for the inhabitants of those inhospitable climates, and approaching the polar regions in spirals, they whirl continually around or about the pole in a direction contrary to that of the hands of the watch.

Returning thence in the upper regions towards the south, as unfit for farther use, they are next felt on the surface within or near the tropics, where vegetation is again in activity, to fit them for the inhabitants of that region; reaching the equatorial calms, they ascend, and next appear on the surface in the south temperate zone as the N. W. passage winds.

Continuing on towards the south pole, and approaching it in spirals, they whirl about, but in a direction with the hands of a watch, and opposite to that which they took about the north pole.

Ascending into the upper regions of the atmosphere, they are next felt on the surface as S. E. trade-winds; reaching the equator, ascending, and coming over into the northern hemisphere, they are again felt to the north of the N. E. trades as the S. W. passage winds.

Let us suppose that this part of the circuit from the antarctic regions be made in our summer, and of course in the southern winter, when the vegetation here is not so active in its demands upon this atmosphere in motion, as it was in the other part of the supposed circuit.

But then this same atmosphere, that has been but partially purified for northern use in the southern forests and fields, reaches us in our summer, when vegetation is in full activity, and when, therefore, all disproportions are properly compensated.

I have faith in the "great first thought." I believe that the animal and vegetable kingdoms are in exact counterpoise; that through the dominions of nature all things are in exact and rigid proportions; that there is not a green leaf too much on one side, nor an insect too many on the other. And because of this belief, I find plausibility and satisfaction in supposing that the general system of atmospherical circulation is as I have been endeavoring to represent it.

In this belief I am strengthened by my reading of a text of Scripture (and the Bible no more than Nature can be wrong, for the Author of both is One), which seems to apply to such a system of circulation:

"The wind goeth toward the south, and turneth about unto the north; it whirleth about continually, and the wind returneth again according to his circuits."

Compare this with what I have already said, which my investigations taught me was the probable course of atmospherical circulation before I remembered me of what Solomon had said, and I think you will find with me, not proof, but grounds to suppose that such may be the system of atmospherical circulation.

THE WHALE CHART.

In 1847, materials sufficient having been collected from the log-books of whalers for an investigation into the habits and places of resort of the whale, Lt. Wm. L. Herndon commenced the construction of this Whale Chart for the whole ocean, excepting the North Atlantic.

The object of this Chart is to show at a glance where this fish has been most hunted;—when, in what years, and in what months it has been most frequently found—whether in shoals, as stragglers;—and whether sperm or right. The sheets are numbered letter F of the series.

Lieut. Herndon was interrupted in these highly interesting investigations, by orders for sea service. He had proceeded far enough, however, with the Charts, to develop some of the first fruits, which, it might be expected, are concealed in a field so abundant with treasures as this may be well supposed to be. But these orders deprived me of the assistance of a most valuable officer, and greatly delayed the work.

The plan of conducting these investigations is by spaces of 5° square, and the observations are so entered as to show at a glance the number of days for each month spent in each square; the number of days in which whales—and whether they are sperm or right—have been seen; also, the years in which whales of either kind were seen, and the years in which they were not seen, in any given square.

As observation after observation in such an immense field was recorded day after day, with the most untiring industry, and as the oft-repeated process finally began to express a meaning, I was surprised to find the lines for entering the right whale were blanks, through certain districts of the ocean, from one side of the Chart to the other. Finally, it was discovered that the torrid zone is to this animal forbidden ground, and that it is physically as impossible for him to cross the equator as it would be to cross a sea of flame. In short, these researches show that there is a belt from two to three thousand miles in breadth, and reaching from one side of the ocean to the other, in which the right whales are never found.

Hence the discovery that the fish called the right whale in the northern hemisphere is not the fish which goes by this name in the southern; that the right whale of Behring's Straits and the whales of Baffin's Bay are probably the same animal; and if so, the conclusion is almost inevitable that there is at times, at least, an open water communication through the polar regions between the Atlantic and Pacific Oceans; for this animal, not being able to endure the warm waters of the equator, could not pass from one ocean to the other unless by way of the arctic regions.

The investigations connected with these animals have also pointed out to us the great currents of warm water which keep up the ocean circulation of the Pacific—it might be said, of the globe; for as we study their habits, these dumb creatures teach us by their instincts that there are continuous currents in the sea between places the most remote.

With the aid of what the whales have taught us, in connection with what we have learned from other sources, we can now *almost* prove the existence of a continuous current of water from the borders of the Red Sea into the English Channel. The current, which has its genesis partly in the Red Sea, and partly

in the Indian Ocean and its contiguous bays, is bifurcated off the African coast by a cold current from the south. And were it possible to throw into the Red Sea two bottles properly marked and labelled, which would not be drifted out of the current, but which would separate at the forks of the stream, these two bottles would, or might pass, one around Cape Horn, and the other around the Cape of Good Hope; and meeting again in the tropical regions of the Atlantic Ocean, it would, theoretically, be possible for them to drift into the Caribbean Sea; thence through the Gulf of Mexico; and by the Gulf Stream out again into the Atlantic Ocean; and by its waters they might be cast up together on the shores of the British Islands, as the drift of the Gulf Stream is often cast.

There is an undercurrent from the Red Sea, and the course of the supposed bottles would be with that undercurrent out into the Gulf of Aden; thence, rising to the surface of the Arabian Sea—an immense caldron without any escape, as from our Gulf of Mexico, for its heated waters to the north—they would be drifted to the south in the currents from this sea; arrived near the Cape of Good Hope, this current is bifurcated by a cold one from the south, going to replace the waters which it has conveyed from the north.

Here the bottles would separate, one following the Lagullas current around the Cape of Good Hope into the Atlantic.

The other, taking the other branch of the stream, would be drifted to the southward of New Holland, and be carried into the antarctic regions near Victoria Land. Here, the current being cooled down and deflected, it would commence its flow towards the north, as the ice-bearing current which flows into the Atlantic around Cape Horn—the icebergs of which I have encountered in latitude 37° south. Bottles that have been thrown overboard off Cape Horn, have been picked up on the shores of Ireland.

However, without pursuing, just now, this system of currents pointed out by the bottles and the whales, and suggested by the dynamical forces imparted by the salts of the sea to its currents, I propose at another time a still further investigation and account of these beautiful and interesting facts, which the Whale Charts are developing.

After Lieutenant Herndon was called away, the investigations for these Charts were continued by Lieutenant Leigh, for a short time. His duties were soon changed, and I remained without force to resume the work, till late in 1850, when Lieutenant Fleming reported for duty. He was set to work on the Whale Charts, but before he had made any progress with them worth the name, he was detached, and ordered on other duty. Passed Midshipman Jackson then took them in hand, and completed them.

They show in what part of the ocean the whales "use" in each month, and the knowledge cannot fail to prove of great importance to the whaling interests of the country—an interest which keeps in continual occupation a fleet of 600 sail, manned by 15,000 American seamen—and which fishes up annually from the depths of the ocean, property, the real value of which far exceeds that of the gold mines of California.

Plate IX. exhibits an extract from the Whale Chart.

The object of these Charts is to show where the whalemen have hunted, and where they have found their game; consequently, this Chart enables us to designate those parts of the ocean where the whales

"use," and those parts where they never go—and to tell where in each month this animal is most likely to be found.

The three horizontal lines, Plate IX., marked D. R. S., in the middle column, repeated from parallel to parallel, stand: D. for days; R. and S. for the number of days, each, on which whales, right or sperm, have been seen. The days of search are expressed in figures; the days on which whales are seen are expressed by the system of "fives and tallies," as already explained with regard to the winds.

It will be observed that, from 60° north to 60° south, between the meridians of 125° and 130° W., right whales, except in one instance, have never been reported by any of the vessels whose logs have been examined. That sperm whales, except a straggler or two, have never been seen between these meridians, and below 5° S.; between which parallel and the equator they are most abundant. That they are seen between 35° and 50° N.; between the equator and 10° N.; but not between 10° and 35° N.; and the inference is drawn, from the fact of their appearing so frequently between the parallels of 35° and 50° N., that warm water is found there.

The investigations for this Chart are so conducted as to show the years in which the whales have been searched for and seen in the various districts of the ocean. These results are the embodied experience of several hundred whalemen as to the best fishing-grounds.

Besides the practical advantages which it is conjectured will inure to the whaling interest from these investigations, much information of a highly interesting character will probably be elicited by them for the naturalist and geologist.

Scenes and information, how interesting so ever to the world at large they may be, yet, by often recurring, lose their novelty to classes; they become familiar, cease to strike, and are at best apt to be thought not worth speaking or writing about. This is particularly the case with regard to the whalemen and their calling.

With the view of reminding them how little is known by the world generally, with regard to the habits of the whale, it may be remarked that the information conveyed in the communications from them, which are now published, and which information has been obtained from them by accident or chance, as it were, will be read with much interest by men of science.

The gentlemen, who were kind enough to furnish this information, had, I am sure, no idea of its publication; but I hope they will excuse the liberty for the sake of the motive.

These papers will, it is hoped, be the means of calling forth much additional information of a kindred nature.

LETTERS FROM WHALEMEN.

Capt. Daniel McKenzie to Lieut. Maury—dated, New Bedford, June 8, 1849.

Herewith I forward some additional knowledge of *sperm whales;* their *history, habits, food, age,* &c.; also the laws that govern their migratory movements, with such other thoughts as may occur to memory as I write.

The sperm whale, though found in every sea and clime, yet its great nursery is in the great Pacific; its haunts are found there from coast to coast; its limits that of the ocean itself. The males are more frequently found in high latitudes, the other sex in milder climates; a tropical region seems to suit them best; they seek bays in islands and coral beds and reefs in vast shoals to bring forth their young. The period of gestation I do not know. Perhaps no animal found in the sea is more timid and easier frightened; they always group by themselves, and seem to shun the society of other tribes of the ocean.

Their powers of vision are exceedingly limited; they cannot see directly ahead of them; hence they often, when alarmed, run foul of each other and foul of other objects. I have seen them run against a whaleboat, and the concussion so alarmed them as to create the most convulsive frenzy; and I think they are as unconscious of the approach of the harpooner from that direction as when he follows after them. Their exquisite sense of hearing, however, is most extraordinary; not unfrequently in large shoals covering miles of space, the instant one is attacked, the whole school, for miles around, spring, shoot out their heads above water, and listen for a moment, and if the attack is made on a female (or cow), they will all rush with great speed to their wounded companion, as if to extend their sympathy, if nothing more, unconscious of their own danger. The bold whaler avails himself of their approach, lays off a short distance from his bleeding victim, and takes them as they come; and if he is clever at the deadly game, he will mortally wound several, ere they discover the tragic act he is playing; but if the first one attacked happens to be a male, nine times in ten the shoal will run off with such rapidity as soon to be out of sight. The cows are found in shoals from twenty-five to a hundred in number, not only at their usual haunts while feeding, but also in their migratory movements in search of food, accompanied generally by one large bull, who seems to reign over all as king, whose head is always found covered with scars and wounds, the result, as we always thought, of battles fought with other bulls in defending his gallantry for the other sex. The principal article of food (and, indeed, the only one, as far as I know) is squid; the smaller kind they eat is found near the surface, and is from two to three feet in length; the larger kind, which probably have their haunts deep in the sea, must be of immense size—the flesh soft and of gelatinous substance. I have seen very large junks floating on the surface entirely shapeless. The cows on an average will yield fifteen barrels of oil; the males (or bulls, as whalers call them) are much larger, will yield from fifty to one hundred barrels of oil. At this stage, he is a noble animal, moving through the water so graceful and with such majesty, and with such astounding velocity; and that, too, without apparent muscular action, is sublime; and when attacked, such perfect command over his locomotion as to entirely change his position as quick as thought. I have seen them lay motionless fifty feet off, and in an instant swing their huge flukes under us, and at one blow send the boats in splinters, men and all, ten feet in the air.

Large whales are seldom seen in groups; frequently, four or five are found within as many miles of each other, but more frequently alone. In their several stages of growth, the males will be found in shoals all very nearly of a size; some shoals will yield 20, some 30, some 40, and sometimes 50 barrels, each whale. The males, when very young, frequently accompany the other sex, as boys and girls go to school together, and as they approach a more mature stage, they separate.

I have never been able to approach any satisfactory result in relation to the time a sperm whale lives; the general opinion is that they live forty or fifty years. I once extracted the barbed end or head of a harpoon from the back of a large whale, inclosed nicely in the oily blubber, and the wound entirely healed where it had been lodged fourteen years. This was satisfactorily proved after we got home, by the initials of the blacksmith who made it, on one side, and the initials of the captain on the other. I remember the whale yielded about fifty barrels of oil; there was nothing in the appearance of the whale indicating old age. I have often noticed their teeth rotten and decayed down to the jaw, and others worn down level with the gum by mastication, and covered with wrinkles and furrows, having a way-worn appearance, evident marks of slow but progressive deterioration.

The ship Balena, of this port, Capt. E. Gardner, while at anchor at Karakakua Bay, in Owhyhee, took a large sperm whale off the bay, that yielded them one hundred and two barrels of oil, whose teeth were worn down level with the gum, evidently by masticating his soft food. This noble animal had no other appearances of extreme age, but seemed to have enjoyed full vigor of health and life; who, then, can tell the length of life they reach, ere it terminates by the ordinary process of nature! may it not as probably reach a hundred years, as close at forty?

I have said that the cows seek bays and still water to bring forth their young; they never visit shallow water; they go to such bays only where the water is blue and deep, and under the lee of islands and reefs—the bays at the great island of Albemarle, of the Gallapagos group, is often visited by large shoals of cows for that purpose—the water in those bays is of great depth, and as blue as the Gulf Stream.

I have said that squid is the only article of their food. I am aware that others think differently; that they do eat other fish. I can only judge from what I have seen. After a sperm whale is mortally wounded, and is in his last struggle, he not unfrequently throws up the contents of his stomach; which, in the hundreds of instances I have seen, I have never discovered anything but parts of squid. In cutting them up, also, I have often opened the stomach, and never noticed anything but squid; hence, I infer that squid is their only food.

Their great object of migrating from place to place is no doubt in search of food; they are often seen in large bodies, moving quickly, all in one direction; by getting their course as they pass, and following on after them, in a few days, again meet them brought to, feeding, and laying quite still, and headed in different directions. In this case, the whaler often succeeds in getting a large share of oil before they are so harassed and cut up as to compel them to abandon the ground.

I have often thought that currents had much to do with the movements of sperm whales; and as they are most always found heading it where it is strong, I have thought it was to meet the bait brought down with the current, particularly near the equator in the Pacific, where a current is always found setting to the westward, which grows stronger as you proceed westward, and the whales generally found stemming it headed to the eastward.

I have spoken of the timidity of sperm whales. I have known, near the land, where sperm whales

were lying entirely still, a seal to spring in among them, and start them to running with great violence. I have also known them started and set running by the approach of porpoises.

It is remarked by many experienced sperm whalers—though I never noticed it very particularly myself, except in large whales—that, after rising to the surface from their deep submarine explorations, they would breathe or spout as many times as they will yield barrels of oil. How this rule works with small whales, I never noticed; but I do know that those we rank as large whales, yield from fifty to one hundred barrels—do, when undisturbed, spout from fifty to one hundred times; as a general rule, they spout from sixty to seventy times, and yield when taken, from sixty to seventy barrels of oil.

Large sperm whales remain submerged in search of food, from an hour to an hour and a half, which I presume is as long as they can hold their breath, for when they rise (unless disturbed or making a passage) they lay quite still, as if breathing was the ostensible object.

That sperm whales do perambulate the whole ocean, I have no doubt. Instances are known of their being harpooned on the Japan coast, and, disengaging themselves from the boat, have afterwards been taken on the coast of Chili; this was known by the ship's mark on the harpoon. One instance is known where a sperm whale was thus struck on the coast of Peru, and subsequently taken off the coast of the United States.

I have often met sperm whales off the Cape of Good Hope, and off Cape Horn, making their passage from sea to sea.

I notice our ships have discovered a new region, new haunts for right whales. They enter the Yellow Sea early in the season; and as it advances, they proceed north, through the Straits of Corea into the Sea of Japan; thence north up the Gulf of Tartary; thence through the Perouse Strait into the Sea of Seghalien; thence up the Ochotsk, following the whales as they proceed north.

Others have passed up the Sea of Behring or Kamtschatka, north through Behring's Straits into the Arctic Sea, where whales are found large and plenty; sea smooth, and weather in the summer months (from the extreme length of the day) favorable for whaling. Several ships have been whaling successfully in those parts. The polar whale (as it is called) yields very rich oil, and the bone is larger and longer than that of the northwest coast, and fetches a better price in the market.

A free communication by our whalers through those remote seas, will develop the phenomenon of winds and currents there; they will also, in cruising for whales, discover the hidden dangers (if any), and thus contribute to assist the hydrographer in preparing charts to guide future navigators.

Herewith I forward you a history of the sperm whale, by Capt. F. Post, of this city; also the history of Nantucket, the once great whaling nucleus of the world, from which you can find many useful statistics of early whaling.

History of the Spermaceti Whale, by Captain Francis Post.

It is a matter of much surprise, that, while the whale has been so long and so extensively an object of commercial pursuit, so little should be generally known of the animal.

There is, perhaps, scarcely a being in the animal world, at least not one whose existence has been so long known, the habits, structure, and qualities of which are less known to the naturalist than are those of the whale. It is a very prevalent opinion that whales spout water. Morse, in his *American Geography*, tells us that whales spout water to a great height, and we find many writers have been led into the same error; but it is well-known among whalers that whales never spout *water*, and that their spouts, which are simply dense respirations, emitted with some force from their large nostril, never ascend above twelve feet high; and when the whale is unmolested, seldom to that height, or to one-half of it.

The spermaceti whale has but one spiralle through which it respires; this is on the left side of the upper part of the head, and within a few inches of its end; it is about fifteen inches long when closed; and when extended, from five to six wide. The spout shoots obliquely forward and upward, expanding when it rises like a whiff of tobacco-smoke, which it much resembles in form; it is visible but for a moment; is near the same density as fog, and, when blown in the face, the same degree of dampness is felt from it. When the air is clear and cool, and a moderate breeze is blowing, so that the sea is not much ruffled, the spout of a large whale may be seen from a ship's masthead the distance of nine miles—the white spout forming a fine contrast with the blue field above which it rises, and appears at intervals of almost as much exactness as can be measured by a first-rate chronometer. When whales spring out of the sea, the spray produced by their fall is so great as to be seen 15 miles—in one of these playful gambols they are frequently first discovered.

The males of this species are out of all proportion the largest, and they are generally found alone; it is then quite astonishing to see with what exactness they pursue their course. Not unfrequently they are pursued by a ship the space of a whole day together without altering their course a single point of the compass. What can enable these inhabitants of the deep to thus pursue an undeviating course for a day, and most likely for as long a period as they choose?

So far as our knowledge extends, the inequalities of the earth's surface beneath the sea are similar to those above; and the conjecture, therefore, is a reasonable one, which supposes that the utmost cavities of the sea, do not exceed the loftiest heights above it. May not then these occupants of the watery world, like those of earth and air, be guided on their way by visible objects? For without such guidance, no animal, man not excepted, can long pursue an unvarying course. Instinct may urge the animal *when* to move, but something discernible must aid its way through the deep with such precision. Nor is it at all unreasonable to suppose that, by a wise provision of nature, their organs of vision are as well adapted for the watery element, as ours are for the aerial one.

These large whales generally spout from fifty to sixty times when at the surface, and the spouts appear at intervals of about fifteen seconds, though when the whale first appears they are rather more hurried than afterwards; this occupies nearly a quarter of an hour, after which they go down, and stop beneath the sea an hour, or an hour and a half, but never exceed this before they return to the surface again for the purpose of respiration. Thus, between one-fourth and one-fifth of their time is occupied in sustaining vitality, by breathing atmospheric air. The periods of time passing while the whale is in the depths below

are often nicely measured. In one instance the writer was in pursuit of a whale which was going quite fast nearly a day, and all this time he never stopped beneath the surface more than fifty-two minutes, nor less than fifty; he spouted no more than 48 times at a rising, nor less than 46. His other movements were equally uniform.

It is observed that whales suspend their breath longer in some seas than in others, probably because they go deeper for their food. Some idea may be given of the depth to which they go, by stating that when harpooned it is sometimes necessary to connect three or more lines together to prevent them from escaping. Each of these lines is commonly 225 fathoms long, so that if a whale take from boats four of these lines, there is attached to it a continued line nearly a statute mile. It would not, however, go the whole depth; but, unless the descent was perpendicular, the whale's course would describe a sort of curve, and from the great length of line out, and pressure of the sea on it, the whale would continue to take line from the boats until it reached the surface, or nearly so. When in this condition the whale appears, it is generally found, in an exhausted state, arising principally, it may be supposed, from its fright and struggles to get free, though some conceive it to be produced by the weight of the vast volume of water that must have pressed upon it while in the sea beneath. But this latter hypothesis seems rather untenable; for though the pressure may be great, yet if small fry, such as are caught from an hundred fathoms or so, can bear this pressure, then one bulky whale is not likely to get squeezed beyond endurance in the deepest cavern of the sea.

Spermaceti whales are rarely, if ever, seen on soundings, though they are often seen and taken near land; but in this case there is always a bold shore and great depth of sea.

It is difficult to assign a reason why these whales are so partial to a deep sea, when all other kinds frequent shallow bays and harbors. Cuttle or squid, supposed to be the only food which sperm whales ever eat, are often found in shoal water; there is however a species of this fish, the exact size of which is not known; but it is presumed to be large, as whales, in the agony of death, frequently eject from their stomachs pieces as large as the bulk of a barrel, and these in large quantities; so that the assertion of the naturalists that the whale, though the largest of animals, is one of the smallest eaters, is untrue. Large pieces of squid are often seen floating on the sea, which whalers consider indicate good whale ground.

The manner in which they take their food is rather curious, and affords a singular specimen of animal ingenuity. While the whale is making little or no progress through the sea, its capacious mouth is extended, by having the lower jaw dropped down, and the inside being white, the squid dart swiftly in. Whales are often seen in this position, and it is known that squid will spring at white and shining objects in the sea, for in this way are they caught. But for this stratagem, the whale might seek other food than the squid; for they are extremely active, and if pursued, could, by frequent evolutions, easily evade the pursuit of a whale.

The general color of this species of whale is a dark-bluish gray, though some have large and irregular formed spots of white on them. The exterior surface of the animal is a thin tender substance of a glass-like slickness, which is easily broken, and forms what anatomists might call the cuticle; beneath this, and

upon the blubber, is a short, soft, furry substance, that covers the whole whale. The blubber is of various thicknesses upon different parts of the body, and may average about 9 inches, though this depends wholly on the size of the whale. Some of this species have yielded 120 bbls. of oil, and as this comes only from the head and blubber, some notion may be formed of the enormous bulk of a large whale. Such a mass of animation cannot weigh less than sixty tons, and yet this animal, by all odds the largest that now exists, and unquestionably the largest that ever did exist, has, by a love of the marvellous, been greatly magnified. When we are told that whales have been found to measure 160 feet in length, we cannot say, that

"Travellers ne'er did lie."

That they are, or ever have been formed of such prodigious length, is wholly improbable; that sword-fish and thrashers attack them, is equally so. But lay hyperbole aside, and reduce the size of a whale to flat reality, and it is then certainly a monster to excite our wonder.

The following are the dimensions and admeasurement of a large sperm whale that yielded 95 bbls. of oil; and it may be asserted, without fear of contradiction, that the description of one which makes the dimensions exceed these more than a few feet, is entitled to no credence. The whole length of the whale, from the end of the head to the end of the tail, was 62 feet; circumference at the largest part of the body 32 feet; head 20 feet long, under jaw 16 feet long, and contained two rows of teeth, 22 in each (the upper jaw has seldom any teeth, and when it does they are very small). The tail was 6 feet long and 16 broad. The head usually yields about one-third part of the whole quantity of oil produced. The tail of the whale, like that of all the cetaceous tribe, is horizontal to the body; and when wielded as it is by a great number of sinews, some of which are as large as a man's wrist, forces an irresistible blow, to which a cedar whale-boat forms a puny shield. The tail is between a triangle and semilunar form, and is the principal organ for impelling the whale along. The two pectoral fins serve rather to guide than to produce its motion. From the head to the hump, the whale approaches to a circular form; from thence the body terminates in an uneven ridge above and below, and diminishes in size till, at the junction of the tail, it is not above 6 feet in circumference; this hinder part of the body measuring much more vertically than horizontally. The hump is a protuberance on the whale's back about 2 feet high, and when the whale is swimming along the surface this is seen elevated so much above it. The whale has no external ears, but two small apertures for admission of sound; the eyes have movable lids, and are between three and four inches in diameter.

In comparison with the males, the females are diminutive, a full-grown one of the latter not exceeding in bulk one-fourth of that of the former, and seldom making more than 20 bbls. of oil, often much less. They are found in herds together with their cubs, varying in numbers from fifteen or twenty, to above an hundred; among them are some scarcely ten feet long. The writer had one of these nursling cubs hoisted on deck whole, which measured fourteen feet in length, and yielded no more than 20 gallons of oil. This afforded an excellent opportunity of examining the internal structure of the whale; and on an occasion like this, the young whaler is never backward in doing so; as, by observing the position of the seat of life, he is

enabled afterward to point his lance with a more deadly aim. Though it be somewhat perilous, an encounter with one of these immense herds is a whaler's delight, since sometimes no less than eight or ten reward the adventurer's exertions. It is a singular fact that when one of these whales is harpooned, though the herd, or shoal, as it is commonly called, be separated some miles apart, it is instantly perceived by the whole, and they either rush with great velocity towards the wounded whale, or decamp and leave it to its fate. If the whales surround the wounded one, they of each boat may select one of them for themselves; and when they are killed, to prevent their being lost (for as they are near the specific gravity of the sea, but a small portion of their bodies remain above it), a hole is cut in each whale, and a pole some 15 feet long, with a small flag affixed to its upper ends, is placed vertically therein. This done, the boats may go in pursuit of more, as there is now no danger of their being lost, and they may be taken alongside the ship at leisure. But it often happens, when a whale is "struck" in one of these large bands, that the others all seek safety in flight, and then the whalers must content themselves with *slim fares.*

Either a whale's sense of hearing must be singularly acute, or else its vision is very powerful in a clear aqueous medium, for by one of these senses it is enabled to ascertain, a long way off, when another whale is attacked. Water, it is said, on account of its density, has the quality of propagating sound farther than the rarity of the air will admit it; though it has only been ascertained that sound can be transmitted far *over* water, not *through* it.

When unmolested, the velocity of whales is not often more than three miles per hour, though when alarmed and closely pursued, they are capable of swimming at the rate of ten miles per hour; but they never go long at this pace before it diminishes to four or five. On receiving a wound in the vitals, they spout out amazing quantities of blood, so as to color the ocean for many yards around. Instances are common, notwithstanding their mighty strength and size, of whales expiring in a moment after receiving their death-wound. Sometimes, in apparent fright, they use every effort to escape from their merciless assailants, and not unfrequently, in plunging into the depths of the sea and drawing all the lines from the boats, succeed in doing so.

When a whale is taking line from a boat, the utmost care is taken that it runs clear, as, should it become entangled and not instantly cut, the boat, and all it contains, would at once be drawn beneath the sea. Many fatal accidents have occurred to whalers from being themselves entangled in the line, drawn from the boats, and seen no more. In order for the whale to get no more line than is absolutely necessary, a strong piece of wood, called a *loggerhead*, is firmly fixed near the boat's stern; round this a turn or two of the line is taken, and it flies so swiftly round, that its friction would set the loggerhead on fire, if water were not occasionally thrown on the line.

Whales when attacked are generally passive, suffering the boat to approach, and the harpoons and lances to pierce their huge bodies without making a show of resistance, though serious accidents often happen, merely from the spontaneous movements of a wounded whale.

Boats in this way are often so badly stoven as to be rendered totally useless, and are abandoned on the sea. But they are not all thus unresisting; occasionally, a large warrior whale is encountered, which proves

himself a formidable and dangerous antagonist; that, with a single blow of his ponderous tail, severs the boat from which he is assaulted quite into halves, often to the destruction of part of its crew. But the terrible jaw of such a whale, set with a couple of score of large pointed teeth, constitutes his chief arm of defence, and woe to the thing in the shape of a man or boat with which it comes in contact.

Naturalists, in their closets, often make ridiculous mistakes in describing animals that are found in regions where they never venture themselves. Thus of the ——— and whale. "Both want *teeth* for chewing, and are obliged to live on insects." Again: "The whale pursues no other animal; leads an inoffensive life; and is harmless in proportion to his strength to do mischief." (*Goldsmith's Natural History.*)

Sperm whales are not so gentle; the large males often encounter each other so furiously as to break off many of their teeth when the jaws come in contact; and they have been taken with their jaws broken. Instead of fleeing, a warrior of this mettle resolutely maintains his ground, and even in turn becomes the assailant, chewing in pieces every boat that approaches him. These desperate whales, after much hard fighting and imminent danger, are sometimes conquered; but so obstinately and so successfully have they been known to defend themselves, that instances are on record, where all the boats of a ship, save one, to convey the drenched crews back, have been chewed into atoms, and the whales themselves, after defying all the resources of art, and disdaining to flee, have been left in full possession of the field of battle. We have heard of more than one case, where, as a *last resort*, the ship herself has been run alongside of a whale like this, and while passing by, lances were so skilfully thrown, that he ultimately died of his wounds, and became at last a prey to his captors. But an attack in this way is certainly hazardous, as all will agree who remember the fate of the whale-ship Essex.*

The sperm whale is remarkable for yielding the unctuous substance, whence comes its name; and it is also remarkable for producing ambergris; the bowels of a sperm whale forming the only situation where this singular fragrant substance is generated. Whether its existence is a cause of, or the effect of disease, is not yet known; it rarely occurs, not perhaps in one whale out of a thousand.

They seem to be more migratory in their habits than other whales, occurring in every parallel of latitude between the two polar seas, down to an equatorial one; though generally preferring the deep blue sea that indicates unfathomable depths.

As they are thus widely scattered, they are searched for in almost every sea, however remote; and hence it often occurs, in voyages of 3 or 4 years' duration, that ships, before completing their cargoes, entirely circumnavigate the globe. They are occasionally seen in the Atlantic and Indian Oceans; but are found in greater abundance in the Pacific, where they are seen at times in favorite spots, scattered over the whole extent of this great sea. When, half a century ago, our ships first ventured into the Pacific in quest of sperm whales, the coasts of Chili and Peru abounded in them; and our hardy pioneers in this daring occupation, were there enabled to fill their ships, without the necessity of penetrating farther. But the whaling fleet

* This ship was attacked and sunk by a whale; the mate and part of the crew, who took to their boats, were brought home from the Cape of Good Hope in the U. S. ship Vincennes in 1829, in which ship I was then serving as midshipman.—M.

increased extensively; the persecuted whales were in a measure killed and driven from their haunts; so that later voyagers, to insure success, have been compelled to push their adventures into still farther and comparatively unknown seas. One unexplored track after another has been traversed, until it may now be said that, from Chili to New Holland, from California to the Japan Isles, and China Sea, with the whole intermediate space—in a word, over a square expanse comprehending above eighty degrees of latitude, and more than one hundred of longitude, there is scarce a spot of any extent but what has been furrowed by the keels of a whaler, and been a place of privation to her enduring crew.

Zoologists have classed these animals, as well as the sporting tribe, among fishes, distinguishing them by cetaceous order, comprehending a variety of species. But on an examination of their structure and functions, the impropriety of this classification is manifest; and the inspector is at once convinced of their being far removed, or in fact wholly distinct from any species of fish. They have many analogies with the larger land animals, having, in common with them, warm red blood flowing through the system, though a certain modern philosopher has asserted to the contrary; Robert D. Owen, in one of his published letters, while in America, skeptically comparing his situation in a stage-coach to that of Jonah in the whale's belly, asserted that the whale was a "cold-blooded animal."

They have a heart, with auricles and ventricles through which this fluid is propelled; they have lungs, together with all the functions for breathing atmospheric air, and they can only suspend this breathing for an hour or two at a time. Being entire tenants of the deep, and having organs for propelling them through it, are the only fish-like qualities they possess. They seem to form a sort of intermediate and connecting link between *absolute beasts*, and their more near submarine neighbors.

It is highly creditable to the spirited and enterprising individuals, who have put forth their capital in ships, destined to traverse the deep in quest of these oily monsters, that they have become so numerous as to form a large and important portion of our navigation; and this, without ever receiving, without ever needing legislative encouragement. A computation roughly made, shows that we have now whale-ships enough, if placed in a direct line, equidistant, and just in sight of each other, to form a continued fleet, that might reach more than half-way around the globe. The wealth drawn out of the deep, and conveyed by them annually to the shores of America, is immense. But aside from contributing thus largely towards our national wealth, no small degree of honest pride arises from the knowledge that no nation can rival us in this perilous branch of industry. The English have, it is true, been for many years engaged in it, and with partial success, but the immense amount of bounty paid by their government to encourage the establishment of one branch of whaling alone, shows how reluctantly they have been drawn into it, and fully justifies us in saying that, in this pursuit, as in others that call forth daring energy, Old England must yield the palm to *New England* adventurers.

From the commencement of the whaling career of the English in the northern seas, down to the year 1786, that government had paid bounty therefor, amounting to £1,266,000, a fraction or so of the national debt. To insure success in their whaling operations in the South Seas, the English, as well as their neighbors across the Channel, have not scrupled to secure for their ships, masters, and other chief conductors of

whaling voyages, from the young country that first led the way beyond the two fellow capes, in this great marine enterprise. So liberal, in fact, were the inducements held forth, that merchants as well as seamen removed from our own to their countries, invested their funds, and became actively engaged in this venturesome pursuit. So far as we know, a detailed description of the manner of capturing, cutting in, and trying out a whale, has never been given. The following may, therefore, supply the place of a better one.

It may first be mentioned, that when a whale-ship leaves her port, a man is stationed in the top-gallant crosstrees of each mast to look out for whales, and the mastheads are kept manned from daylight until sunset, during all weather that admits boats to leave their ship, from the time of her leaving home until her cargo is completed, or the voyage terminates; the ship's company standing watch aloft by turns of two hours each. When the spout of a whale is descried, the discoverer immediately makes it known by the welcome, and, on board of a whaler, the well-known exclamation of "There she blows!" which is repeated often, as the spout appears in view; and though it should be so far off as to be but just discernible, yet, by its peculiar formation, as well as by the number of times and regularity with which it appears, the experienced eye of a practical whaler can distinguish at once from what species of whale the spout proceeds. If it be a sperm whale, and not to windward, the ship is instantly headed for it, and all sail made in pursuit. After some few preliminary observations, such as noting time by watch, and with a spyglass tracing the animal's way through the sea, its course and rate of going are ascertained, and it now may be calculated for with tolerable precision.

The ship is usually run within a half mile or so of the spot where the whale is expected to appear, when it rises to the surface; and by having the courses hauled up, and one of the larger topsails hove back, she there remains nearly stationary. The boats are now sent off, and are rowed in different directions, so that, if the whale is not going fast, at least one of the boats is nearly sure of being near him when he rises; or, should he chance to come up a mile from the boats, they can generally reach him before he has his spoutings out; as this occupies some fifteen minutes, and the boats may be rowed at the rate of six miles an hour, even over quite a rough sea. If the whale be slow in his movements, the boat's crews have nothing to do, while waiting for it to appear, but to lay upon their oars; and as the time draws nigh, eager eyes scan all portions of the sea around, to catch the first glimpse of a rising spout. But if there happen to be much swell, from the depressed condition of the boats, being often in a cavity between waves that entirely obstruct the vision, it is difficult to discern a spout from boats beyond a limited distance; in this case, the main dependence is placed on the man at the ship's masthead, who, as soon as he sees the whale, runs up a signal and points out its direction. This creates a scramble among the crews, as there is generally no small share of rivalry existing among them, and all strain every nerve with the view of being the first who approach and have the honor of first implanting their harpoons in the whale; but as the boat which is more favored by chance, or happens to outrow the others, gets within a few yards of him, the contested race is given up, and the sternmost crews cease rowing, and silently await the issue of the first conflict. Sometimes boats approach a whale, as their situations chance to be, by rowing up towards the head, and get to the pervious part of its body in this way; at other times they proceed direct to its side, but generally the most approved

way is to row up from behind, and, if necessary, make a circuitous route to do so. The approach of a boat often alarms a whale, when he dives beneath the sea and suffers it to come near him no more; but more commonly, and especially on new grounds, where they have been but little disturbed, there is no difficulty in placing boats sufficiently near whales as to leave them in the attacker's power. It is probable, however, that boats seldom arrive near whales without their knowledge, such only making efforts to escape as have learned to regard them as enemies by having become acquainted with the missive weapons thrown therefrom. The harpooner rows at his oar until the boat gets nearly "within dart," when he is called up by the officer who steers and controls the boat; and when within a few feet of the whale, the progress of the boat is checked as much as possible, by strokes of the oars. The harpooner now darts his two harpoons, which pass through the blubber and enter the fleshy mass that incloses the bones of this great animal; and these keen instruments coming in quick succession often give to the affrighted whale the first intimation of impending danger. This is always a moment of peril to the assailants, and, therefore, one of anxiety to the lookers on; as some fearful accident might proceed from the convulsive motions of the wounded whale, other boats promptly row up to assist the first. The skill and activity of every one are now in requisition, lest the yet slippery and valuable prize should by some means escape before receiving his death-wound. If, as often happens, a boat is badly stoven in the first outset, another takes in the immersed crew and tows the stoven boat to the ship, while others make a fresh and combined attack on the whale, which may now be rolling in the ocean foam, that his own struggles have produced, or, perhaps, rearing its mighty tail in the air, and drawing it down on the sea with such force as to make it resound to a great distance.

Soon as a boat is attached to a whale, the officer in charge exchanges situations with the harpooner or boat-steerer, as he is more generally called, the latter now steering the boat while the former goes forward and plies his lance, taking care to poise it well before throwing it, and to aim it always so that some portion of the whale's vitals shall be pierced. Copious emissions of blood then gush from the spout-hole, rise up a few feet, and fall into the sea, dyeing it with the crimson fluid wherever the animal pursues its way. Where a whale has fairly received its death-wound there is but a small chance for escape, as it seldom lives above an hour or so afterwards. When dead, a hole is cut in the head or tail, through which a rope is rove, and if the ship is to the leeward the boats tow the whale towards her; but if the ship be to the windward, this labor is saved, as she then runs down within a short distance of the whale, where the foretopsail is hove aback, the whale is hauled alongside, and a cable of rope or chain put round its tail. Preparations are now made for cutting in the blubber and other oily portions of the whale.

This is a laborious process, which, for a large sperm whale, requires the principal part of a day to complete. The cutting operation is performed from stages suspended over the ship's side; the cutters being provided with sharp instruments for the purpose, called spades; these have a razor-like edge of fine steel, and are affixed to poles of convenient length. To make a beginning, a small hole is cut first in the blubber near the head, and into this is placed a blubber-hook, to which is attached one of the two large tackles employed in hoisting in the blubber, and by means of the windlass a piece of blubber about six feet in width

is thus raised up to the ship's side. As this goes aloft, the whale rolls over and over, the blubber peeling off rapidly as it rolls; and as the cuts are made not quite circularly round, but in a direction somewhat obliquely towards the tail, the whole blubber comes off the whale in one continued piece, being stripped off in the spiral way from head to tail. With the aid of the windlass, this piece of blubber is heaved some thirty feet above the deck, when the lower block of the tackle meets the upper one, which is suspended from the main masthead; a second tackle then relieves the first, having a strap of the block inserted through and secured to the blubber near the deck; just above this block the blubber is cut off; the piece separated forming what is termed a *blanket piece;* this is lowered into the *blubber-room*, which is that portion of the ship between decks, directly abreast and beneath the main hatches; another piece goes up to the same height as the first, and is in the same manner cut off and lowered into the blubber-room, and so on till all the blubber is taken from the whale, five or six of these pieces commonly taking the whole. The carcass is then abandoned to the ravenous sharks and hungry birds that surround a ship on these occasions. The carcass sometimes floats, but most commonly sinks.

While the whale is being rolled, the head is cut off; and it remains alongside secured by a strong rope till the blubber is hoisted in.

Small whales' heads are heaved on deck whole, but the immense weight of a large one renders it impracticable; it is therefore necessary to divide it. Both tackles are firmly hooked to a portion of the head denominated the junk, and this when cut off requires the united strength of the whole ship's crew at the windlass to heave it high enough to reach the deck, a large one weighing at least between five and six tons.

The last and most remarkable portion of the whale remains yet to be hoisted in. This is what whalers term the *case;* it is a body of fluid head matter that often amounts to twelve or fourteen barrels, which, when removed from the head, leaves a large tubular cavity that runs longitudinally its whole length. It is inclosed by a cartilaginous substance that yields no oil, and this again has an outer covering which is of an intermediate nature between blubber and a singular part of the whale called *whitehorse*, which contains no oily matter, and is impervious to all but the keenest instruments—a cannon-ball would hardly penetrate it. The part containing the case is also too unwieldy to be taken in whole, and to subdivide it would cause a loss, as much thin oil would escape; hence it is necessary to raise it with the cutting apparatus perpendicularly up the ship's side, with its lower end remaining in and supported by the sea. A perforation is then made in the upper end with a spade, and into this a bucket is placed which requires to be pushed down with a pole in order to tear away the tender membranous filaments that oppose its way; the bucket is then filled with oil, and by means of a pulley is hoisted up and emptied into a receiver. In this way ten or twelve barrels of the oily liquid are obtained from every whale of a large size. It is necessary that this oil should pass through the pots and be heated to prevent its becoming rancid, though it may be mentioned that while fresh it is perfectly sweet, and like other animal fats only becomes rancid through age. While fresh, it may be and is sometimes used on board ship for culinary purposes. A certain species of Yankee food called *doughnuts*, fried in fresh oil, occasionally adds variety to the homely and too often scanty board of the whaler. Next to the case, the junk contains, in proportion to its bulk, the largest

quantity of oily matter; much of it yielding its own bulk in oil; and while it is being cut into smaller pieces, the oil exudes so copiously that it is necessary to stop up the scuppers, and bail it from time to time off deck. The blubber between decks is cut into small pieces so as to be conveniently transferable; these are called *horse pieces*, and in this form the blubber passes through the mincing operation. This is performed by drawing a long knife across or nearly through the pieces, cutting down portions from a half to three quarters of an inch thick; these are not entirely severed, but for the convenience of removal are kept hanging together somewhat after the manner of book leaves.

In this state the blubber is ready for the try-pots, into which it is transferred with a fork or pike constructed for the purpose. A hot fire is kept up under the pots, and in an hour or less a pot full of blubber has all the oil fried out; "the scraps," are then skimmed off; more blubber is put into the pots and a sufficient quantity of oil is boiled therefrom.

The oil boiled off is poured into a copper cooler, and from thence it runs through a cock into a second cooler, and from this is bailed into casks which are placed about deck, and when the oil is perfectly cool, the casks are coopered and stowed away into the hold.

If the weather is fair and the sea smooth, a large whale may be fried out in about 36 hours, which gives an average of from 2 to 3 barrels an hour; and if the whale be uncommonly fat, the oil can be extracted proportionably faster.

The scraps, it may be stated, form a sufficient quantity of fuel for continuing the frying process; this goes on night and day, the ship's company being divided into two watches who perform duty alternately.

It is somewhat remarkable that, in this age of invention, there has been no new method devised for capturing whales; nor any improvement made on the old one, nor yet on the simple instruments used against them.

The plain harpoon employed by the early whalers, is still in use, although there have been various modifications of this form; such as harpoons with one flue, those with joints, others barbed, &c. &c. But these have all had their day, and given way to the plain primitive harpoon.

There have indeed been some curious, but theoretical rather than practical, machines constructed for *shooting whales*, and also fanciful contrivances designed to explode in the animal, and blow it up. But nothing has yet been fabricated for sending a harpoon, that is at all comparable to a pair of nervous and dexterous arms, more especially if these happen to belong to a stout heart. That, however, a portable piece of mechanism can be put together which will fully answer the end of throwing the missive weapon, and destroying the whale with less risk of human life than the means now employed, is undoubtedly within the bounds of possibility. The chief difficulty, however, seems to be that of constructing an engine of this sort, which shall possess sufficient projectile force to enable the *shooter* to remain secure in the distance, and yet be of diminished size and weight, so as not to occupy much space, nor add materially to the weight of a boat.

Whaleboats are necessarily nutshells of fabrics, there being not a board in one, from the keel to the gunwale, that measures one half inch in thickness, and this of the lightest material.

From Capt. Crocker to Lieut. M. F. Maury.

If the following will be of any use to you, it is heartily at your service; if not, I trust your fire burns brightly, and I know that your *patience* has been already proved.

For being so backward in furnishing my mite to your stock of materials, I have need to apologize, as, at this late period to have just become acquainted with "Maury's" indefatigable labors, and their splendid result, is a disgrace to all American shipmasters.

In 1848, I returned from a long whaling voyage, and in a few days after, started again upon another; and during the interval, obtained but a very imperfect knowledge of the uses to which the *abstract log*, I was requested to keep, would be applied. I kept it, however, in an imperfect manner (though it was correct as far as it went), and on my return, duly forwarded it (from ship Mary Edgarton, arrived Nov. 1851). My avocations since that time have excluded me from all knowledge of nautical affairs until within the last few months, when I took the ship Massachusetts, merchant ship, from New York to Europe; this opened the way to a more perfect knowledge of your surprising discoveries, and made me desire to furnish *my* mite in return for the many benefits I am sure to receive, now that I am again "doing business upon the mighty waters."

The sickness and death of a beloved wife during the passage out, and the sinking of my ship on my *attempted* return, will, I conceive, be my excuse for neglecting what I hold to be the duty of every shipmaster under ordinary circumstances, viz: to furnish a complete abstract of all that occurs during a voyage. I intend in this to give you some account of the two whaling voyages before mentioned.

In Nov. 1845, I sailed from New Bedford in Capt. McKenzie's old ship, the Minerva Smith, for South Georgia, the large island west of Cape Horn, in search of right whales. We arrived there in January, and found but *one*, though we stayed there a month—but we found there, in great plenty, a kind of whale different from any I ever saw before, and resembling, somewhat, the kind called "bowheads," by your correspondents; they were very large (would make two hundred bbls.), very smooth, and black, and very wild. They had a small hump, which appeared only when "turning flukes." We could not take one—for, three days before we arrived at the island, we were sailing through countless numbers of humpback; near the land, we saw very many ice islands, which drifted slowly towards the N. E. I also saw one very large sperm whale. We were *twenty days*, in March, 1846, beating westward into the track of ships bound round the cape.

During the months of July, August, and September, 1846, I was cruising in the Kamtschatka Sea, in a space not more than ninety miles square, the centre of which would have been the Island of Preobragima,(?) did it exist; but it does not, at least near the latitude and longitude where laid down, viz: lat. ——, long. ——. During that time I saw no ship (they were on the Kamtschatka shore that year), but plenty of whales, *such as they were.* We took *ten* of them, which made us only *five hundred barrels*, thus averaging only *fifty barrels* a piece—they were all *young whales;* for the blubber was thin, fine-grained, and full of water, and the bone also was thin and short. *There were no full-grown whales there;* this appears to me a singular cir-

cumstance. Do the young right whales separate from the old at a certain age? and is it to get different food? The space they occupied was not more than sixty miles square—outside of that space none were seen. They left in September, moving suddenly to the southward, where I did not follow them. In October, we reconnoitred at the Bonin Islands, and then proceeded to cruise *between seasons*, off the Island of Morty, near Celebes, lat. ——, long. ——, where we saw plenty of sperm whales.

In March, we got a few recruits of Yloylo, in the Isle of —— one of the Philippines, and then passed northward, through the China Sea, towards the Sea of Japan. Proceeding northerly, we touched at the Island of Typinsan, the inhabitants of which appeared to be Chinese; they were polite and friendly enough, but would not suffer me to enter their town, nor to trade for refreshments. We met with just the same reception at Komsang, one of the Loo Choos, and at Harbor Island, a most singular and interesting island, which lies still farther north; lat. ——, long. ——, and belonging apparently to the Japanese, as I saw people and vessels from Jeddo there. This island is shaped like a horseshoe—open to the westward, thus forming a spacious bay, free from rocks and shoals, and all around the sides of which are large inlets, forming admirable harbors, safe from all winds, and much more easy of access than the harbor at Bonin Islands, recently surveyed by Commodore Perry.

This island (Harbor Island) will be of great value to the future commerce that is sure to spring up between our western coast and China; for it is very near the route, and extremely fertile. The inhabitants carry on a trade with Japan. The junks I saw there from that place were after sugar, large quantities of which I saw put up and ready for market. This island is much nearer our western coast than Luconia, where they now go for sugar, and from whence we must be shut out by Cuban troubles, or a war with Spain. I hope Commodore Perry will not overlook it.

Those junks were very curiously constructed, but you perhaps know more about them than I do.

In the Straits of Corea, we lay "off and on" the harbor of ————; while in a boat, I pulled in to see if I could obtain the water and refreshments I had been so long seeking; but though it seemed a fine harbor, the inhabitants were not friendly, and I was obliged to pack on into the Japan Sea with a much shorter supply of those necessaries than I desired. I saw these junks from the coast of Tartary, loaded with fish.

North of the Basha Islands I am confident that whalers will be unable to find water or refreshments. Captain Potter's directions for entering the Japan Sea, through the Straits of Corea, are correct. Ships should not, however, borrow too much upon the Corea shore, as it is fronted with many small islets, and much discolored water. Daylight is very desirable in passing the narrowest parts.

I come now to what I wish most particularly to communicate; I am confident that mine was the first ship that entered that sea in search of right whales; and but two or three others entered that season—not enough to disturb the whales *much*. We may believe, therefore, that the whales acted naturally that season—that their migratory movements were the same as they had been always before.

How the whales got into that sea I am unable to tell; for, upon my arrival there in April, they were already there, and feeding diligently. I can only say I saw none in the Yellow Sea, nor in the Straits of

Corea; I met them first about sixty miles northeast of the straits, but they were not "regular," and I passed still farther on into latitude ——, near the coast of Japan, where they were at home, and I commenced taking them rapidly. We cruised there and *off shore* until about the 10th of June, when I steered northwest, into latitude ——, near the coast of Tartary. Here we cruised until about the 15th of July, when it became evident that the whales were all moving quickly towards the northeast, and as that was just the direction of Perouse's Straits, it was not difficult to suppose the whales were leaving the sea, and I, of course, followed them. Two other ships, however, that I saw at that time, chose to remain, supposing they would "soon be round again."

On arriving at Perouse's Straits, I saw many whales, all moving eastward, and was confirmed in my opinion. It was morning when we left the straits, with a good breeze blowing from the northwest, and seeing a whale moving rapidly and steadily towards the east, I determined to follow it, believing it would lead me at last to "good whale ground." All the day the whale moved steadily upon one course, at a speed of some six miles per hour, and I followed. At dark we shortened sail, and continued upon the same course until 12 o'clock, when we "hove to" until daylight; and true enough, at daylight next morning, we found ourselves in the midst of a fleet of ships which had come from the southward, and most of whom were "boiling." There were plenty of whales in sight, all of which were "at home." I learned afterwards that the "bulk" of the whales had been "set on" about a week before that time; the ships there had done nearly nothing. My unique pilot had brought me to just the right place; for during August, I "filled up," and left the sea, one of the first ships.

I thus demonstrated the fact that the whales which had been found from year to year in the Ochotsh Sea after July, migrated there from the Japan Sea. Ships that entered the Japan Sea after the 20th of July found the whales. It has long been morally certain that whales *do* migrate, but never before to my knowledge have they been observed and *followed* from one place to another.

The winds in the Japan Sea were mostly from the southward, and the weather was warmer, and the sky clearer than in the same latitude outside. There was no perceptible current there, but in those days "Maury" had not learned us *how to observe;* we never thought then of trying the current, or the temperature of the sea.

One meteoric phenomenon observed there, is worth relating. We were about forty miles from the coast of Tartary, and had been enveloped in a thick fog several days, when one afternoon—as not unfrequently happened there—it suddenly cleared away, and the sun came out bright. The sky was clear, and the sea smooth, with a very light breeze from off the land, which *appeared* plain in sight; I say, *appeared*, for a close examination disclosed singular changes in the shape of various head-lands, and thus we soon saw that it was a fog-bank; but with its upper edge as clearly defined, as hills against the sky. It was soon apparent that it was rapidly nearing us, and although there was very little change in the barometer, I became alarmed, and kept the ship before the wind, at the same time taking in sail. As it approached us, we could see it to be a perpendicular wall of dense fog, about three hundred feet high; it soon reached us, and with it a sharp squall (a whirlwind), with large hail and some rain. The bank of fog was not more

than a quarter of a mile deep, and not near so dense upon the back side. This bank extended as far as the eye could reach, north and south, and after passing us, hung in the eastern horizon until nearly dark, when it melted away. It moved about sixteen miles per hour.

Contrary to most of the whalers that season, I came home through the China Sea, and around the Cape of Good Hope, touching at the Ladrone Islands, where we lay nearly a month waiting for the northeast monsoons. Had we been obliged to remain upon the whaling-ground until October, our passage home would have been shorter by many weeks, than that of any other ships. North of the —— in lat. —— I discovered an island upon which was a deposit of guano, and it has been suggested by a New York merchant, that it might be very valuable, and we think of an expedition there. You would do me a great favor by giving your opinion as to how much *rain* falls there. So much for my first voyage as master.

My next and last, was for sperm whales in the Sooloo Sea, Molucca Passage, and thereabouts. I was considered very lucky in finding them; perhaps I was, but I had read Wilkes on *Currents and Whaling*, and paid *attention to the temperature and currents.*

If I mentioned in my "abstract" a singular current of warm water, that I found setting westerly along the north coast of New Guinea, and a cooler one setting easterly upon the northern edge of the first, I think of nothing further interesting, that I did not note there. The whole ground was in the warm current.

In the description of the sperm whale given by Capt. McKenzie and others, I am astonished to find they did not mention one of their most noticeable features. I refer to their *rugæ*, or the wrinkled appearance of the blubber. The right whale and all other spouting fish (or animals, if you please), except the Humpback, which has the same rugæ upon its belly only, are singularly smooth and plump-looking; they have no uneven places upon them, and generally the epidermis is unbroken. They convey the idea of fat by their very appearance. The sperm whale, on the contrary, has a lean and shrivelled appearance, that would lead the inexperienced person to suppose the creature sick.

The ribs appear almost to protrude through the *apparently* thin covering, and the "black skin" or epidermis has a broken and chafed appearance, seen upon no other whale. In their convulsive struggles when attacked, large portions of this skin frequently drop from them, and, when dead, they have the appearance of having been violently rubbed against some hard substance. This appearance of leanness, however, is fallacious; for it is a common remark among whalemen, that, "the deeper the wrinkles, the fatter the whale." The head of the sperm whale is smooth, but from the eye to the fluke these *rugæ* extend without interval. They are not regular and running in parallel lines, but very irregular and broken. I can think of nothing to which the surface of a sperm whale has so great a resemblance as the surface of the ocean, when the wind has been very changeable. These *rugæ* are from one to three inches deep.

So far as these gentlemen went, their descriptions accord with my own experience. I remark, however, that I know nothing of a whale's ability to remain under water "*ad infinitum*"—I doubt it.

The whale grounds, where whales are supposed to exhibit this singular power, are, I believe, without exception, long, narrow strips, extending over but few degrees of latitude, but many of longitude; and in

every case, there is good whale ground not far to the southward. Such shaped grounds *would* be occupied almost at once, were the whales from the south impelled to migrate in a body; and we have seen in the case of the whales in the Japan Sea, that large bodies of whales are thus impelled; and we saw, also, that they became "slow in their movements, and headed to every point of the compass" immediately upon their arrival at the new grounds—it is therefore much easier to account for their appearance on the whale ground "about the same day" in this way than to believe they go down to unknown depths, and stay for *months*, *fighting their battles*, &c., and living a life generally so at variance with their physiological structure.

It was not until lately that I became aware there was actually so many kinds of right whales existing; that fact, however, appears to be well established.

May there not also be more than one kind of *sperm whale?** We discovered a remarkable difference between the whales we caught in the Sooloo Sea, and those taken elsewhere; they were more thickly covered with *deep* wrinkles, and the head was differently proportioned; but the distinctive difference was in the *size* and in the *motion*. These were so marked that, at last, we were able to distinguish them when miles distant—and they obtained the name with us, of "Sooloo Sea Whales," in contradistinction to the common sperm. During the voyage we took fifty of them, which made us only *four hundred barrels*, thus averaging, male and female, only *eight barrels* a piece; while the common sperm *cows* average at least fifteen barrels. We saw the same kind of whale in the Straits of Macassar, the Flores Sea, and the Molucca Passage, and I was told by the English whalers, who had cruised in those seas many years, that they were to be met with in spots as far east as the Red Sea. Are they not a species peculiar to the East Indian waters? Such is the opinion of all those who have cruised long in that region. If this is a fact, what assistance will they render in tracing out the *currents* of that region?

Of those we took, many were females, whose udders were filled with milk, and which presented every other mark of maturity; there were also males with them, apparently full grown, but dwarfed in the same proportion. I never but once saw a *large male* among that species, and that one was evidently very old and sick, being large enough to make a hundred barrels, but actually making only sixty. When attacked, he immediately joined the others.

Not having seen your Whale Charts, I am not aware whether or not you know there is a little spot in the China Sea (Palawan Passage), about forty miles west of Louisa Shoals, where sperm whales are sometimes found in great plenty; they are not of the Sooloo species, but the common kind. Whales are also found in the western part of the same sea, farther north.

If you desire a skull of the Sooloo Sea whale, or any other bone, I have friends cruising there, who would procure one if desired.†

In your valuable work, I notice that but very little is said concerning the longevity of sperm whales, and nothing at all about that of other kinds. Captain McKenzie (who is a good judge) thinks sperm whales live from forty to one hundred years—there can be no doubt but that they live at least as *long* as

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* Yes. "The Japanese," says Dr. Gray, in his work on the whale, "distinguish three kinds of sperm whale."—M. F. M.

† They would be very acceptable.

that; they have the appearance of being a long-lived creature; they are compactly built—their muscles are firm, and their organization generally superior to most of the warm-blooded fishes. We have reason to believe, also, that they are much longer in arriving at maturity, for we notice many more stages in their growth; the teeth, size, shape, and *deportment* of those we see, leave no doubt, but that they are a number of years in attaining their full growth—I think as many as ten. With the right whales, however, it is different in every respect. I cannot believe them so long-lived, and we have means of *knowing* that they are not so long in coming to maturity. The right whale is much more loosely made, more *lymphatic*, decidedly, and they arrive at full growth in a surprisingly short time, considering their immense size. The (southern) right whale frequents bays and shoal water for the purpose of bringing forth its young; thus whalers, who seek them there, first see only full-grown females, heavy with young; but as the season advances, find them accompanied with very young "calves," which, before leaving for "off shore," have already become large and seaworthy. These are met again "off shore," still with the mother, growing larger and larger as the season advances, until at the last part they are scarcely to be distinguished from the *males*, which, at that time, begin to couple again with the female. We sometimes meet with the bull, the cow, and the calf, all together.

I believe that the right whale attains to full growth in two or three years at most, and that their longevity is not more than *half* that of the sperm; and I infer that they do not produce young *every year*, from the fact that, although they always bring forth at one season, we meet them in different stages of pregnancy at the same time.

C. B. Chappel to W. R. Jones, Esq.—New London, October 25, 1849.

Having been requested to furnish a description of the Greenland whale and its habits, I comply with pleasure in furnishing what information my experience in the country will afford.

First, then, I will state that there are two kinds of whales in the Greenland seas, the first of which is found in latitude from 59° to 62° north, and invariably close to the ice, which at different seasons extends farther to the eastward, sometimes as far as 55° of longitude west; but as the season advances from March, the ice gets broken and scattered in April and May. The whales seek their food and protection from rough weather among the ice, and always the heavier ice in preference; towards the land to the westward, and where there is no ice, they are seldom found and never at rest. The currents here set to the S. E. These whales have a long crooked head, perfectly smooth, with a very high crown or spout-hole; measures not more than 50 to 52 feet in length, having a small ridge or hump near the flukes, but not like the sperm whales or humpback. When the ice is gone these whales seek the land, and go up the floe which runs far inland towards the west. The whales farther north, in latitude 68°, near the Island of Disco, have no such hump, but their habits are the same. From Disco Island, the currents are found to set from the westward, which clears the ice from the land on the east side of Davis's Straits, and leaves water for the whales in this vicinity.

The current at the same time presses the ice over to the west side, barring the passage of the whales up

Hudson Straits in the early part of the season; but after June comes in, the ice becomes more open and the whales can pass through to the west land, where in general there is a strong land ice, in which, if there be no cracks or holes, they remain a short time in quiet. In the early part of July, whales are found to be going to the westward very quick, up Lancaster Sound, and in large numbers, where it is supposed, by all men that I have conversed with on the subject, that, if they meet no firm ice across the sound, they continue their passage either through Barrow's Straits down to Hudson Bay, or farther to the north and westward through the unexplored regions. Some seasons they have been found, after going up Lancaster Sound and being gone for a while, to return to the southward. From this we must suppose that the ice was so strong that the whales could migrate no farther west, and the frost setting in, obliged them to seek a passage farther south. When it happens that they come south they keep the land, and generally at the mouth of some deep inlet seek inland again; and finally, when in September, if there is any ice in the straits and any whales, we find them with the ice. We seldom find whales to the northward of Lancaster Sound in Baffin's Bay. But in former years it has been said they were quite numerous in latitude 76° 35′. Off Pond's Inlet, in latitude 74° N., longitude 76° 30′ W., we find whales coming from the middle of the straits; and if the land ice permits, they go directly up the inlet; if not, they remain awhile, then make up the sound. In March, we find the old whales with their young in latitude 50° to 62°. In August, we find many young ones in latitude 74°, yielding from 50 to 60 barrels. The largest one that I have seen taken yielded 175 barrels and 2,200 pounds bone. About whales stopping under the ice, I would say that they can at certain seasons stop beneath the water according to their own pleasure, or as nature, according to my own judgment, has created them to lay at bottom dormant for a length of time. I am strengthened in this belief by hearing the Governor of Disco relate the fact that he saw a whale lying at the bottom near the Harbor of Liefly on Disco Isle for seven weeks, and that he visited the spot each morning on the ice beneath which the fish lay for this length of time, and then arose to the surface and was captured. I do not remember at what season of the year this happened. What I have seen of the whales, their average length of stopping down is one hour and fifty minutes, and they remain above about twenty-five minutes; but when amongst the ice we seldom see them more than two risings, and many times never see them after going down. When they are irritated by having the harpoon stuck into them, they do not stop down so long as when disentangled; and still, I believe I have seen a stuck fish stop down over two hours and come up apparently out of breath; and have seen them when I supposed they had made much exertion to pass under a heavy floe of ice, and, as they could not pass it, were obliged to return again completely out of breath. At such times they are captured without a move to get away. I have seen a whale in a hole in the ice lay without going under for four hours, and if not troubled probably would have lain longer. It is my belief that these whales do emigrate to the west, and that there is a passage for them beneath the ice to seas beyond these sounds, or we should meet them oftener going the other way, which we never do. These whales do not require a large hole to breathe through; have often been found dead in the vicinity of Lancaster Sound, with no mark upon them, in numbers. From what I have heard, I believe them to be the same as the polar or Russian whale, but never saw one.

Captain Roys to Lieutenant Maury—Hong Kong, January 19, 1851.

I received your favor with pleasure, and am very willing to communicate any knowledge I possess respecting the whaling business. The whales of Behring's Straits and Baffin's Bay are the same; yet they differ very much from the Kamtschatka or northwest whale, or the right whale of the South Seas. I have known a whale to sound deep enough to take one thousand and fifty fathoms of line from the boats; yet I never knew a whale to remain longer under water than 35 minutes, of the right whale species; and one hour and 30 minutes for the sperm whale kind. I have never known them to sound under ice, that is, more than 30 feet above the water's surface, which was in the South Seas. I have never seen any ice to the northward of Behring's Straits more than 30 feet high. The right whale feeds upon a small animal substance, which seems to vegetate and come to maturity every year, and perish like the vegetation upon the land. And it is in only one state that the whale will eat it; consequently, in the northern hemisphere, in the month of January, the food is to be found from 30° to 35° north; and in February it is ripe for the whale; a little farther in March; still farther, and so on, until August, when it is as far north as the Kamtschatka whales go, which is 60°; while the feed from 35° to 40° becomes dead and unfit to nourish the whale; consequently, the whale cannot live at that season in those latitudes; while the humpback and finback take possession, and seem to enjoy and revel in the food, after it has passed its stage for the right whale. The polar whale's feed differs a little from the others; and in January, may be found in 50° north, and in August, from 70° to the pole. I am firm in the opinion that the south is the same; but as no one has ever yet seen a right whale, the opposite of the arctic whales, in the antarctic, the matter still remains in doubt; and it is a lamentable truth, that the ships of war who have visited those seas are not able to tell us for certainty the kinds of whales they saw there. It is not the easiest thing in the world to distinguish the different kinds of whales, even to those who have been in the whaling business, and a ship must be brought close by a whale to tell for certain his kind.

The sperm whale is found in all climates, and in every sea; he feeds upon an inanimate animal substance called a squid, which grows upon the bottom of the sea, and is never seen upon the surface, except when torn up by the whale. I have seen it in large pieces floating upon the surface. I have seen a dying whale vomit it up. I have opened the stomach of a whale and seen it there in pieces; which convinces me that the animal is very large, also, as well as small; and that the sperm whale almost always, when in want of food, goes to the ocean's bed.

I do not know as I shall be able to procure for you a whale's horn, as they are difficult to take; but if no ill betide me, I will bring you the under and upper jaw of a Russian whale, which will be about 24 feet long by 16 diameter, which will serve to show the magnitude of this animal, and, perhaps, we may obtain the horn and something more.

I obtained the last season 3,200 barrels of oil, and 40,000 whalebone, which I shipped from here to England, and try my fortune another season. I commenced whaling in 1833, at 17 years of age, and it has been the whole study of my life ever since that time; and I am writing a book, with all the knowledge I

possess, giving a particular description of all kinds of whales, with all my opinions, &c., which I will forward unto you upon my return to the States. I shall sail from here the 10th of February, and expect to be in 60° north on the 20th of March. It would require too much paper to send, by mail, full answers to your inquiries, and I can only say that I heartily rejoice that we have one man in our Government who will condescend to take notice of a business the annual income from which is millions, and at the present time has broken down all competition of other nations, and is supplying the markets of the world with oil. I shall also be able to give you some of my opinions of ocean currents, &c. I have a set of your *Wind and Current Charts*, which, I am happy to say, I consider very useful, and have found them so. When I arrive at home, you will hear from me soon.

In this stage of my investigations into the habits of the whale, I have thought it best to give the foregoing letters without any comments of my own. They possess much interest and have a peculiar value. I quote them, not for the purpose of exciting discussion among naturalists, but for the purpose of eliciting further information from the whalemen themselves; hoping that these last will be induced to go more into detail, and give us all the information which they possess; and among such a number of close observers there is no doubt much to be elicited that is truly valuable. I need not add that naturalists would be thankful to any whaleman who will furnish them with a specimen of the *hair* with which we are informed by Captains Post and McKenzie that whales are covered.

Let us now return to the Whale Chart—letter F of the series.

By examining this Chart it will, in its present state, serve to satisfy one at a glance that the favorite haunts of the sperm whale are about the equatorial; of the right, about the polar regions. That near the tropics is a sort of debatable ground, where the pasturage of the one overlaps the pasturage of the other. And that, on either hand, a straggler from the one herd is occasionally found far over within the borders of the other.

I have to request that whalemen when they come across these stragglers will observe them closely. Do they appear to be lost? What is their bodily condition, fat or lean? and what the contents of their stomach? Are the stragglers generally male or female, and what is there that is peculiar about them?

The Whale Chart (series F), which comprises a chart of the world, Mercator's projection of 10 degrees to an inch at the equator, and which extends from lat. 79° 50′ N. to 68° south, shows three places where the sperm whale is in the habit of leaving the tropical regions and of resorting to higher latitudes. These places are in the South Atlantic, where they have been found in large schools, between the parallels of 30° and 35°; in the South Pacific, between the parallels of 35° and 60°; and in the middle of the North Pacific as high up as 40°.

I account for their presence up in the North Pacific by the Gulf Stream, which has its genesis in the Indian Ocean, and its exodus in the China Seas. It carries, high up into the North Pacific Ocean, the warm waters and sea climate of the tropics. And the sperm whale resorts there to enjoy it.

The sperm whale being found in the South Atlantic, has suggested the inquiry as to the temperature

of the waters there. Can there be a warm current in that part of the ocean? If so, whence does it come? from the inter-tropical regions of the Atlantic, or from the Indian Ocean? or, is it a branch of the Lagullas current?

If it be the temperature of the water which invites the sperm whale into these extra-tropical regions of the South Atlantic, we may perhaps obtain from these dumb creatures an answer to the question: By what channel do the waters which the Lagullas current, and the ice-bearing current around Cape Horn, and the cold current from Baffin's Bay, and the waters which the Mississippi River, the St. Lawrence, and all the great rivers of Europe, Africa, and America, bring into the Atlantic Ocean—by what channel do these waters escape and preserve the level of that sea?

These currents bring into the Atlantic water more than enough to supply the waste of evaporation. The brine of the sea is not accumulating or concentrating in this ocean, and we therefore *know* that there must be somewhere in this ocean, either at the surface above or in the depths below, a current of large volume running from it. I have searched for it long and patiently. I have looked for it—feeling as certain of its existence as we do of a thing that has been seen and known to exist, and is lost—but in vain.

The components of sea-water, like the components of the atmosphere, are everywhere the same. It is true that we find a little more salt in this place, and a little less in that; but this is attributable, not to the want of a general system of aqueous circulation in the terrestrial economy, but rather to local causes, such as an excess of precipitation or an excess of evaporation, or the discharges of fresh water from rivers in the neighborhood. If the waters of the sea did not pass from one climate to another, and from one ocean to another, it would not be difficult to conceive why, in the process of time, there should not be as great a difference in the waters in different parts of the great oceanic reservoir of the earth as there is in the waters of the Dead Sea and the Mediterranean, or in the waters of any two seas between which there is no communication.

The chemist analyzes the waters of the Mediterranean and of the Red Sea, and detects the same components. Now, unless the waters of these two seas could intermingle—and I have traced a current from the one to the neighborhood of the other—unless, I repeat, there were an intermingling between the waters of these two seas, what could preserve the same salts in the same quantities in each?

The Red Sea, because it is riverless and rainless, receives no salts from the land on its shores. Whereas, the rivers which empty into the Mediterranean have for ages been filtering "the salt of the earth," taking it up in solution from the soil, and bringing it down with their drainage into this sea.

Now, unless nature had provided some means of process by which the waters of these two seas should regularly intermingle with the waters of the ocean, and, through the ocean, with each other, what would hinder the two seas from salting up their brine with different strength.

No doubt the harmonies of the sea are as beautiful and as sublime as the "music of the spheres." And to what agency, therefore, if not to the agency of currents and the mobility of water, must we ascribe the permanent condition of sea-water? For perhaps of all parts of creation that are both tangible and visible

to us, the waters of the sea are most permanent and stable in their characteristics, proportions, and constituents.

If nature had not provided a general system of circulation for the waters of the sea, what would prevent the waters of the Mediterranean, for instance, from absorbing salts and other constituents through its rivers, and of accumulating them in quantities and proportions, which would possibly make a characteristic difference between sea-water from the Mediterranean and sea-water from the Red Sea?

That the waters of remote seas do not permanently attain different degrees of saltness—that sea-water, like the air of heaven, come whence it may, is always the same—may of itself be taken as a proof, if no other evidence could be had, that there is a regular and constant passage, secret and invisible though it be, of the waters from one oceanic basin to another. At least, in the present state of our information upon this subject, we infer that such is the case; and that it is owing to the agency of currents in the depths below and on the surface above, that the waters of one sea are not all brine, of another all fresh, and of another all ice.

Twice, perhaps thrice, as much fresh water is discharged by the rivers of Europe, Africa, and America, into the Atlantic, as is discharged by all other rivers into the Pacific. Twice, perhaps thrice, as much fresh water is taken up from the Pacific as from the Atlantic by evaporation. Now, if the waters of these two oceans were never to intermingle—if the waters of the Pacific never found their way into the Atlantic, and if the Atlantic were never to send its waters to mingle with those of the Pacific Ocean in its own basin—what would prevent the great water-sheds that are drained into the Atlantic from filling its basin up, in the process of time, with fresh water. What, too, would prevent the Pacific, which gives more fresh water to the clouds than they restore to it again, from becoming, first, a sea of brine, then finally a bed of salt?

Studying the habits of nature, so to speak, with regard to the air and the sea, I have learned to conjecture that every drop of water now in the Pacific, has been at some former period in the Atlantic; and this conjecture, reason teaches me, is as plausible as is the supposition that every breath of air now in the northern hemisphere, has at some time or other, in following its appointed paths, coursed its round in the general system of circulation through the channels of the southern hemisphere.

Assuming these principles to be in conformity with the designs of nature, I have been induced to search for a current from the Atlantic Ocean into the Pacific.

Taking its existence for granted, therefore, as I am disposed to do, it can be readily shown that this current does not have its exodus through the Arctic Ocean; for in that case, the precipitation in that ocean being greater than the evaporation, the waters of the great rivers of Northern Asia, Europe, and America, being added to its own waters, would create a stream of immense volume and frightful rapidity through Behring's Straits into the Pacific. Whereas, so far from this being the case, the reverse occurs.

The current through Behring's Straits runs generally from, not into the Pacific. I have, therefore, looked to the South Atlantic—to the space between the two stormy capes—as the only place in which this ex-Atlantic current could make its exodus. And if, after all this special and minute investigation; if, after

the most accurate, and careful, and patient examination that has been made of log-books here for some evidence of this current; if, after the attention of navigators has been called to it, and they have exhausted all the means which human ingenuity has devised for detecting and measuring currents at sea, and have failed to discover one here; if, after all this labor and research, it should so turn out, when we go there with the water thermometer, that the sea climate is not an extra-tropical one, as its latitude indicates; that it is the inter-tropical temperature of its waters which tempts the sperm whales to gambol there in such multitudes—then the discovery of the fact that the sea-water here is a little warmer, and that, therefore, there is a current running hither from the equator, should be regarded as one which is due to the information which the study of the habits of this animal has given us.

In the sperm whale region of the coast of Chili and Terra del Fuego, we have been taught to believe in the existence of a cold current. Assuming this cold current to be there—that it is not crossed or divided by a warm current, the resort of the sperm whales there must be regarded as an anomaly in the habits of the creature.

These investigations as to the habits and places of resort of the whales, have taught me to regard sperm whales as much out of place in cold water, as the whalers themselves would regard out of place, a wilderness of howling monkeys of the Amazon among the Green Mountains of Vermont.

I take this occasion to say—because some of the whalemen have supposed it unnecessary to continue the abstracts when in sight of land—that it is important to have a complete abstract for every day they are at sea; that we may know whether they find fish or not, how plentifully, the force and direction of winds and currents, the temperature of the air and water, and that we may glean information as to all other phenomena which they are requested to note in the abstract log.

Plate XIII. is a section taken from the Whale Chart of the world. It is a copy, and nearly a facsimile, except that, in some of the Charts, the right whale curves are colored blue, and the sperm, red. Take the square marked A, as an illustration and explanation of the Chart. Between the meridians of 45° and 50° W.—as between every fifth pair of meridians—are 12 columns for the 12 months; the first column on the left always standing for December, or the first winter month, the next for January, and so on.

Between the parallels of 35° and 40° are 11 horizontal lines. Beginning always at the south and counting up towards the north, each of the first ten of these lines stands for 10 days, thus making the 10th stand for 100. The scale is then changed; the 11th line stands for 200; and the 12th on the parallel of lat., for 300 days. (See the figures in the margin.)

Now, by following the curve for the days, and the curve for the whales, right and sperm, for this square—it will be seen that, during different years, whalers have spent in this square upwards of 100 days (125) searching for whales in the month of December; and that, out of this time, they saw right whales on 15 days—sperm on 2; and that during each month they have fished and seen as follows, viz:—

Days of Search.		No. of days on which were seen— Right Whales.	Sperm Whales.	Days of Search.		No. of days on which were seen— Right Whales.	Sperm Whales.
In December,	125	15	2	June,	12	0	0
January,	96	8	12	July,	8	0	0
February,	150	5	10	August,	28	0	0
March,	110	2	8	September,	68	20	0
April,	78	0	5	October,	90	25	8
May,	28	0	3	November,	88	43	5

It appears, therefore, that from September to December, inclusive, is the best time for whaling in this district of 5° square. In some of its neighboring districts, whalers have been more successful in other months, as a glance at the Chart will show.

It is worthy of remark that the sperm whale, according to the results of this Chart, appears never to double the Cape of Good Hope. He doubles Cape Horn. Since this fish delights in warm water, shall we not expect to find, off Cape Horn, an undercurrent of warm water, heavier with its salts?

ROUTES TO AND FROM EUROPE.*

The information contained under this heading relates to the best routes, under canvas, between New York and Europe.

The best average route, each way, as it regards the winds, independent of currents, is only indicated.

Upwards of thirty thousand observations on the winds in this part of the ocean alone, have been collated, compared, and discussed for these routes.

The routes now indicated are the results of this mass of materials, and these routes are to be looked upon as the mean or average track of all the vessels engaged in making the voyages which have afforded these observations, supposing that each vessel, under all circumstances and on every occasion, had made the most judicious courses.

My information is yet quite meagre in many portions of this part of the ocean, and the present routes should be regarded, not as fixed and final determinations; they are rather approximations.

Though they be approximations to those routes which further investigations, based on more ample materials, may establish as the best routes, their importance will no doubt be readily appreciated when it is considered that the average per centum of calms, head and fair winds, is stated for each district of 5° square of ocean through which the vessel is recommended to pass; and that they are stated in the tables, and exhibited on the Charts, in such a manner that the navigator, who pursues these routes and consults the authorities before him, will be freed from all doubt and perplexity as to which tack to take when the wind comes out *dead* ahead.

Upon a right decision in such cases often depends the success of the voyage, as to time.

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* Letter to Sec. Navy, Jan. 1, 1850.

I have now before me the log-books of two vessels, which afford a case in point; they were bound to Europe—were together, and had accomplished more than half the voyage; the wind came out ahead; one stood off to the northward on the starboard tack, the other to the southward on the opposite tack; one was right, and the other wrong; for, in consequence, one got into port ten days before the other.

In such cases, those who pursue these routes with the Pilot Charts on board, would be left in no doubt as to the tack having the greatest number of chances in its favor.

Permit me to call attention to a very remarkable part of the ocean through which these tracks pass. It is about 45° N. and 50° W. The water here is permanently cold; so cold that the water thermometer is sometimes found, within the distance of a few miles, to fall 40° of Fahrenheit; and I notice in many log-books the remark, "water, colored."

The spot is also remarkable for its fogs and its disturbed atmospherical conditions. If a vessel could be sent to examine into it, important service might be rendered to navigation, by showing how, when the heavenly bodies are obscured, the mariner may determine the position of his ship by dipping his thermometer into the water; or the examination might lead to other results not less important. It is probably the centre of great atmospherical disturbances.

There is said to be, somewhere along these routes, a rock just awash, and not known to any chart. The doubtful existence of such a danger is always perplexing and harassing to navigators; not knowing its exact position, they have to turn far aside out of the way, to be sure of avoiding it. The rock is small—only a few feet across—with bold water up to it. And because it is said to be in a part of the ocean that is so much frequented as is this, it is a matter of great importance to the mariner that all doubts as to its existence and locality should be removed. I have the reports of navigators who have seen it, and who have passed so close to it that they might have thrown a biscuit upon it. But its position is vaguely described.

I have received the following "Notice to Mariners."

"On the 2d Dec. (1849), the ship Marmion, Capt. Freeman, from Liverpool, when in long. 69° 29′ W.; lat. 41° 05′ to 41° 01′, got in between two tide rips, which broke. Capt. F. had been sounding 21 fathoms, and on steering S. by E. to S. by W. found as little as seven fathoms, which of course would be dangerous in blowing weather. * * *

"G. W. BLUNT."

And in addition the following has been published touching the same:—

NATIONAL OBSERVATORY, *February* 10, 1851.

SIR: Captain R. F. Hartshorn, of the ship E. Z., reports in his Abstract Log kept for this office, the discovery of a shoal in a much frequented part of the ocean, viz: near Nantucket Shoals, and directly in the route hence to Europe.

Extract from his log from Liverpool to New York, last July—

"N. B.—During the two days, the 20th and 21st July, I was beating between lat. 41° 10′ to 41°, and long. 69° to 69° 40′; the fog very thick. Several times, I shoaled the water suddenly from 20 fathoms to 8

and 7—steering S. S. W. to S. by W. I am certain there must be a very shoal spot in the neighborhood of 69° 30′, or 69° 35′, and lat. 41° to 41° 08′. I had the lead constantly going during the 56 hours, and the soundings differed very materially from Blunt's Charts Soundings.

"I have sounded a good deal about Nantucket Shoals during the last eight years, and find the depths of water in the same places have changed more than I could have possibly believed; but it is a positive fact."

The place of this shoal is six or eight miles to the southward and eastward of Davis's Bank, discovered by the Coast Survey in 1846. It is possible that this may be the shoal reported by Captain Hartshorn; but doubt as to the existence of dangers in such a frequented part of the ocean, cannot be harmlessly tolerated. I therefore would recommend a careful examination of the locality.

Respectfully, &c.

M. F. MAURY.

HON. WM. A. GRAHAM,

Secretary of the Navy.

These reports as to danger in this part of the ocean, led to an examination of this locality by the Coast Survey. The result was, thanks to Capts. Freeman and Hartshorn, the discovery of three shoals.—Vide *Coast Survey Chart: Davis's South Shoal and other Dangers*, 1852.

The best Average Routes to and fro between New York, Cape Clear, and the English Channel.

These routes are calculated from the Pilot Chart, also; and they represent each for its month, the best track *on the average*, which a vessel can make.

The navigator who intends to follow any one of these routes, should lay it down on his chart from the table; and when he gets thrown off of it by the winds and currents, as he often will, he should then, instead of turning out of his way to get back to it, recollect that if a special route were now calculated for him from his position, it probably would not touch the projected route at all. He therefore is in a new position, and must consult his Pilot Chart as to future courses and route. In recommending these routes, and in speaking of them, I wish navigators to understand and bear in mind *always*, that I am speaking from the information before me, which is sometimes imperfect and often deficient. When full and complete, it may modify present conclusions; present conclusions, therefore, must be regarded only as approximations.

If every vessel, whose log between this and Europe has afforded materials for the Pilot Chart, had always taken the most judicious course; and when she was headed off, if she had in every instance taken that tack which was really the best; and then, if a line had been drawn to represent on the Chart the average or mean track of all those vessels for January, February, March, or April, and the other months, then that line would be represented by the route as given in the tables for that month.

In other words, the vessels that shall pursue the routes here given, will pursue exactly that course which the experience of all has shown to be the best on *the average*.

By consulting the Pilot Chart, or the column "Total No. of Observations," in the table of Routes, it will be observed that for the months for which the routes are given for European traders, I have not observations enough to the north of 45° N., and west of 45° W., to enable me to speak of the advantages or disadvantages of making that part of the ocean a greater thoroughfare than it is.

Take the route *from* New York in March for illustration: It will be seen by the table that the course recommended from longitude 55° to 50°, is east, and that the winds are from E. on *the average* 1.9 per cent. of the time, and that a vessel in steering E. there, would be headed off from her course by slant winds from the northward, 2.8 times; and by slant winds from the southward, 15.9 times in the hundred—and that these proportions are derived from the records of 108 vessels between these meridians in that month, or, which is the same, by 108 observations there, during the month of March of different years.

The south, therefore, is the windward side then and there; therefore these, facts thus presented, will leave the navigator, when he comes to be headed off in that part of his route, in no doubt as to which tack to go upon; with the wind directly ahead or east, he should stand to the southward or to windward, because the probabilities of the wind's coming out from that quarter are greater than they are that it will come from the northward.

Again, from the meridian of 35° to 30° W., the best average course is E. N. E.—1.3 per cent. of the winds are *dead* ahead, and 19 are slant from the northward against 4.3 from the other side. Here then it is shown, from the records of 80 vessels, that the northward is the windward side.

I have the records of two vessels which were together in this part of the ocean, on their way to Europe; they had kept together so far on their way; they sailed alike; when they arrived here, the wind came out ahead—one went off on the larboard and the other on the starboard tack; the latter arrived in port ten days before the other. With the Pilot Chart on board, it would have been impossible for the other vessel so to have mistaken the chances in favor of her proper course. Captain Hartshorn, of the E. Z., informs me that on his last voyage in 1852, from Liverpool to New York, he made these Charts his guide; that he made the most remarkable passage of the season (19 days), and that vessels which sailed about the same time he did, did not arrive for twenty days and more after he did. He attributed his success to the lights which the experience of others, expressed by these Charts, afforded him.

I have not calculated the track beyond 10° W. off Cape Clear for the Liverpool track; nor beyond 5° W. for the English Channel, because, beyond these meridians, the best course to steer is indicated by the land and the winds that happen to prevail.

ROUTES BETWEEN NEW YORK AND EUROPE.

BEST AVERAGE ROUTES BETWEEN NEW YORK AND LONG. 10° W., FOR VESSELS BOUND TO AND FROM LIVERPOOL; ALSO, BETWEEN NEW YORK AND LONG. 5° W., FOR VESSELS BOUND IN OR OUT OF THE ENGLISH CHANNEL.

New York to Europe.—JANUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.		
40° 28′	74° 00′	to										
40 28	70 00	E.	182	6.2	193	6.2	6.0	5.0	82.8	2.1	97	
42 02	65 00	E. N. E.	245	10.4	271	2.8	5.6	*w* 13.3	78.3	3.6	143	
43 33	60 00	E. N. E.	238	20.8	287	8.0	12.8	12.8	66.4	3.2	64	
43 33	55 00*d*	E.	217	4.2	226	0.0	*w* 11.0	4.4	84.6	4.4	94	
45 03	50 00	E. N. E.	233	14.4	266	4.8	*w* 13.2	8.4	73.6	8.5	89	
45 03	45 00	E.	212	11.4	236	0.0	14.3	14.3	71.4	0.0	7	
45 28	40 00*d*	E.	212	6.8	226	0.0	3.1	*w* 18.6	78.3	0.0	32	
45 27	35 00	E.	212	5.1	223	1.5	3.0	4.5	91.0	9.2	71	
46 30	30 00	E. N. E.	227	8.5	246	2.2	9.9	9.9	78.0	2.1	94	
47 55	25 00*d*	E. N. E.	221	5.6	233	0.0	4.8	*w* 13.2	82.0	7.0	92	
47 55	20 00	E.	201	8.1	217	1.5	9.0	*w* 12.0	77.5	3.1	67	
49 17	15 00	E. N. E.	214	2.2	219	0.0	1.4	*w* 8.4	90.2	2.8	74	
50 00	12 20	E. N. E.	113	6.3	120	2.1	4.2	4.2	89.5	0.0	43	To
50 38	10 00	E. N. E.	98	15.1	112	5.8	*w* 13.6	2.9	77.7	1.9	105	Liverpool.
			2825		3075							
49 17	10 00	E.	196	8.0	212	4.2	*w* 4.2	0.0	91.6	0.0	43	To
49 36	5 00	E. ½ N.	196	24.9	245	8.3	0.0	*w* 41.5	50.2	0.0	12	Channel.
			3006		3300							

New York to Europe.—FEBRUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.		
From 40° 27′	74° 00′ to											
40 45	70 00	E. ½ N.*	182	7.7	196	1.0	8.7	*w* 10.5	79.8	1.9	106	
41 42	65 00	E. by N. ½ N.	233	8.2	252	3.4	*w* 8.5	3.4	84.7	6.6	62	
43 13	60 00	E. N. E.	238	5.7	251	0.0	*w* 12.0	8.4	79.6	0.0	84	
44 42	55 00	E. N. E.	234	10.8	259	2.2	11.0	11.0	75.8	7.8	96	
44 42	50 00*d*	E.	213	9.0	232	3.3	*w* 12.1	3.3	81.3	2.3	88	
44 42	45 00	E.	213	7.4	228	0.0	*w* 13.0	8.0	79.0	2.9	105	
45 00	40 00	E. ½ N.	212	5.9	229	2.8	1.4	*w* 2.8	93.0	4.4	70	
46 26	35 00	E. N. E.	225	6.1	235	0.0	3.2	*w* 19.2	77.6	3.1	65	
47 50	30 00	E. N. E.	221	7.8	239	1.0	7.0	*w* 13.0	79.0	4.9	106	
49 13	25 00	E. N. E.	217	3.6	225	0.9	2.7	*w* 4.5	91.9	4.3	111	
49 13	20 00*d*	E.	197	10.3	216	3.0	8.0	8.0	81.0	4.0	103	
50 00	15 00	E. by N. ¼ N.	200	8.5	217	4.2	4.2	*w* 5.6	86.0	1.4	69	
50 50	10 00	E. by N. ¼ N.	196	11.2	217	3.6	5.4	*w* 16.2	74.8	3.5	118	To Liverpool.
			2781		2996							
49 30	10 00	E. ¾ S.	200	16.7	233	5.7	*w* 22.8	*w* 7.6	63.9	1.9	52	To Channel.
49 30	5 00	E.	195	9.9	214	0.0	16.6	16.6	66.8	0.0	6	
			2980		3226							

Average sailing distance, to 10° W., by this route, to Liverpool, 2,996 miles, for 215 of which the winds, on the average, are *dead* ahead.

Ditto to 5° ditto English Channel, for 246 of which the winds, on the average, are *dead* ahead.

* Nantucket Shoals are in the way of an E. N. E. course, which would be the best.

New York to Europe.—MARCH.

Latitude.	Longitude.	Course.	DISTANCES. True.	Per cent.	Average.	WINDS; PER CENT. Head.	SLANTS FROM N'd.	S'd.	Fair.	Calms.	Total No. observations.	
40° 27′	74° 00′to											
40 27	70 00	E.	182	12.4	205	6.2	2.8	*w* 6.9	84.1	4.1	151	
40 00	65 00	E.N.E.	245	7.2	263	7.2	7.1	*w* 15.8	69.9	1.4	206	
42 45	62 30	E.N.E.	119	13.1	134	2.5	13.2	*w* 15.0	69.3	} 4.1	126	
42 00	60 00*d*	E.S.E.	119	13.7	135	4.2	13.3	13.0	69.5			
43 31	55 00	E.N.E.	238	13.2	269	9.6	7.1	*w* 15.1	68.2	5.3	118	
43 31	50 00	E.	217	7.9	234	1.9	2.8	*w* 15.9	79.4	0.9	108	
43 31	45 00	E.	217	9.4	238	1.7	*w* 10.3	8.5	79.5	2.5	121	
43 31	40 00	E.	217	3.7	225	1.6	2.1	3.2	93.1	5.0	200	
43 31	35 00	E.	217	7.6	234	0.0	2.9	7.6	89.5	4.8	109	
45 00	30 00	E.N.E.	233	4.3	243	1.3	*w* 19.0	4.3	75.4	3.9	80	
46 27	25 00*d*	E.N.E.	226	8.4	245	4.4	4.4	1.1	90.1	1.1	90	
46 27	20 00	E.	206	3.2	212	0.0	*w* 7.0	2.2	90.8	2.2	90	
47 52	15 00	E.N.E.	221	6.7	236	0.0	*w* 12.0	6.3	81.7	0.0	74	
50 00	11 45	N.E.	181	5.4	191	0.0	4.0	*w* 12.0	84.0	0.0	67	
50 44	10 00	N.E. by E.	81	10.8	90	5.4	6.0	*w* 8.4	80.2	3.5	116	To Liverpool
			2919		3154							
50 00	10 00	E.	67	11.8	75	3.0	9.0	9.0	79.0	0.0	67	} To
49 40	5 00	E. ½ S.	194	10.0	213	17.0	25.0	8.3	49.7	0.0	12	} Channel.
			3099		3352							

New York to Europe.—APRIL.

Latitude.	Longitude.	Course.	DISTANCES. True.	Per cent.	Average.	WINDS; PER CENT. Head.	SLANTS FROM N'd.	S'd.	Fair.	Calms.	Total No. observations.	
40° 27′	74° 00′to											
40 27	70 00	E.	182	9.2	199	3.0	9.6	*w* 11.4	76.0	7.1	180	
42 00	65 00*d*	E.N.E.	244	12.3	274	3.2	8.3	*w* 11.1	77.4	2.5	161	
42 00	60 00	E.	223	12.7	251	5.2	7.8	*w* 9.1	77.9	7.3	88	
43 31	55 00	E.N.E.	237	7.9	256	2.4	6.4	5.7	85.5	4.1	126	
45 00	50 00	E.N.E.	233	5.0	244	0.0	*w* 9.9	*w* 7.2	82.9	10.1	120	
46 21	45 00*d*	E.N.E.	226	3.3	233	0.0	0.0	8.3	91.7	0.0	12	
46 27	40 00	E.	207	6.6	320	0.0	*w* 5.5	*w* 16.5	78.0	5.6	19	
46 27	35 00	E.	207	5.5	218	2.5	5.0	0.0	92.5	7.6	42	
46 27	30 00	E.	207	10.1	228	0.0	8.8	*w* 20.9	70.3	5.5	92	
47 52	25 00	E.N.E.	221	15.6	255	5.2	11.8	*w* 16.3	66.7	7.4	145	
49 14	20 00*d*	E.N.E.	215	12.9	242	4.2	6.7	*w* 10.9	78.2	5.9	125	
49 14	15 00	E.	196	8.8	213	3.6	*w* 13.2	3.6	79.6	7.5	86	
49 14	10 00	E.	196	4.6	205	1.1	1.1	*w* 7.7	90.1	0.0	89	
49 30	5 00	E. ½ N.	196	20.9	237	5.5	11.0	*w* 33.0	50.5	5.6	12	To Channel.
			2990		3375							
50 00	13 06	E.N.E.	79	4.0	82	1.1	4.4	5.5	89.0	0.0	89	} To
Cape Clear	10 00	E.N.E.	130	3.6	135	0.0	3.6	3.6	92.8	0.0	80	} Liverpool.
			2807		3150							

New York to Europe.—MAY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			Direct.	Per cent.	True.	Head.	North.	South.	Fair.	Calms.	
Sandy	Hook to										
40° 27′	74° 00′										
42 00	70 00	E. ¾ S.	185	14.4	211	5.4	9.1	7.7	77.8	4.0	235
41 34	65 00	E. N. E.	246	10.2	271	2.7	11.0	6.8	79.5	7.3	281
43 06	60 00	E. N. E.	240	10.4	265	1.2	18.2	7.8	62.8	3.9	189
44 36	55 00	E. N. E.	234	8.8	254	1.2	4.3	11.0	83.5	3.0	170
44 36	50 00	E.	214	11.5	238	3.9	8.5	8.5	79.1	3.9	160
44 36	45 00	E.	214	7.3	229	2.2	7.6	6.0	84.2	4.8	195
44 36	40 00	E.	214	5.6	226	1.1	6.8	5.1	87.0	2.9	180
45 00	35 00	E. ½ N.	215	4.3	224	0.0	5.3	10.1	84.6	1.5	136
45 00	30 00	E.	212	4.8	222	0.7	7.8	4.3	87.2	4.8	132
45 00	25 00	E.	212	5.1	223	0.8	6.4	4.0	88.8	5.6	131
48 25	20 00	N. E.	290	9.6	318	3.0	9.0	9.0	79.0	3.0	137
48 25	15 00	E.	198	11.5	220	2.9	10.9	10.2	76.0	3.6	142
48 25	10 00	E.	198	16.8	231	4.8	21.6	10.4	63.2	3.2	129
To Channel		E. N. E.	210	16.8	245	2.8	11.3	33.6	52.3	5.5	38
			3082		3377						
50 16	15 00	E. N. E.	212	16.4	246		8.7	8.7	75.3	3.6	142
To Liverpool	10 00	E. N. E.	194	14.0	221		4.4	13.2	79.1	1.1	96
			2882		3148						

New York to Europe.—JUNE.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			Direct.	Per cent.	True.	Head.	North.	South.	Fair.	Calms.	
Sandy	Hook to										
40° 08′	73° 00′	E. S. E.	50	9.7	55	1.7	11.0	9.2	78.1	} 2.7	232
41 13	70 00	E. N. E.	170	8.7	185	1.8	4.8	10.9	82.5		
42 45	65 00	E. N. E.	241	8.5	261	1.8	3.5	3.9	90.8	3.5	235
42 45	60 00	E.	220	10.9	244	4.5	8.0	4.5	83.0	3.8	216
44 15	55 00	E. N. E.	236	8.5	256	3.3	3.8	7.1	85.8	1.1	184
45 43	50 00	E. N. E.	230	5.1	242	0.5	5.8	8.2	85.5	3.1	202
47 10	45 00	E. N. E.	224	5.9	237	2.3	0.0	6.8	90.0	0.0	44
48 33	40 00	E. N. E.	217	4.8	227	1.4	0.9	7.0	91.6	9.9	78
49 54	35 00	E. N. E.	212	10.7	234	3.1	5.0	11.9	80.0	3.1	165
51 13	30 00	E. N. E.	207	2.0	211	4.0	0.0	2.0	94.9	0.0	47
51 13	25 00	E.	188	0.8	189	0.0	9.0	2.0	98.0	6.1	52
51 13	20 00	E.	188	2.2	192	0.0	0.0	6.9	93.1	2.3	44
51 00	15 00	E. ½ S.	190	15.4	218	7.2	6.0	4.7	82.1	0.0	82
50 40	10 00	E. ½ S.	194	10.0	214	4.9	13.3	15.4	66.4	5.6	150
To Channel			209	5.1	219	3.9	18.2	1.3	76.6	0.0	78
			2976		3184						

According to the Charts, this is the best track yet developed, and ought to give the shortest passages.

New York to Europe.—JULY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			Direct.	Per cent.	True.	Head.	North.	South.	Fair.	Calms.		
40° 27′	74° 00′ to											
40 27	70 00	E.	182	12.0	204	3.6	7.2	5.1	84.1	4.2	322	Calms.
42 00	65 00	E.N.E.	246	5.0	260	3.0	7.0	9.1	80.9	8.7	414	Calms.
43 30	60 55	E.N.E.	237	4.2	247	0.9	3.3	4.8	91.0	8.4	350	
43 30	55 00	E.	218	10.3	240	4.4	5.6	8.0	82.0	5.6	263	
44 59	50 00	E.N.E.	233	5.9	244	0.4	8.8	7.6	83.2	5.4	236	
44 59	45 00 *d*	E.	212	12.6	238	4.4	8.1	8.1	79.4	8.1	173	
45 40	40 00	E. by N.	214	8.0	231	1.0	8.0	3.0	88.0	4.0	103	
47 06	35 00	E.N.E.	224	3.3	231	0.0	2.2	11.0	86.8	4.6	95	
47 06	30 00	E.	204	5.9	216	1.1	10.6	4.1	84.2	3.2	77	
47 06	25 00	E.	204	9.0	222	2.1	10.6	8.2	79.1	6.5	100	
48 29	20 00	E.N.E.	218	8.8	237	4.2	2.1	6.3	87.4	9.4	105	
49 50	15 00	E.N.E.	213	8.5	231	2.5	13.2	3.3	81.0	2.5	125	Liverpool.
50 30	10 00	To Liv'pool	195	13.4	220	5.7	5.6	9.1	79.6	4.5	92	
			2800		3021							
48 29	15 00	E.	198	5.8	209	2.5	5.8	0.8	90.9	2.5	125	Channel.
48 29	10 00	E.	198	17.8	234	6.5	17.5	3.2	72.8	2.2	94	
49 00	To Channel	E.N.E.	213	12.8	240	0.0	28.0	8.0	64.0	0.0	24	

New York to Europe.—AUGUST.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			Direct.	Per cent.	True.	Head.	North.	South.	Fair.	Calms.		
40° 27′ *d*	74° 00′ to											
40 00	70 00	E. ¾ S.	186	13.0	209	3.0	9.5	18.0	69.5	6.0	194	
39 12 *d*	67 30	E. S. E.	125	8.7	135	3.1	2.9	10.7	83.3	3.6	229	
39 12	65 00	E.	116	6.6	123	1.6	17.0	7.1	74.3			
39 12	62 30	E.	116	8.0	125	3.0	6.5	5.5	85.0	4.3	193	
40 00	60 00	E.N.E.	125	7.6	134	2.0	9.5	5.0	83.5			
41 34	55 00	E.N.E.	246	7.1	263	7.1	7.0	8.4	77.5	6.8	157	
43 06	50 00	E.N.E.	241	11.1	268	3.0	6.5	11.0	79.5	6.5	213	
44 36	45 00	E.N.E.	235	14.3	268	4.8	12.0	12.6	70.6	3.7	166	
45 00	44 26	N.E.	34	9.4	37	2.8	4.5	11.2	81.5	5.0	147	
48 08	40 00	N.E.	260	7.	279	0.0	11.4	12.6	76.0	7.9	123	
48 00	35 00	E.	201	8.2	217	2.4	7.2	7.2	83.2	9.4	129	
48 00	30 00	E.	201	8.0	217	3.0	4.0	5.0	88.0	2.9	106	
48 00	25 00	E.	201	3.0	207	0.0	5.0	6.0	89.0	1.1	92	
48 00	20 00	E.	201	8.4	218	3.0	9.0	1.5	86.5	7.8	69	
48 00	15 00	E.	201	3.0	207	0.0	8.0	2.0	90.0	4.2	100	
49 22	10 00	E.N.E.	214	3.7	221	0.8	11.2	0.0	88.0	3.2	130	Liverpool.
49 30	5 00	E.	195	5.0	205	0.0	5.1	8.4	86.0	0.0	36	Channel.
			3098		3333							

New York to Europe.—SEPTEMBER.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			True.	Per cent.	Average.	Head.	North.	South.	Fair.	Calms.		
40° 27′	74° 00′ to											
40 00	72 35	E. S. E.	71	5.4	75	0.0	9.9	5.4	84.7	4.5	115	
40 49	70 00	E. N. E.	128	15.3	147	0.9	30.6	9.0	59.5			
40 49	65 00	E.	227	10.4	250	4.2	9.0	3.6	83.2	5.3	178	
40 49	60 00	E.	227	15.5	261	6.3	13.3	4.9	75.5	5.3	159	
42 22	55 00	E. N. E.	243	5.6	256	0.0	13.8	5.4	80.2	3.7	167	
42 22	50 00	E.	222	16.3	257	6.0	14.4	9.6	70.0	6.2	172	
43 53	45 00	E. N. E.	237	15.0	272	4.9	11.2	14.0	69.9	5.8	147	
45 22	40 00	E. N. E.	232	9.8	255	4.2	8.4	4.2	83.2	2.2	138	
46 48	35 00	E. N. E.	225	8.9	245	2.6	9.1	7.8	80.5	1.3	78	Liverpool.
48 12	30 00	E. N. E.	220	4.7	229	1.2	6.3	5.1	87.4	6.2	85	
49 35	25 00	E. N. E.	213	4.2	222	0.0	9.0	5.0	86.0	8.0	109	
49 35	20 00	E.	192	12.2	216	3.6	11.7	15.3	69.4	0.9	111	
50 33	15 00	E. by N.	201	7.6	216	1.8	3.6	19.2	75.4	1.8	64	
50 33	10 00	E.	191	12.8	213	3.3	7.7	17.6	71.4	1.0	96	
			2830		3114							
45 22	35 00	E.	211	9.9	232	3.9	5.2	6.5	84.4	1.3	78	To Channel.
45 22	30 00	E.	211	5.3	222	1.3	2.5	8.8	87.4	6.2	85	
46 48	25 00	E. N. E.	225	4.2	234	0.0	9.0	5.0	86.0	8.0	109	
46 48	20 00	E.	205	12.2	230	3.6	11.7	9.0	75.7	0.9	111	
48 12	15 00	E. N. E.	220	11.4	245	3.6	2.4	9.6	84.4	1.2	81	
48 12	10 00	E.	200	14.8	230	3.6	21.6	5.4	69.4	1.8	57	
49 34	5 00	E. N. E.	213	15.0	245	0.0	10.0	40.0	50.0	0.0	20	

Europe to New York.—JANUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
							SLANTS FROM					
			True.	Per cent.	Average.	Head.	N'd.	S'd.	Fair.	Calms.		
49° 30′	5° 00′ to											
49 30	10 00	W.	192	0.0	192	0.0	0.0	0.0	100.0	0.0	12	From long. 5° W.
49 30	15 00 *d*	W.	192	30.2	250	12.6	16.8	16.8	53.8	0.0	43	
50 40	10 00											From long. 10° W.
49 30	15 00 *d*	W. by S. ¾ S.	202	36.1	275	16.5	15.5	17.5	50.5	1.9	105	
48 08	20 00	W. S. W.	213	37.1	293	14.0	*w* 30.8	23.8	31.4	2.8	74	
46 45	25 00	W. S. W.	219	24.0	272	9.0	*w* 22.5	7.5	61.0	3.1	67	
45 18	30 00	W. S. W.	226	29.3	292	10.8	18.0	*w* 24.0	47.2	7.0	92	
45 18	35 00	W.	211	22.7	259	6.6	15.5	*w* 20.9	57.0	2.1	91	
45 18	40 00	W.	211	28.8	270	9.0	12.0	*w* 28.5	50.5	9.2	71	
43 49	45 00	W. S. W.	232	18.9	276	5.5	*w* 18.7	16.5	59.3	6.8	78	
43 49	50 00 *d*	W.	215	19.6	256	4.4	*w* 20.9	13.2	61.5	0.0	91	
42 19	55 00	W. S. W.	237	17.0	277	3.6	13.2	*w* 19.2	64.0	8.5	89	
40 46	60 00	W. S. W.	244	22.1	298	5.5	*w* 25.3	15.7	53.5	4.4	94	
40 46	65 00	W.	225	16.3	261	6.4	*w* 14.8	12.8	66.0	3.2	64	
40 46	70 00 *d*	W.	225	26.8	285	9.1	*w* 21.0	16.7	53.2	3.6	143	
40 27	74 00 *d*	W. ½ S.	183	24.4	226	9.0	*w* 23.0	11.0	57.0	2.1	97	
			2843		3540							

Average sailing distance, from 5° W., by this route, 3,707 miles; and from 10° W., coming out of Liverpool, 3,540. The aggregate of adverse winds, expressed in their equivalents of *winds dead ahead*, give 697 miles from Liverpool, and 687 from the Channel, for the average number of miles to be overcome by a dead beat during the voyage. It will be observed that the most difficult parts of the route, are between longitudes 15° and 20°, 25° and 30°, and 35° and 40° W.; and that calms are most prevalent between longitudes 25° and 30°, 35° and 45°, and 50° and 55° W.

Europe to New York.—FEBRUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.	
49° 00′	*d* 10° 00′ to										
47 38	15 00	W. S. W.	216	9.9	237	1.9	*w* 20.9	0.0	77.2	1.9	52
47 38	20 00	W.	202	18.8	239	5.6	11.2	*w* 19.6	63.6	1.4	69
47 38	25 00	W.	202	16.6	235	4.0	15.0	*w* 21.0	60.0	4.0	103
47 38	30 00	W.	202	24.8	242	6.3	17.2	*w* 25.4	51.1	4.3	111
46 12	35 00	W. S. W.	225	22.2	275	4.0	*w* 27.0	24.0	45.0	4.9	106
46 12	40 00	W.	208	29.4	269	11.2	12.8	*w* 19.2	56.8	3.1	65
46 12	45 00	W.	208	17.1	244	3.0	16.5	*w* 22.8	57.7	1.5	66
44 44	50 00 *d*	W. S. W.	230	5.5	242	0.0	9.1	*w* 27.3	63.6	9.0	12
44 44	55 00	W.	213	23.9	264	8.8	*w* 22.0	16.5	52.7	2.3	88
43 15	60 00	W. S. W.	234	16.7	275	4.4	*w* 25.3	7.7	62.6	7.8	96
41 44	65 00 *d*	W. S. W.	239	20.9	288	6.0	*w* 31.2	8.4	55.0	0.0	84
40 44	70 00	W. by S. ½ S.	233	24.1	290	8.5	*w* 27.2	11.9	52.4	6.6	62
40 29	74 00	W. ½ S.	184	11.3	204	0.0	*w* 21.1	13.5	65.4	1.9	106
			2796		3304						

Average sailing distance, from 10° W. by this route, 3,304 miles; for 508 of which the winds average ahead. It will be observed that, from longitude 25° to 35°, a vessel is more liable to adverse than fair winds; and further, that in this month the winds prevail very much from the westward, though not so much so as in some of the other months. From port, steer for longitude 10° in latitude 49°.

Europe to New York.—MARCH.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.		
49° 30′	5° 00′ to											
50 00	6 54	W.N.W.	79	6.6	85	0.0	*w* 16.6	8.3	75.1	0.0	12	From Channel.
50 49	10 00	W.N.W.	128	15.4	147	3.0	14.0	14.0	69.0	2.7	38	
50 00	13 06	W.S.W.	128	25.9	161	10.0	16.4	18.0	55.6	3.5	110	
49 30	15 00	W.S.W.	79	23.0	97	3.0	*w* 38.0	21.0	38.0	0.0	67	
49 30	20 00	W.	195	24.6	244	6.0	*w* 26.0	23.0	46.0	0.0	74	
49 30	25 00 *d*	W.	195	17.5	228	3.3	17.0	*w* 25.3	54.4	2.2	90	
46 05	30 00	W.	290	26.5	366	9.0	*w* 30.8	8.2	52.0	1.1	90	
46 05	35 00	S.W.	208	14.8	238	3.4	15.4	*w* 21.0	60.2	1.7	59	
46 05	40 00	W.	208	25.0	260	9.1	7.0	*w* 25.0	58.9	1.2	82	
46 05	45 00	W.	208	22.6	253	6.0	19.0	20.0	55.0	1.5	67	
46 05	50 00	W.	208	12.6	234	6.0	*w* 6.0	3.0	85.0	0.0	36	
45 00	53 40 *d*	W.	170	10.0	187	0.0	*w* 25.0	0.0	75.0	8.3	13	
44 37	55 00	W.S.W.	61	13.9	148	4.7	*w* 12.3	8.4	74.6	0.9	108	
43 08	60 00	W.S.W.	234	8.9	255	0.9	*w* 16.9	8.9	73.3	5.3	118	
41 36	65 00 *d*	W.S.W.	239	17.3	280	4.2	*w* 18.2	14.1	63.5	4.1	126	
40 02	70 00	W.S.W.	245	17.2	286	4.1	*w* 18.8	12.8	64.3	1.4	200	
39 37	71 00	W.S.W.	65	19.4	77	5.7	15.2	14.4	64.7	2.0	457	
40 27	74 00 *d*	W. by N. ¾ N.	146	20.7	176	5.5	*w* 20.0	15.6	58.9	3.0	304	
			3086		3722							

Average sailing distance, from 5° W. by this route, 3,722 miles. The average per centum of adverse winds is equivalent to winds *dead ahead* for 636 miles. It will be observed that the most difficult part of this route is between longitude 10° and 30° W., where there are few calms, but a great prevalence of westerly winds.

Europe to New York.—APRIL.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			Direct.	Per cent.	True.	Head.	North.	South.	Fair.	Calms.		
49° 30′	5° 00′ to											
49 30	10 00	W.	195	9.0	213	5.5	*w* 11.0	5.5	78.0	5.6	19	From Channel.
49 30	15 00 *d*	W.	195	12.7	230	1.1	14.7	13.2	71.7	0.0	89	
50 40	10 00											
49 30	15 00	W. ¾ S.	205	21.0	248	7.5	17.1	18.2	57.2	4.0	85	
46 06	20 00	S.W.	289	9.8	317	9.8	*w* 18.0	13.2	49.0	7.5	86	
45 00	21 34	S.W.	93	11.9	104	2.5	*w* 14.3	11.7	71.5	5.9	125	
44 46	25 00	W. ½ W.	147	15.1	168	0.0	14.0	*w* 33.6	52.4	5.7	37	
45 00	30 00	W. ½ N.	147	16.2	171	6.0	7.5	*w* 13.0	73.5	4.5	70	
44 46	35 00	W. ½ S.	147	16.8	172	6.7	8.6	*w* 10.5	74.2	1.0	104	
44 46	40 00	W.	313	20.2	256	12.4	12.5	*w* 22.9	52.2	2.7	115	
44 46	45 00	W.	213	27.5	271	7.1	23.9	24.0	45.0	2.7	115	
44 46	50 00 *d*	W.	213	18.7	253	5.2	14.7	*w* 17.3	62.8	6.9	115	
43 16	55 00	W.S.W.	234	22.9	268	8.2	*w* 18.1	10.0	63.7	10.1	120	
41 43	60 00	W.S.W.	242	14.3	276	4.1	14.7	*w* 26.2	55.0	4.1	126	
41 43	65 00 *d*	W.	223	22.4	272	6.5	19.5	19.5	54.5	7.5	86	
40 27	70 00	W. ¾ S.	240	19.9	268	7.3	*w* 14.8	12.8	66.4	2.5	161	
40 27	74 00	W.	182	15.4	210	3.6	16.2	*w* 19.8	60.4	7.1	180	
			2973		3437							

Average sailing distance from 5° W., 3,437 miles; average per centum of adverse winds equivalent to winds *dead ahead* for 464 miles. Frequent calms in this month.

Europe to New York.—MAY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			Direct.	Per cent.	True.	Head	North.	South.	Fair.	Calms.		
Channel	to											
50° 50′	10° 00′	W. N. W.	209	7.8	225	2.8	11.2	2.8	83.2	5.5	38	
50 50	15 00	W.	191	17.6	226	5.5	18.7	11.5	64.3	1.1	96	
50 50	20 00	W.	191	13.2	216	4.4	5.5	15.4	74.7	6.7	95	
50 50	25 00	W.	191	8.2	206	0.0	12.0	9.6	78.4	0.0	42	
50 50	30 00	W.	191	20.5	228	9.6	6.4	12.8	71.2	3.2	32	
49 30	35 00*d*	W. S. W.	209	14.1	237	2.9	5.9	17.7	73.5	0.0	17	
46 08	40 00	S. W.	286	18.2	337	5.0	20.0	9.0	66.0	5.0	104	
44 41	45 00	W. S. W.	228	15.2	261	0.0	24.0	28.0	48.0	3.9	53	
44 41	50 00*d*	W.	213	21.3	258	7.0	9.8	23.2	60.0	4.8	195	
44 41	55 00	W.	213	22.3	260	7.2	13.7	22.2	56.9	3.9	160	
43 11	60 00	W. S. W.	234	18.0	276	3.1	15.8	21.3	59.8	3.0	170	
41 39	65 00	W. S. W.	239	21.7	282	7.2	17.1	11.0	64.7	3.9	189	
40 05	70 00	W. S. W.	245	27.2	310	10.6	17.1	13.0	59.3	7.3	281	
Port		W. ½ N.	184	10.0	202	2.5	10.8	14.5	72.2	4.0	235	
			3024		3524							From Channel.
			2815		3299							From Liverpool.

Aim to make a straight course from *d* to *d*.

Captain Oliver Eldridge, of the Liverpool packet ship, the Garrick—to whom I am indebted for much valuable information, and who is, moreover, a most zealous and efficient co-operator in collecting materials for these Charts—reports, on his last voyage from Liverpool, two deep-sea soundings. They were without bottom; but they are the first I have received from a merchant ship, and I quote them as well for their value as for the example which they afford to the industrious and intelligent navigator, as to what he may do in assisting men of science to solve this interesting problem, as to the depths of the sea. A line of deep-sea soundings hence to Europe would be of great value and interest. It is supposed that the depth of the sea in that quarter is not very great, and that, therefore, these soundings may be had without much trouble to those who may be disposed to undertake them.

The following is from the abstract log of the Garrick, on her voyage from Liverpool to New York, May and June, 1852:—

"30th May. Lat. 48° 5′ N.; long. 41° 39′ W. Temperature, 55°. Let 1,150 fathoms line run out without finding bottom.

"2d June. Lat. 45° 14′ N.; long. 46° 36′ W. Temperature, 48°. No soundings with 450 fathoms line, and a strong current setting S. E. by E."

His distance per log was 3,385 miles, being only 86 miles more than, according to the above route for May, he should have logged. This is but one of the many instances that I continually receive illustrative of the correctness of the routes recommended. Steer such courses, the tables say, you will meet on the average such and such winds; and the distance which you will have to sail, in order to accomplish your

voyage, will be so many thousand miles. The navigator does it, and, in some instances, the computed distance and the actual distance by the log, will be found, after a voyage of 4,000 or 5,000 miles, to differ only a few leagues. In this case of the Garrick, the difference, though comparatively large, is less than 30 marine leagues.

Europe to New York.—JUNE.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			Direct.	Per cent.	True.	Head.	North.	South.	Fair.	Calms.	
Channel	to										
48° 18′	10° 00′	W. S. W.	213	29.4	276	9.1	16.9	35.1		0.0	78
44 52	15 00	S. W.	292	12.1	327	1.7	21.0	9.3		8.4	129
41 13	20 00	S. W.	310	2.4	316	0.0	3.0	6.0		0.0	33
39 39	25 00	W. S. W.	247	14.2	281	4.0	18.0	11.4		0.0	51
39 39	30 00	W.	230	23.2	283	7.1	14.3	22.0	57.0	4.4	189
39 39	35 00	W.	230	12,5	259	0.0	12.0	20.0	68.0	5.6	200
39 39	40 00	W.	230	26.0	290	11.0	15.8	17.3	55.9	3.4	215
39 39	45 00	W.	230	18.2	272	5.0	8.0	24.5	62.5	3.4	213
39 39	50 00	W.	230	13.2	263	2.8	6.0	22.8	78.4	2.5	251
39 39	55 00	W.	230	22.3	281	7.2	10.0	22.3	65.5	4.1	281
41 13	60 00	W. S. W.	247	20.4	297	7.6	3.1	22.0	67.3	0.9	225
41 13	65 00	W	226	25.3	283	8.0	7.0	36.0	49.0	3.8	210
40 28	70 00	W. by S.	231	30.0	300	14.0	7.5	19.4	59.1	3.5	235
Port		W.	184	19.3	220	6.2	11.5	23.3	59.0	2.7	232
			3330		3948						

A tedious time of the year is the month of June to the homeward-bound.

Europe to New York.—JULY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			Direct.	Per cent.	True.	Head.	North.	South.	Fair.	Calms.		
49° 40′	5° 00′to											
48 18	10 00	W. S. W.	213	15.6	245	4.2	25.0	0.0	70.8	0.0	24	
48 18	15 00	W.	200	23.0	246	5.5	27.5	14.3	52.7	2.2	94	
44 50	20 00	S. W.	295	14.2	336	1.6	27.8	8.2	62.4	2.5	125	
44 50	25 00	W.	212	37.8	292	15.0	15.0	30.0	40.0	2.8	36	
44 50	30 00	W.	212	18.5	251	5.0	14.9	16.2	63.9	16.2	93	
44 50	35 00	W.	212	11.0	235	3.0	4.0	14.0	79.0	7.4	104	
44 50	40 00	W.	212	24.9	264	10.5	5.6	18.2	65.7	6.3	151	
44 50	45 00	W.	212	14.8	244	5.4	8.1	8.7	77.8	4.7	155	
44 50	50 00	W.	212	24.2	263	8.7	10.0	20.0	61.3	8.1	173	
43 20	55 00	W. S. W.	233	20.0	279	5.5	17.8	17.1	59.6	5.4	236	
41 48	60 00	W. S. W.	240	26.9	305	8.3	21.2	19.2	51.2	5.6	263	
40 14	65 00	W. S. W.	245	35.0	330	13.6	19.8	21.3	45.3	8.4	350	
40 14	70 00	W.	230	27.8	294	10.7	10.8	26.0	52.5	8.7	314	
Port	74 00	W.	183	29.9	237	11.2	7.7	35.9	45.2	4.2	322	
			3111		3821							From Channel.
			2950		3623							From Liverpool.

Europe to New York.—AUGUST.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
49° 40′	5° 00′to										
48 20	10 00	W. S. W.	210	19.0	250	5.6	11.2	16.8	66.4	0.0	36
44 55	15 00	S. W.	291	22.4	255	7.2	26.4	5.6	60.8	3.2	130
43 25	20 00	W. S. W.	234	14.9	269	6.2	12.4	0.0	81.4	6.2	17
41 54	25 00	W. S. W.	238	15.6	275	1.7	28.9	11.9	58.5	0.0	60
41 54	30 00	W.	223	16.8	260	5.8	11.6	11.6	71.0	2.9	35
41 54	35 00	W.	223	21.4	270	6.0	15.0	22.0	57.0	1.9	106
41 54	40 00	W.	223	18.6	264	4.8	12.0	20.8	62.4	4.7	133
41 54	45 00	W.	223	18.1	263	5.6	9.8	19.6	65.0	5.0	147
41 54	50 00	W.	223	16.3	259	7.8	4.2	7.2	80.8	3.7	166
40 20	55 00	W. S. W.	244	17.9	268	3.5	19.5	17.0	60.0	6.5	213
38 44	60 00	W. S. W.	250	22.7	306	6.6	12.6	20.4	64.4	7.9	164
40 20	65 00	W. N. W.	250	10.8	277	2.0	7.0	17.5	73.5	4.3	193
40 20	70 00	W.	229	19.0	272	7.5	9.6	16.2	66.7	6.3	336
40 20	74 00	W.	183	16.3	208	7.0	8.0	12.5	72.5	6.0	194
			3244		3696						

Europe to New York.—SEPTEMBER.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	North.	South.	Fair.	Calms.	
49° 30′	5° 00′to										
46 09	10 00	S. W.	284	3.0	292	0.0	10.0	0.0	90.0	0.0	20
45 00	11 38	S. W.	98	13.3	111	1.8	19.8	12.6	65.8	1.8	57
44 00	15 00	W. S. W.	155	3.6	160	0.0	0.0	18.0	82.0	0.0	17
44 00	20 00	W.	216	7.7	231	0.0	22.0	5.5	72.5	0.0	18
40 18	25 00 *d*	S. W.	314	6.2	333	0.0	7.7	7.7	84.6	7.7	14
40 18	30 00	W.	229	19.6	274	6.8	18.7	10.2	64.3	7.0	62
40 18	33 00	W.	143	6.8	152	1.3	8.8	7.5	83.4	} 8.7	87
39 42	35 00 *d*	W. S. W.	94	14.0	107	6.2	2.6	11.3	79.9		
39 42	40 00	W.	230	15.2	265	4.4	13.2	13.2	69.2	0.0	95
39 42	45 00	W.	330	14.2	263	3.2	8.0	20.8	68.0	7.7	139
39 42	50 00	W.	230	16.7	269	6.3	3.5	16.8	73.4	5.1	145
39 42	55 00	W.	230	13.9	262	5.6	6.3	10.5	77.6	3.6	144
40 39	58 00	W. N. W.	149	16.1	173	4.4	10.8	16.0	68.8	4.0	148
38 45	65 00 *d*	W. S. W.	349	14.0	398	3.5	10.5	16.1	69.9	3.4	154
40 20	70 00	W. N. W.	250	19.1	298	6.5	9.5	16.5	67.5	5.4	194
Port		W.	183	16.4	212	6.3	5.4	20.7	67.6	4.5	115
			3384		3800						

The routes to and fro, between Europe and the United States, do not require any written explanation. If the navigator will project them, and then consult these pages and the Pilot Chart, he will never be at a loss, as to his best course *on the average*. In projecting these tracks on his Chart, he will find them running sometimes inconveniently near the land or over shoals. Of course, he will not infer that he is recommended actually to stand over such places. The route of the tables being intended merely as a guide, from which the land, as well as the winds and currents, will sometimes turn him aside. Navigators who pursue these routes, will confer a favor by making a note of the fact in their abstracts, accompanied with an expression of their opinion as to the advantages of them; mentioning, also, whether they have had any longer or shorter passages than vessels sailing about the same time without the *Wind and Current Charts* on board.

I have already the pleasure to acknowledge my obligations to Captain Oliver Eldridge, of the Roscius, for such an act of kindness. Under date of May 21, 1850, he writes: "In reply to your inquiries as to my opinion in regard to the New Sailing Directions and Routes recommended by yourself, I would say, that as far as I have had opportunity of judging, I think they will be of great advantage, and in particular to that part of the commercial community who depend upon wind as a propelling power.

"On my last passage to Liverpool, I think it was lengthened some *two* or *three days* by not following more closely the directions recommended by you, in your No. for January, 1850; as a ship that left New York with us, kept in company, or nearly so, to the longitude of 25°. The wind then came out ahead; we stood on the southern tack, and she on the northern (as recommended by you). The wind afterwards came N. N. E.; she brought up to Cape Clear, and we 200 miles south of it."

Capt. Samuel Clark, of the James Wright, in a letter of May 9, 1853, says: "As an instance of their use [the Pilot Charts], after examining them in Liverpool, previous to the last passage to New Orleans, I made up my mind to take the northern route, *via* the Hole in the Wall, and the southern edge of the Banks of Newfoundland; and on stating my intention to several shipmasters of my acquaintance, they unanimously told me that I should miss it, and that they should take the trades for it. And although the most of them sailed from five to fifteen days before me, I arrived at New Orleans four or five days before the first of them, and, in several cases, ten to fifteen days. On the 3d of October, I dined in company with a New Orleans merchant, who was interested with my friends, in the shipment of cotton; and he asked me about what time he might expect me in New Orleans. I told him that I expected to be there on the 10th November, and by the abstract that I presented you, you will see that on that day I was at the mouth of the Mississippi. It was my intention to have gone to the northward and westward of Bermuda, but was prevented by light westerly winds, when I had expected easterly winds; still, you will see that the daily distances sum up under 5,000 miles, which is near 1,000 less than the common route, *via* the trade-winds and the south side of Cuba. You will see by the inclosed abstract, that I made the return passage to Liverpool in a little over 4,600 miles, which I think is about as short as a *cotton* loaded ship can well make it, as they have to make a free wind, of what a stiff heavy loaded ship would go by the wind. I have no abstract of my passage from Liverpool, as the weather on this passage has been so variable that I could not keep one to my satisfaction for want of observations."

So, also, Capt. Myrick of the Diadem, June, 1853:—

"I am firmly convinced of the utility of the Pilot Charts of Mr. Maury, in shortening passages across the Atlantic; and, had I not had one, should have probably prolonged the passage several days. In consulting the Chart for the prevailing winds for the month, I found that, from the Azores, the wind prevailed from the N. E. quarter to the longitude of 10° west, and then from W. N. W. to W. S. W. After leaving the Islands, we had to brace sharp up, and had strong breezes, bringing us to two reefed topsails; so that, in 12° west, we were to leeward of the Straits of Gibraltar; and, had I not had a chart on board relating to the winds, should have tacked to avoid falling upon the African coast. But, having firm conviction that a different wind would be found in 10° west, I kept on the port tack and eventually found my anticipations correct, the wind hauling to the westward and carrying us through the straits with a fair wind. I think every master should provide himself with the Charts, as he thereby has the experience of many in a condensed form; and has an opportunity of placing his vessel on the weather side and avoid falling to leeward."

Perhaps some navigators may have an opportunity to throw further light as to the green place or shoal to which the following extract from the log of the ship Diadem, Frederick Myrick, relates. She was bound from Mobile to Toulon, 1853.

"May 6. Lat. 37° 58′ N.; long. 69° 10′ W. Current, two knots per hour. Barometer, 29.70. Temperature, air, 66°; water, 72°. Winds: first part, S. S. W.; middle part, S. W.; latter, W. Strong gales with rain. A heavy bank of clouds to the north, passing eastward. Saw blackfish. I expect to be on a bank to-morrow, as I have always found green water and low temperature in longitude 65° W.

"May 7. Lat. 37° 45′ N.; long. 65° 30′ W. Current the same. Barometer, 29.60. Temperature, air, 60°; water, 59°. Winds: first and middle parts, W. N. W.; latter north. Fresh gales, with passing mist, showers, and lightning. Green water, kelp-weed, chips, feathers, blackfish, porpoises. Evidently a bank exists here, there being every indication of soundings. I think the shoalest part, from the appearance of the water on former voyages, is in lat. 38° 50; long. 65° W.; have always found the same indications in this longitude on repeated voyages."

And again, in the same ship, on her return to New York, Captain Myrick, in his abstract log, says:—

"Oct. 13, 1853. Lat. 39° 45′ N.; long. 65° 00′ W. Barometer, 30.00. Air, 58°; water, 58°. Winds: first part, W. N. W.; middle and latter parts, calm. Begins with fresh gales, inclining to moderate. 6 P. M. till meridian, light, variable airs, and calm, cloudy weather. Green water, full of bright eyes and sun squalls; some sprigs of gulf and rock-weed. Ends light airs from S. E., and pleasant weather. It is my opinion that we are on the north edge of a bank which I have found in this longitude; water colder farther south on former voyages.

"N. B. I am firmly of the opinion that there is a bank between the latitude of 39° 30′, and 37° 00′, and longitude 65° W., as I have always found the water much colder than the surrounding water. There appear

to be very irregular currents between 60° and 55° longitude; some to the westward and others to E. S. E. I think there must be some very irregular formations of the bottom in this vicinity, as the sea is always much agitated, streaks of very green water and blue.

Explanation of the Route Tables.

Columns 1, 2, and 3 (see Tables of Routes, pp. 395 to 405; also those of the route to Rio) explain themselves.

Column 4 gives the distance by middle latitude sailing, to be run on the course in column 3, when the winds are fair.

Column 5 shows the percentage by which the distance in column 4 is to be practically increased on the average, by adverse winds. The numbers in this column are obtained upon this principle: That, if a ship sail with the wind dead ahead, and within six points of it, she loses 62 miles in every hundred—that is, she has to sail 100 to make 38 miles good; when she sails within 4 points of her course, that is, when she has a *slant* wind, that will allow her to lay within 4 points of her course, she loses 29 miles only in 100; and when she sails within two points of her course, that is, when she has a *slant* wind 4 points from the course she wishes to steer, she then loses only 7.6 miles in 100. In other words, a vessel sailing 5 knots an hour, will get as far on her course in 5½ hours with a *slant* wind 4 points from her course, as she will, at the same rate, in 13 hours, with the wind *dead* ahead. According to the ratio here indicated, the 2 and 4 point *slant* winds, have been reduced to their equivalent as winds *dead* ahead, and this equivalent in distance is given in column 5.

Column 6 shows the distance in column 4, after the per cent. in column 5 has been added to it. It is the average distance to be sailed from point to point, not allowing for currents, and supposing the vessel to sail within 6 points of the wind when close hauled.

Column 7 shows the average percentage of winds that are *dead* ahead.

Column 8 shows the average percentage of *slant* winds from the northward or eastward that will head a vessel off the course given in column 3.

Column 9 shows the average percentage of *slants* from the southward or westward that will head a vessel off the course given in column 3.

Column 10 shows the average percentage of winds that are entirely fair for the course given in column 3.

Column 11 shows the average percentage of calms for each district of 5° square through which the course in column 3 leads.

Column 12 shows the number of observations from which the figures in the other columns, and the courses recommended, have been obtained.

When the winds are fair, and the vessel is near the route recommended, she should steer straight from *d* to *d*, instead of making a zigzag track, as by the projection.

The letter *w*, where it appears in column 8 or 9, means that that side is the windward side. But it is not necessary so to designate the windward side. It is obvious from mere inspection.

The letter *e*, in the column of calms, means that this part of the route is through the region of calms that border the northeast trade-winds, north and south, or that that part of the ocean is peculiarly liable to calms. (See *Trade-wind Chart.*)

The courses given are *true.*

It will be perceived by the tables that the average European passage in February, ought to be nearly two days shorter than it is either in January or March.

According to the Pilot Charts, I make the average distance to be sailed by a New York packet ship by the routes, from January to April, not estimating for the set of currents, to be, when bound—

To Liverpool.

In January	3075	miles	to	10° W.,	for 250	of which	a vessel	will have	winds dead ahead.
February	3015	"	"	"	234	"	"	"	"
March	3150	"	"	"	231	"	"	"	"
April	3051	"	"	"	244	"	"	"	"

To English Channel.

In January	3300	miles	to	5° W.,	for 293	of which	a vessel	will have	winds dead ahead.
February	3245	"	"	"	261	"	"	"	"
March	3448	"	"	"	249	"	"	"	"
April	3275	"	"	"	265	"	"	"	"

According to the log-books taken at random, both of packet ships and transient traders, I find the average time between these meridians and New York to be as per statement subjoined:—

When bound to Liverpool, average length of passage from New York to 10° W.			When bound from Liverpool, average length of passage from 10° W. to New York.			When bound to English Channel, average length of passage from New York to 5° W.			When bound from English Channel, average length of passage from 5° W. to New York.		
Month.	Days' passage.	Number of passages.	Month.	Days' passage.	Number of passages.	Month.	Days' passage.	Number of passages.	Month.	Days' passage.	Number of passages.
January	18	25	January	33	16	January	20	11	January	40	7
February	20	18	February	35	36	February	23	6	February	41	13
March	20	20	March	31	41	March	25	10	March	33	10
April	21	9	April	29	17	April	22	6	April	30	2

It is important that navigators should bear it in mind, that when the winds are fair, they are not expected to make the zigzag track of the Tables, but to steer straight from *d* to *d*.

New York to New Orleans.—Capt. Wm. C. Berry to Lieut. Maury—New York, Feb. 1, 1851.

Having had long experience in the trade between New York and New Orleans, I herewith furnish you with a few remarks on wind and currents. For the last six years I have commanded the ship Vicksburgh, constantly trading between these two ports. In making the passage out, after passing the Hole-in-the-Wall, I have frequently found a current from 1 to 3 miles per hour, setting to the eastward through the northwest channel of Providence, particularly after the wind has prevailed from the westward a few days. This, no doubt, has been the cause of putting a number of vessels on shore among the Berry Islands. I have latterly made it a point to take the last bearings of the light on the Hole-in-the-Wall, and either haul up or keep off as I found the current; generally running on a west course until quite down with Little Stirup Keys, then steering W. by N. ½ N., by compass, if in the night, until I was up with the Great Isaacs; the last three voyages, having reached the vicinity of the Little Isaacs in the daytime. I have hauled in on the bank between the western Little Isaacs and the east Brother Rock, and steered S. W. by W., by compass, which has brought me out in good passing distance from the Moselle Shoal. During one of my summer passages out, after passing the above shoal, I was compelled to anchor, and remained there for six days; the wind during all this time was light from the southward, and I could not help remarking the regularity of the current setting along the Bemini Islands, ebb and flow, about two miles per hour; this continues as far as Gun Key, when it is broken off by the Gulf which sets close into the Key. From this point up to Orange Key, when close in, little or no current is experienced except the ebb and flow, which is directly off the bank. In crossing the Santaren Channel, the current is governed greatly by the winds; with strong southerly winds the current sets about N. N. W., two miles per hour; on the other hand, with strong northerly winds, little or no current is felt. After leaving the Double-Headed-Shot Key, I have generally hauled over for the Florida Reef, and in the daytime kept close in, when I have frequently found an eddy-current setting to the westward from 1 to 1½ miles per hour. After passing the Tortugas, I have invariably felt a southerly current until I had reached the long. of 84° 30′ W., and even farther than this at times, as will be seen by referring to my journals, particularly in November, 1848. Returning from New Orleans, I have always made it a point to keep to the westward until I had reached the long. 85°, lat. 28°, before keeping off. My object in doing this is, that the wind here generally prevails from the northward and eastward, and that the current generally sets to southward and eastward, which greatly facilitates the passage. After rounding the Tortugas, with the wind from the eastward, I have generally beat down on the Florida side, knowing that the strongest current prevails on that shore, unless too close in. From Carrysfort Reef to Mantanilla, I have always endeavored to keep in the centre of the stream. During all my voyages, I have made it a rule to steer from Mantanilla to latitude 22°, N. by W., and then north to latitude 31°, before hauling up N. E. by N.; by so doing I have, with a few exceptions, kept the strongest current. On some other occasions, I have hauled up on a N. E. by N. course, when in latitude 30°, longitude 79° 40′, and have soon found myself on the eastern edge of the gulf. After rounding Cape Hatteras, it is advisable to keep to the westward, especially in the winter season, on account of the prevailing westerly winds.

Sailing Directions for the Coatzacoalcos River—Capt. Foster, of the Alabama, to Lieut. Maury.

Sailing vessels bound for the Coatzacoalcos ought to make the land to the eastward. This precaution is necessary on account of the prevailing trade-winds, which cause a strong westerly current; also in case of a norther, to have the advantage of sea-room. The entrance to the river may be known by the vigia or tower situated upon the western side; likewise from the sand cliffs extending from that point to the westward.

The best mark for crossing the bar is to bring the tower* to bear S. ¾ W. by compass. Having passed the bar, haul up to the east of south, and steer in midway between the two points that form the entrance to the river. The wind, after crossing the bar, often falls to calm; for this reason it is necessary to have an anchor ready to let go, as the current on the ebb, even in the dry season, sets out strong.

The extent of the bar, east and west, is about 220 fathoms, and the width, by actual measurement, 108 feet. The bottom, composed of sand and clay, is hard, on which account it is not liable to shift. It forms in hard northerly gales, a narrow barrier of breakers, and cannot be crossed without imminent risk. The depth at high water, on full and change, is about 13 feet, and falls as low as 10½ feet. The general depth, however, is 12 feet, from which it suddenly deepens to 5 or 6 fathoms.

Except in heavy weather, there prevails a regular land and sea breeze. The latter sets in between the hours of 9 A. M. and noon.

April, 1851.

Letters of Lieutenants Foote and Porter—Coast of Africa.

UNITED STATES BRIG PERRY,

St. Paul de Loanda, May 17, 1851.

SIR: In a letter addressed to the commander of any U. S. vessel who may come to the southern coast, I have inclosed a copy of notes drawn up by Lieutenant Porter, who has cruised on the southern coast of Africa, severally in the Marion, John Adams, and this vessel.

I transmit a copy of these notes (which fully accord with my own observations and experience), under the impression that they may be available in the Hydrographical Department.

I have the honor to be,

Very respectfully, your obedient servant,

ANDREW H. FOOTE,

Lieut. Commanding.

COMMODORE LEWIS WARRINGTON,

Chief of the Bureau Ordnance and Hydrography.

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* This tower, of great solidity, is destined to last for ages.

PASSAGE FROM THE CAPE DE VERDES TO THE S. W. COAST OF AFRICA, WITH REMARKS UPON THAT SECTION OF THE COAST.

Lieut. W. C. B. S. Porter, U. S. N., to Andrew H. Foote, Lieut. Commanding U. S. Brig Perry—LOANDA, *May* 17, 1851.

In the season of February, March, April, and May, there is no difficulty in making the passage from Porto Praya to Ambriz in thirty days, provided the run from Porto Praya to Monrovia takes not more than eight days.

The direct route, and that which approaches the great circle, leads along the coast, touching the outer soundings of St. Ann's Shoals, thence to Half-Cape Mount, to allow for a current when steering for Monrovia. From there, follow the coast along with the land and sea breezes, assisted by the current, until you arrive at Cape Palmas; keep upon the starboard tack, notwithstanding the wind may head you in shore (the land breezes will carry you off), and as the wind permits, haul up for 2° west longitude; cross the equator here, if convenient, but I would not recommend going to the westward of it; you will encounter westerly currents from thirty to fifty miles a day. In the vicinity of Prince's Island, the S. W. wind is always strong. In the latitude of about 1° 30′ N., there is a westerly current. Should it not be practicable to weather the Island of St. Thomas, stand on, approach the coast, and you will meet with north winds to carry you directly down the coast. Our Salem vessels make the passage from the United States in 56 days, arriving at Ambriz in May. I have made three different cruises to this coast in the same season, in the Marion, John Adams, and Perry.

The impulsive desire to attain the object of our duty will, as much in nautical matters as others, mislead our better judgment, when there is a prospect, or any temptation to success, without experience to forewarn us. Thus, our vessels, after arriving at Cape Palmas, have generally gone upon the port tack, because the wind carried them towards the coast or Gulf of Guinea, and seemed to favor them for the port tack the most; which, on the contrary, although slowly veering towards the S. E., was hauling more ahead, and leading them off into a current, which, under a heavy press, it is impossible to work against. The consequences were, they had to go upon the starboard tack, and retrace the ground gone over. On the starboard tack, as you proceed easterly, the action of the wind is the reverse, and it allows you to pursue the great circle course.

It employed the Marion eighty odd days to Kabenda, a port 200 miles nearer than Ambriz; to which port (Ambriz) from Monrovia, in this vessel (the Perry), we went in 23—making 31 from Porto Praya. In the John Adams, 10 to Monrovia, and 46 to Ambriz, by the way of Prince's Island; about 10 of which was lost working to the south of Cape Palmas. From Cape Palmas to the point of crossing the equator the current is easterly—south of that westerly.

The practice along the coast in this vessel (the Perry), was to keep near enough to the land to have the advantage of a land and sea breeze, and to drop a kedge whenever it fell calm, or we were unable to stem the current. Upon this part of the coast, near the Congo, the lead line does not always show the direction

of the current which affects the vessel. On the bottom, there is a current in an opposite direction from the surface; therefore, before dropping the kedge, the better way is to lower a boat and anchor her, which will show the drift of the vessel. Between Ambriz and the Congo, I have seen the undercurrent so strong to the S. E., as to carry a 24 pound lead off of the bottom, while the vessel was riding to a strong S. W. current; but the undercurrent is the strongest.

In crossing the Congo, I would always suggest crossing close to its mouth, night or day; going north with the wind W. N. W., steer N. N. E., with a five or six knot breeze, when you strike soundings on the other side you will have made about a N. ½ E. course in the distance of 9 miles, by log from 11½ fathoms off Shark Point. The current out of the river sets west about 2 knots the hour. With the land breeze it is equally convenient; and may be crossed in two hours. In coming from the north, with Kabenda bearing N. E., in 13 fathoms, or from the latitude of 5° 48′, wind S. W., a S. S. E. course will carry you over in four hours outside of Point Padron; and by keeping along shore, the current will assist you in going to the south. Vessels which cross to seaward from latitude of 5° 45′, and 9° W., are generally six days or more to Ambriz; by the former method it occupied us (the Perry) only two days.

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*General Remarks on the Passage from the United States to Ports beyond the Equator.**

It has now [January, 1854] been about seven years since I first proposed a new and shorter route hence to the equator, for all vessels, whether bound around the Cape of Good Hope, Cape Horn, to Rio, or to any of the ports of South America. The tracks of all such are the same until Cape St. Roque be cleared.

The W. H. D. C. Wright (Jackson) of Baltimore, was the first vessel to try the new route. In 24 days from Hampton Roads, she crossed the line in 31° W., and had a passage of 13 days thence to Rio. This was in February, 1848.

In May, she went out again, had 33 days to the line, which she crossed in 33° 41′ W. In 3 days after, she cleared St. Roque. On this passage, she was detained 6 days by calms between 8° 30′ and 5° N. But she had no difficulty, it will be observed, in weathering Cape St. Roque. This trip, it took her 11 days to clear the equatorial calms, which she found between 9° N. and 3° N.

In the spring of 1849, she went out again. She had 32 days to the line in 28°, after having been delayed 9 days by calms between 5° N. and the line; whence, in 3 days, she again cleared Cape St. Roque. The average, therefore, of Captain Jackson's passages to the line, by the new route, was 30 days, against 41 by the old route.

The Chicora, the Helena, and the Midas tried this route about the same time, and all with equal success; their average to the line being 26 days only.

These practical demonstrations of the advantages of the route which I had pointed out were not

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* Originally submitted in 1849.

wanting to satisfy me of their value, for I had consulted many thousand records as to the winds encountered in this part of the ocean by different vessels on different occasions. These records show the number of times on which the winds had been found to blow from each point of the compass in different parts of the ocean. And knowing the prevailing winds for each 5° square, the navigator could tell what course it was practicable for a vessel to steer through these squares, as well before as after the trial had actually been made.

For instance, in a certain square of 5°, I obtained the records of 700 vessels during the month of August in different years. Vessels, bound south by the old route, were in the habit of passing through this square, always aiming to make a S. S. W. or south course through it. And of these 700 records as to the wind, 600 gave the wind directly ahead for the south or S. S. W. course. To convince any one, then, who believes in the records examined, that a vessel in this part of the route to Rio would *generally* find the winds ahead, did not require that a vessel should be sent there actually to try it, for here was the experience of 700 vessels, 600 of which had found the winds adverse for a southerly course.

But certain navigators were not disposed to look upon my investigations in this light. Forgetting that they were the results of actual observations, these persons were disposed to consider those results, thus announced, as theories, or matters of opinion of my own; whereas, they are no more matters of opinion, than the fact that the trade-winds blow is a matter of opinion. They are nothing more nor less than the sum of the experience of some thousands of navigators, as to winds and calms.

The effect has been that, though many shipmasters have at once perceived the bearing of these results, and the correctness of the conclusions derived from them, and have readily adopted them; still, others have rejected them altogether, or only partially adopted them.

It has not unfrequently happened, as I perceive by the log-books returned to me, that occasionally a navigator will put to sea, and stand boldly out for the new route. But after awhile, the wind comes out ahead. He then gets frightened, abandons it, has a long passage, and lays the blame to the new route.

I have never claimed for any of these routes an exemption from liability to head winds. On the contrary, I expressly show that a vessel by any of the routes proposed by me is liable both to head winds and calms; and not only so, I have shown the chances of both against her.

I may here remark that I have never yet heard of a navigator complaining of the new route, and a long passage by it, but what, when his abstract log came to be examined, it did not appear that the fault was quite as much with him as with the route. For instance, I have drawn certain lines or tracks to show the route recommended. These lines are intended to show the route that vessels should take, not the *track* that they should make. Vessels taking such routes, should be guided by these lines as to the general direction which they ought to pursue. It was never intended that, with fair winds, they should make the zigzags of these lines. But some navigators have inferred that there was virtue in these lines themselves; that they must be followed as rigidly and as closely as though they marked out a channel-way, on either side of which if a vessel should fall, she would find herself in difficulty. Accordingly, abstracts that have

been returned to me, show frequent instances wherein vessels, after having been headed off from the projected track, have had the winds perfectly fair for pursuing their straight course onward; yet they have, nevertheless, proceeded to make a head wind of such, and to beat back out there on the open sea, for the purpose of getting back on the track projected.

Suppose that ship A makes an uncommonly quick run to a given port, and that she gives her track to B; B attempts it, but is headed off. Now B, from this new position, will not attempt to go out of his way to get actually in the wake made by A; but B will shape his course by that of A, and run by it; and consider that he is following it, when he is near it. This is what I wish vessels to do with regard to the routes that I have projected for them. Do not go out of your way to get on those tracks, but consider yourself, unless especially directed otherwise, to be in good position, according to the quantity of sea-room, when you are within one or two hundred miles of the projected track.

Therefore, when you are *near* the projected track, consider yourself in as good a position as though you were actually on it.

The greatest average by the old route is for July, which is 48 days; the most tedious month by the new route is August, which gives 41 days as the average.

When a vessel finds herself pinched for room, she should never hesitate to pass inside of Fernando de Noronha; and vessels bound around the Cape of Good Hope, will find it to their convenience to cross the equator somewhat further to the east than they would if bound to South America or around the "Horn."

The most pertinent question for the navigator to ask, with regard to the route hence to the southern hemisphere, is not, "Where shall I cross the equator?" but, "Where shall I lose the N. E., and where get the S. E. trades?"

Hence, it will be observed that, by following these *Sailing Directions*, vessels will occasionally be compelled to go as far east as longitude 25° W.; but this is north of the equator, and in those regions and months when and where the N. E. trades usually fail.

I have given, in former editions, and here repeat, with all their mistakes, the passages of 89 vessels that have attempted the new route; and of 73, also taken at random, that have gone by the old route. The result showed, then, that the routes which I have proposed, and which were followed by these 89 vessels—many of them doubtingly—had reduced the average sailing distance from the ports of the United States to the equator, as much as two weeks for some months; 10 days as the average for the winter and spring, and one week as the average the year round.

The average passage to the line the year round was, according to these tables, by the old route, 41 days, by the new 34;* thus exhibiting a saving of about 17 per cent. of the usual time under canvas hence to the equator; which saving was among the first fruits of the *Wind and Current Charts*, and of that system

* This was written and published several years ago. Since that time navigators have learned to follow the new route better. Twenty days is now not an uncommon passage from New York to the line, and some of the new ships talk of making it in 16. It has been made in 18.

of investigation, with regard to the winds and currents of the ocean, that the patriotism, intelligence, and public spirit of American ship-owners and masters have enabled me to pursue with such signal advantage to the commerce of the country.

Since the first publication of the *Wind and Current Charts*, the materials for improving them have increased with great rapidity. These materials have been so discussed and arranged, by the officers at the Observatory, that, with the aid of the Pilot Charts, the navigator may now calculate and project the path of his ship on an intended voyage, very much in the same way that the astronomer determines the path of a comet through the heavens. There is this difference, however: the Chart with its data shows the navigator that, in pursuing his path on the ocean, head winds and calms are to be encountered, which will turn him aside, or retard him on his way; and that, therefore, he cannot predict with certainty the place of his ship on a given day. He therefore, in calculating his path through the ocean, has to go into the doctrine of chances, and to determine thereby the degree of probability as to the frequency and extent with which he may anticipate adverse winds and calms by the way.

Thus, in the 5 degrees square of the ocean, between latitude 35° and 40° N., longitude 70° and 75° W., the log-books of 4,387 vessels, or the records of vessels for 4,387 days in this square, have been examined; 323 of which were there in the month of February of different years.

Now, supposing (and there is no reason to suppose otherwise) that these observations give a fair average as to the prevalence of calms, and the direction of the winds; we are led to the conclusion that, if one of these vessels had attempted to sail through this square one hundred times on an E. S. E. course, in the month of February, for a series of years, she would have had 6.2 calms, fair winds 85.5, and 1.3 wind *dead ahead*, or at E. S. E.; that she would have been headed off on the larboad tack, or by "slant" winds from the northward and eastward, 7.3 times; and on the starboard tack, or by "slant" winds from the southward, 5.9 times.

From this, the navigator will see, also, that, along this part of the February route, the northern side is rather the windward side; and that, therefore, when winds are *free*, it is better to keep along this part of the route, somewhat to the north of the projected line.

After crossing latitude 20° N., longitude 40° W., he will likewise see that he is there still liable to be headed off by winds from the northward and eastward; and that, consequently, when the wind comes out *dead* ahead, he should stand off on the starboard tack; and that, when the winds are fair, he should keep the projected track to the southward and westward of him, say generally 40 or 50 miles.

He is recommended to steer straight from *d* to *d* when the winds are fair; and when he gets thrown off his course, instead of getting out of his way to get back to the projected track, he should be guided by the Pilot Chart, and run parallel to this track, or otherwise, according to the Pilot Chart.

Similar tables, with complete sailing directions, are in the course of preparation for every month, and all the principal routes across the ocean.

These present tables from that publication are given for the information especially of those navigators who are bound on voyages beyond the equator.

Those who desire to try these routes, should project the route for the month on the Chart as far as the equator; arrived there, let a line be drawn from the point of *actual* crossing to Cape St. Augustine; and then aim to keep this line under the *lee*, so as to have it at least 20 or 30 miles to the westward when the ship crosses the parallel of 6° or 7° south.

After that, the winds haul more to the eastward, and there will be no difficulty in laying up S. S. W., or even as high as south.

If the ship be headed off to the west of her course or to the west of said line to St. Augustine, she should take advantage of the first "slant," tack, stand east, and make short and long legs until she can clear the land.

This part of the route is the turning-point of the passage. By studying the Charts as well as the tables, navigators will see, that, with attention and management between the equator and 6° south, they will have little or no difficulty in making either a S. S. W. course good on one tack, or an east course on the other; and when they find it necessary to stand to the eastward, they should never stand farther, unless they can make southing also, than to bring, 20 or 30 miles to the leeward of them, a straight line, drawn from 31° on the equator, just so as to clear the land about Cape St. Augustine. In this part of the route, more than in all others, the navigator should study the *slants*, and take advantage of all of them.

I recommend these routes, it should be understood, only to vessels which can sail within six points of the wind. I would not advise any vessel that cannot do this, to attempt them, for she will be apt to fall to leeward, and then she will find it difficult and tedious to get up again.

There are other parts of the routes in which it is also necessary to study the "slants." For instance: take that part of the February route which lies between the parallels of 20° and 15° N. It will be observed that though but one of the 25 observations from which this part of the route is determined, gives the wind *directly ahead*, yet that 8 per cent. of them are "slant" winds from the eastward, which will prevent a vessel 8 times in 100 from lying S. S. E., the course prescribed.

After crossing 15° it will be seen that the navigator will have, if the observations consulted give a fair average as to the direction of the wind, neither head-winds nor "slants," until he gets 5° N. Thence to the equator he is liable to be headed off to the westward 14.7 times in 100. He should, therefore, in this month aim, if the winds allow, to keep this part of the route under the lee, so as to cross 5° N. to the east of 31°.

By *slants*, I mean winds that, though not *dead* ahead, will, nevertheless, head a ship off her course; thus, for a vessel that wishes to head E., a wind at N. N. E. or N. E. would be what here is called a *slant* wind.

The route for each month is computed according to the doctrine of chances; the number of observations from which each part of the route is calculated is stated in the last column, "Total number of observations."

It will, therefore, be perceived that some parts of each route are entitled to more weight than others.

Thus, the percentage of fair and adverse winds for the first course on the December track is derived from 364 observations, whereas that for the fifth course is derived from only 26. All will admit that 364 give a better average than do only 26 observations.

It must be further presumed and admitted that vessels may expect, in following any one of these routes, *sometimes* to encounter head-winds and calms, and have long passages.

But, taking the average length of passage by these routes, the data of the Charts lead us to the conclusion that a fair sailer, under good management, will run in December from 31 to 36 days from the Atlantic ports to the equator; in January, from 30 to 35 days; and in February and March, from 19 to 27 days, against 41 days by the old or usual route.

Navigators who are disposed to try these routes should have the Pilot Charts on board; which Pilot Charts will be furnished to them on application, either at the National Observatory at Washington, or to George Manning, No. 142, Pearl Street, New York; provided the applicant will agree to furnish this office an abstract of his log according to the form with which he will also be gratuitously supplied, and which form may be found in another part of these directions.

Vessels from other ports of the United States, besides New York, are recommended to make the best of their way to the track from New York. They should generally be governed by the winds they happen to meet as to where they will intercept this track. If vessels from southern ports aim to intercept it to the S. of 33° N., they will be liable to encounter the calms of the Horse Latitudes.

NATIONAL OBSERVATORY, *Washington, December* 14, 1849.

In the above, the first edition of the Pilot Charts is referred to for illustration. The second edition, which is now (Jan. 1854) out, contains more observations for this part of the route.

In coming out, especially from New York and Boston, with *fair winds*, the navigator who is bound into the southern hemisphere will do well, as long as the winds are fair, to stand east, and not to attempt to make any longitude until he reaches the meridian of 65° or 60° west. This should be done only when the winds are fresh and fair.

BEST AVERAGE ROUTES FROM NEW YORK TO RIO, AND PORTS BEYOND THE EQUATOR.

New York to Rio.—DECEMBER.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From 40° 27′N.	74° 00′to										
39 12	70 00	E. S. E.	200	7.0	214	2.1	7.2	4.5	86.2	3.0	364
39 12	65 00 *d*	E.	233	6.4	248	2.0	5.0	7.0	86.0	1.5	195
35 12	60 00	S. E.	338	7.2	363	0.8	8.8	8.8	81.6	0.8	119
35 00	59 24	E. S. E.	31	10.9	34	4.0	7.0	7.0	82.0	1.0	100
33 29	55 00	E. S. E.	237	6.4	252	4.0	0.0	0.0	96.0	0.0	26
33 29	50 00 *d*	E.	350	3.7	259	0.0	0.0	*w* 9.2	90.8	0.0	44
31 44	45 00 *d*	E. S. E.	275	9.3	300	3.9	7.8	6.5	81.8	7.5 *e*	75
30 00	43 00	S. E.	147	24.8	183	6.4	16.8	*w* 26.4	50.4	2.4	121
25 00	43 00	S.	300	9.6	329	2.0	12.0	12.0	74.0	6.0	48
22 16	40 00	S. E.	232	9.0	253	3.4	*w* 13.6	0.0	83.0	3.4	29
20 00	37 34 *d*	S. E.	192	7.5	206	0.0	*w* 19.5	6.5	74.0	1.3	79
15 00	35 24	S. S. E.	325	4.3	339	0.0	*w* 7.2	4.8	88.0	2.4	42
14 37	35 00 *d*	S. E.	33	22.9	41	11.1	*w* 14.8	0.0	74.1	0.0	27
10 00	35 00	S.	277	1.4	231	0.0	*w* 6.0	0.0	87.0	0.0	25
5 00	30 00 *d*	S. E.	424	13.1	479	2.0	*w* 26.0	14.0	58.0	10.7 *e*	50
Equator	32 04	S. S. W.	324	3.0	334	1.4	4.2	0.0	94.4	4.0	71

Shortest distance to the equator by this route, 3,918 miles; average distance to be sailed, on account of adverse winds, 4,115. Ship Bothnia, Captain Avery, in December, 1850, accomplished it in 29 days, and 4,077 miles per log.

It is only about in the proportion of 1 to 2 that a vessel in this part of the ocean can make a S. E. course between the parallels of 10° to 5° N. Therefore, vessels going the December route should generally aim to cross 10° N. to the east of 35° W.

These tables have been before navigators for several years; ships are now found consulting them daily, and shaping their course by them. With the view of affording practicable examples as to the speed of vessels that have tried this route, I quote tracks from logs of such vessels, taken at random.

December Tracks.

Clipper Ship Contest, from New York, bound to San Francisco, fifteen days out.

Dec. 2, 1852. Lat. 20° 44′ N.; long. 36° 30′ W. Winds: South, South, S. S. W.* This day comes in with squally weather and rain; middle part, wind all about the compass in squalls, with heavy rain; latter part, light.

Dec. 3. Lat. 19° 52′ N.; long. 35° 32′ W. All this 24 hours, light airs, variable from S. S. W. to S. S. E., with more unsettled weather; ends calm.

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* In these extracts, the winds are quoted three times (first, middle, and latter part) for each day.

Dec. 4. Lat. 19° 01′ N.; long. 36° 31′ W. Throughout these 24 hours, light, baffling airs, from south, S. S. E., and west, to a calm.

Dec. 5. Lat. 17° 24′ N.; long. 36° 39′ W. Winds: S. S. E., S. E., E. S. E. Light winds, and pleasant, trade-like weather.

Dec. 6. Lat. 14° 22′ N.; long. 35° 26′ W. Commences with fine, settled, pleasant weather, with moderate trades from E. by S. to E. by N. I do not like my being so far to the west; feel as though I shall be bothered to fetch by the cape; but I shall go boldly on, and do the best to make a run.

Dec. 7. Lat. 10° 35′ N.; long. not observed. Comes in light from E. by S. to east, and pleasant; middle, brisk from E. by N.; latter, moderate.

Dec. 8. Lat. 8° 30′ N.; long. 31° 34′ W. Winds: E. by N., E. by N., S. E. Begins with pleasant trades, with fine weather; middle part, fresh and cloudy, with a swell from S. E.; latter, squally, with calms between squalls.

Dec. 9. No observations. Winds: E. S. E., E. N. E., east. First part, squally with rain; middle, brisk; ends, next to a calm. Up to this time it has rained every day but four since leaving port.

Dec. 10. Lat. 5° 01′ N.; long. 29° 30′ W. Winds: calm, east, S. S. E.; first part, calm; middle and latter, light, with rain squalls.

Dec. 11. Lat. 4° 03′ N.; long. 30° 00′ W. Winds: calm, calm, east. First and middle parts, calm, and constant rain; latter, light breezes, with rain squalls. The weather very sultry and hot, as much so as I ever experienced.

Dec. 12. Lat. 1° 52′ N.; long. 30° 17′ W. Winds: S. E. First part, light and rainy; middle, squally, with rain, and very baffling; latter, moderate and pleasant. Current, 12 miles S. E.

Dec. 13. Lat. 0° 26′ S.; long. 31° 06′ W. Winds: S. E., S. E. by E. First part, light airs; middle, baffling; latter, fine, settled, trade-like weather. Crossed the equator in 27 days; think I have done well, for the chance that I have had for making a passage.

Dec. 14. Lat. 3° 37′ S.; long. 32° 07′ W. All this day brisk trades from S. E. by E., to S. E. by S. Close-hauled.

Dec. 15. Lat. 6° 56′ S.; long. 32° 50′ W. Winds: S. E., S. E. by E. Moderate. Middle and latter parts, brisk.

Dec. 16. Lat. 10° 26′ S.; long. 34° 15′ W. Winds: S. E. by E., and E. S. E. First part, brisk trades; middle and latter, moderate and pleasant.

Captain Whitmore to Lieut. Maury.

SAN FRANCISCO, *March* 26, 1853.

SIR: Inclosed is an abstract of the ship Tingqua, from New York to this port, which I forward according to your request. I have, on this passage, followed your directions as near as possible, and have no reason to regret it. Was unfortunate on this side of the line; but, on inquiry, I do not think my crossing could have been better. On comparison of logs with other ships, I find I gained considerable by

being in shore from the River La Platte to Cape Horn. A ship arrived here last evening from Boston, had 64 days to the line, which she crossed in 26° longitude; and a number have come under my observation in this passage, who were in the same difficulty. The clipper ship Alboni sailed some days previous; the Living Age, Tuscany, and Sacramento sailed in company with me, and have not yet arrived. I leave this port for Hong Kong on the 29th inst., and during the passage shall make all the observations practicable.

Ship Tingqua (S. D. Whitmore), New York to San Francisco. Nine days out:—

Dec. 3, 1852. Lat. 28° 23′ N.; long. 42° 10′ W. Barometer, 29.90; temperature of air, 74°; of water, 75°. Winds, throughout, N. N. E.; fresh breezes, and fine weather. All sail set. Barometer rising, and every appearance of trade-winds, although I do not expect them yet; if so, I am afraid we shall have them light, and far to the southward.

Dec. 4. Lat. 24° 36′; long. 40° 00′. Barometer, 30.00; temperature of air, 78°; of water, 76°. Winds, throughout, from N. E.; moderate breezes, steady, with light squalls of rain. Barometer, steady. Sure of the trades. Here is where I ought to have struck my line from Sandy Hook, but was anxious to get to the eastward.

Dec. 5. Lat. 22° 16′ N.; long. 39° 19′ W. Barometer, 29.95; temperature of air, 78°; of water, 76°. Winds: first part, N. N. E; middle part, E. N. E.; latter part, E. S. E. Commences light, baffling breezes, and fine weather; throughout the night, light, baffling airs.

Dec. 6. Lat. 19° 23′; long. 39° 27′. Barometer, 30.00; temperature of air and water, each 79°. Winds: first part, E. S. E.; middle part, S. E.; latter part, S. S. E.; light airs and baffling, with light squalls of rain. A heavy squall from N.; am afraid it is going to be as I conjectured, very light trades—wrong time of the moon. This time last year, I had double reef breezes from E. N. E.

Dec. 7. Lat. 16° 17′; long. 38° 47′. Barometer, 29.90; temperature of air, 79°; of water, 79°. Winds: first part, S. E.; middle part, S. E.; latter part, S. E. by S. Light breeze, and fine weather. I wish I was 3° farther east; however, I will keep on, and trust to Maury.

Dec. 8. Lat. 13° 7′; long. 36° 45′. Barometer, 29.90; temperature of air and water, 79°. Winds: during the first and middle part, E. S. E.; latter part, E. by S. Strong breeze, and a heavy head sea. Rigging much slackened; obliged to tack to the northward two hours to get a pull of the weather rigging. Two weeks out; distance sailed, 2,666 miles.

Dec. 9. Lat. 11° 25′; long. 36° 00′. Barometer, 29.85; temperature of air, 79°; of water, 80°. Winds: during the first and middle part, E. by S.; latter part, E. Strong breeze, and dark cloudy weather; glass falling; heavy head sea; all sail set.

Dec. 10. Lat. 9° 9′; long. 33° 50′. Barometer, 29.80; temperature of air, 78°; of water, 79. Winds: first part, E. N. E.; middle part, E. by N.; latter part, E. S. E. Strong breeze, and dark squally weather, as I believe is always the case in this parallel. Winds inclining to the northward. Barometer still falling; latter part wind heading; heavy squall from the S. S. E.; fear these trades are done; have recovered Maury's track.

Dec. 11. Lat. 7° 5′ N.; long. 32° 30′ W. Current, ½ knot, W. Barometer, 29.80; temperature of

air, 79°; of water, 80°. Winds: first part, S. E.; middle and latter part, E. Commences with hard squalls from the S. and E., and much rain. Wind heading me to S. W. by S.; headed me the same the last time I crossed the parallel—in March, 1850—being advised of it by Maury, and of course expected it, am not to be discouraged yet. Latter part, winds more easterly; heavy head sea, and dark cloudy weather.

Dec. 12. Lat. 5° 3′ N.; long. 31° 20′ W. Current per hour, 1 knot, W. Barometer, 29.85; temperature of air, 80°; of water, 79½°. Winds: first part, S. E. by E.; middle part, E. S. E.; latter part, baffling. Commences with strong breezes from the east, and cloudy weather; hove to two hours, setting up rigging. Through the night, light baffling winds, and squally, with much rain; all sail set; ends strong breezes.

Dec. 13. Lat. 2° 30′ N.; long. 31° 10′ W. Current, ½ knot, W. N. W. Barometer, 29.90; temperature of air, 80°; of water, 79°. Winds: during first and middle part, E. S. E.; latter part, S. E. Fresh breezes and firm weather. I do not know whether to call them S. E. trades or not; if so, I have had them since leaving 20° N.; weather more settled; made a sail hood on the weather bow. At 8 P. M. spoke the brig Brandywine, 26 days out from Philadelphia, bound to Pernambuco; reports light easterly winds; of course he was to the east, and had no difficulty in clearing the cape, as he crosses in this parallel every three months.

Dec. 14. Lat .00° 5′ S.; long. 32° 5′ W. Current, ½ W. N. W. Barometer, 29.95; temperature of air, 80°; of water, 79°. Winds: during the first and middle part, E. S. E.; latter part, S. E. Strong beeezes, and fine weather. I considered my passage thus far extra, and I consider myself far enough to the eastward to be safe, in order to clear the cape (19 days and 19 hours). I can see where I have lost *one* day in this passage, by not bracing sooner, and keeping to the eastward, in order to cross 20° N., according to Maury's direction; but supposing the wind would favor me, if I kept on with the wind free until I crossed the latitude of 15° N., I was obliged, as the wind still hung to the eastward, to brace up sharp, to make my mark, and have been so for the last eight days, and making a zigzag track. However, I was determined not to tack until the land compelled me, or as long as she would head S. S. W. good full.

Dec. 15. Lat. 1° 20′ S.; long. 33° 00′ W. Current per hour, ½ knot, N. Barometer, 30.00; temperature of air, 80°; of water, 79°. Winds: first part, S. E. by E.; middle part, S. E.; latter part, S. E. Light breezes and fine weather; wind hanging steady for S. E., and every appearance of continuing so.

Dec. 16. Lat. 3° 24′ S.; long. 34° 00′ W. Barometer, 29.95; temperature of air, 80°; of water, 79°. Winds: during first and latter part, S. E.; middle part, S. E. by E. Light and steady winds, and fine weather. I have been looking for a strong current, but experience none of any consequence.

Dec. 17. Lat. 6° 17′ S.; long. 34° 34′ W. Barometer, 29.90; temperature of air, 80°; of water, 79°. Winds: during first and middle part, E. S. E.; latter part, S. E. by E. Moderate breeze from the E. S. E. through the night; wind seems to favor us a point; no prospect of weathering "Roccas"; fortunately, there is water enough to the leeward of it; for the Tingqua shall proceed—cannot think of tacking so long as there is room to wear—in hopes the wind will favor us through the night as heretofore. Latter part, fine weather—to the southward of "Roccas"; judged we passed about 9 miles to the west of it, but did not see it; ship heading up S. ½ W. during the night. At noon, saw the land; about Point Natal and

Point Anger, cannot weather it. I believe I will stand off a few hours, in order to take advantage of the breeze through the night.

Dec. 18. Lat. 7° 48′ S.; long. 34° 40′ W. Barometer, 29.90; temperature of air, 82°; of water, 79°. Winds: during first part, S. E.; middle and latter part, E. S. E. Light breezes, and pleasant; stood off shore until 10 P. M.; wind still continuing steady from the S. E.; appearance of a change to the eastward. Tacked in shore, wind dying away; at 11 P. M. wind from the E. S. E., in a squall. Continued blowing fresh throughout the day. At noon, passed in sight of Olinda; and now I consider myself clear of all dangers, with a good leading breeze, and all the *kites* out. 24 days out, and clear of Cape St. Augustine.

Dec. 19. Lat. 9° 55′ N.; long. 34° 45′ W. Barometer, 29.95; temperature of air, 82°; of water, 80°. Winds from the E. S. E. during the 24 hours; with moderate breezes, and fine weather; under all sail; sea very smooth. I do not suppose there is one instance out of a hundred, where the wind has held so steady from the S. E., as in this one—which shows the worst side of Maury's Track—which, I think, I have given a little more than a fair trial—that is, exceeded his limits somewhat; however, I have found no difficulty, and would try the same track again. I found no current of any consequence south of the line, and the wind bearing to the eastward at night, has helped me amazingly. Since leaving 5° N. the wind has held S. E. steady, which would carry me on to Cape St. Roque; and I stood on, still in hopes of a change, until, by help of winds veering by night, and a short tack, I weathered and passed about ten miles east of Olinda. 24 days out, without any trouble whatever, except what was borrowed.

Dec. 20. Lat. 12° 10′ S.; long. 35° 00′ W. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: during first and middle parts, E.; latter part, E. N. E. Commenced with light winds, and fine weather. At 3 P. M. made two sails ahead from the top-gallant yard; at 5 P. M. saw them from the deck, a ship and a barque. Ship steering S. S. E.; barque, the same course as ourselves. At 7 P. M. spoke the barque, which proved to be the Francis F. Jenness, of Portland, from Philadelphia, bound to San Francisco. 84 days out; did not understand the longitude in which she crossed the line, but she was 33 days between 10° N. and the line; suppose, of course, he must have been to the eastward. If there is any virtue in Maury's Charts, I think I have had the benefit of them. This ship left Philadelphia 4 days before the Tingqua was launched at Portsmouth. I do not know whether this is a comparison or not between the new and old route; if so, the advantage is decidedly in favor of the new one.

Dec. 21. Lat. 15° 07′ S.; long. 35° 00′ W. Barometer, 30.00. Winds: during first and middle part, E.; latter part, E. N. E. Commenced with light breeze; saw a number of vessels to the northward. At 6 P. M. wind dying away; at sunrise, saw a large ship to windwind, steering S. S. W.; appeared as if her foretopmast was gone; wind inclining to the N.; clouds rising from the N. E.

Dec. 22. Lat. 17° 37′ S.; long. 36° 10′ W. Current, per hour, ½ knot, S. W. Barometer, 30.00; temperature of air, 82°; of water, 80. Winds: during first part, E. S. E.; middle, E. N. E.; and latter part, N. E. First part, light and baffling winds; latter part, fresh breeze, and cloudy.

Dec. 23. Lat. 20° 50′ S.; long. 37° 20′ W. Current, per hour, 1 knot, S. W. Barometer, 29.90; temperature of air, 80°; of water, 78°. Winds: during the first and latter part, N. E.; middle part, N. N.

E. Commences and continues during the night with moderate breezes and squalls, with much rain. Ends squally; wind veering two points in the squall, owing, I suppose, to the Abrolhos Bank, although there is no change in the barometer or thermometer. Ends with strong breeze.

Dec. 24. Lat. 23° 51′ S.; long. 41° 00′ W. Current, per hour, *one* knot, S. W. Barometer, 29.90; temperature of air, 80°; of water, 78°. Winds: during first and latter part, N. E.; middle part, N. N. E. Light winds and pleasant; all sail set; saw two fishing-boats. Ends cloudy; 30 days out, and to the southward of Rio, and only one degree to the eastward of it.

Ship Alboni (N. R. Littlefield), New York to San Francisco, fourteen days out.

Dec. 6, 1852. Lat. 21° 43′ N.; long. 37° 50′ W. Temperature of air, 78°; of water, 79°. Winds: N. E. baffling, E.S.E. First part, light; middle very light; latter, pleasant breezes.

Dec. 7. Lat. 19° N.; long. 37° 50′ W. Barometer, 29.50; temperature of air, 80°; of water, 79°. Winds: S. E., E., E.S.E.; first and middle parts, fresh and squally; latter, pleasant.

Dec. 8. Lat. 16° 20′ N.; long. 37° 58′ W. Current, 64 miles E.; temperature of air, 80°; of water, 85°. Winds: E. N. E.; fresh gales and squally. Rainbows, sundogs, wind gulls(?)—everything to make it unpleasant. I have never found such a current hereabout. I have crossed this latitude some forty or fifty times. I have often, in long. 40° near the equator, found similar currents.

Dec. 9. Lat. 14° 30′ N.; long. 34° W. Current, 1.4 miles per hour E.; temperature of air, 79°; of water, 79°. Winds: E. S. E., E. S. E., E.; fresh gales and squally. Tide rips.

Dec. 10. Lat. 12° 24′ N.; long. 33° 10′ W. Current, 0.6 miles per hour E.; temperature of air, 79°; of water, 80°. Winds: E., fresh and unpleasant, very heavy sea from S. E.

Dec. 11. Lat. 10° 18′ N.; long. 32° 15′ W. Temperature of air, 80°; of water, 80°. Winds: E. S. E., E., E.; fresh and squally. Tide rips; found no current.

Dec. 12. Lat. 7° 33′ N.; long. 31° 58′ W. Temperature of air, 80°; of water, 81°. Winds: E.; fresh and squally.

Dec. 13. Lat. 5° 16′ N.; long. 31° 38′ W. Temperature of air, 82°; of water, 81°. Winds: E. S. E. and baffling; first part fresh and pleasant, middle and latter, squally.

Dec. 14. Lat. 3° 28′ N.; long. 32° 10′ W. Temperature of air, 81°; of water, 81°. Winds: S. S. E. and baffling; light and squally.

Dec. 15. Lat. 3° N.; long. 32° W. Temperature of air, 80°; of water, 80. Calm throughout. This day calm; with rain, thunder, and lightning.

Dec. 16. Lat. 1° 54′ N.; long. 32° 10′ W. Temperature of air, 79°; of water, 79°. Winds: calm, S. E., S. E. First part calm, with thick fog; middle and latter, light breezes.

Dec. 17. Lat. 0° 27′ S.; long. 32° 25′ W. Temperature of air, 80°; of water, 80. Winds: S. E., light and pleasant.

Dec. 18. Lat. 3° 03′ S.; long. 32° 38′ W. Temperature of air, 80°; of water, 80. Winds: S. E. by E. S. E., S. E. All this day, light and pleasant.

Dec. 19. Lat. 5° 43′ S.; long. 32° 38′ W. Temperature of air, 80°; of water, 80. Winds: S. E. by E., S. E., S. E. Light and pleasant.

Dec. 20. Lat. 8° 43′ S.; long. 33° 58′ W. Temperature of air, 80°; of water, 80. Winds: S. E. This day pleasant; I found not the least difficulty in clearing the land.

Jan. 15, 1853. Lat. 50° 11′ S.; long. 64° 10′ W. Temperature of air, 48°; of water 48°. Winds: south, calm, west. First part light; latter part with rain; saw patches of kelp.

Jan. 16. Lat. 52° 21′ S.; long. 63° 50′ W. Temperature of air, 46°; water 48°. Winds: S. W. by W., S. S. W., S. W. First part, fresh; middle, fresh gales; latter, fresh breezes and pleasant. Large schools of whales, two or three hundred or more.

Jan. 17. Lat. 52° 40′ S.; long. 64° 12′ W. Temperature of air, 47°; water 46°. Winds: S. S. W., west, calm. First part light; middle very light, with rain squalls. The next passage I make to Cape Horn, I will, if possible, keep much nearer the land. If I had been two degrees nearer the land, I have no doubt but what I should have shortened my passage at least five days.

Ship Samuel Russell (J. Limeburner), 19 days to the line from New York, ten days out.

Dec. 15, 1851. Lat. 19° 1′ N.; long. 43° 29′ W. Wind: E. S. E., fine and pleasant.

Dec. 16. Lat. 16° 13′ N.; long. 42° 2′ W. Winds: E., E. N. E.; baffling winds and squally weather.

Dec. 17. Lat. 13° 47′ N.; long. 39° 48′ W. Wind: E. S. E., strong breezes.

Dec. 18. Lat 11° 36′ N.; long. 37° 25′ W. Wind: E. N. E.; strong breezes and rainy.

Dec. 19. Lat. 8° 59′ N.; long. 34° 47′ W. Wind: E. N. E.; very fine.

Dec. 20. Lat. 6° 27′ N.; long. 32° 31′ W. Wind: E. N. E.; fine breezes and squally weather.

Dec. 21. Lat. 4° 30′ N.; long. 30° 38′ W. Winds: E. N. E., E. N. E., east; moderate and pleasant.

Dec. 22. Lat. 2° 27′ N.; long. 30° 30′ W. Wind: east; light airs.

Dec. 23. Lat. 0° 00′; long. 30° 18′ W. Wind: S. E.; moderate breezes; crossed the equator in 18 days and 20 hours from New York.

Dec. 24. Lat. 3° 32′ S.; long. 32° 18′ W. Wind: S. E. by S.; fine breezes. At 3, passed Fernando de Noronha.

Dec. 25. Lat. 7° 9′ S.; long. 32° 55′ W. Wind: S. E.; strong breezes, with passing squalls of rain.

Dec. 26. Lat. 11° 14′ S.; long. 33° 12′ W. Wind: E. S. E; fine breezes and pleasant.

Bark Hazard (Andrew Barstow), New York to Rio, thirteen days out.

Dec. 16, 1853. Lat. 20° 11′ N.; long. 39° 51′ W. Barometer, 30.00. Winds: E. S. E., E., E. N. E.; fresh breezes and squalls; ends hazy.

Dec. 17. Lat. 16° 54′; long. 38° 31′ W. Barometer, 30.00. Winds: E. N. E., E. S. E., E.; fresh breezes and squalls; ends hazy.

Dec. 18. Lat. 13° 55′ N.; long. 37° 12′ W. Barometer, 29.9. Winds: E., E., E.; squally from E. S. E. to E. N. E.

Dec. 19. Lat. 11° 14′ N.; long. 35° 48′ W. Barometer, 30.00. Winds: E., E., E.; moderate weather.

Dec. 20. Lat. 8° 31′ N.; long. 34° 49′ W. Barometer, 29.9. Winds: E., E., E.; first moderate, middle and latter fresh.

Dec. 21. Lat. 6° 03′; long. 32° 54′ W. Barometer, 29.9. Winds: E., E., E. N. E.; fresh breezes and pleasant weather.

Dec. 22. Lat. 4° 37′ N.; long. 31° 46′ W. Barometer, 29.9. Winds: E. N. E., E., E. S. E., a heavy S. E. squall; middle and latter squally.

Dec. 23. Lat. 3° 11′ N.; long. 31° 47′ W. Barometer, 29.9. Winds: E. S. E., E. S. E., S. E.; light airs and cloudy.

Dec. 24. Lat. 1° 14′ N.; long. 31° 35′ W. Barometer, 29.9. Winds: E., E., S. E.; midddle heavy; E N. E., squalls; thunder, lightning, and rain.

Dec. 25. Lat. 0° 47′ S.; long. 31° 41′ W. Barometer, 29.9. Winds: E., E. N. E., E.; squalls with thunder, lightning, and rain.

Dec. 26. Lat. 2° 20′ S.; long. 31° 50′ W. Barometer, 29.9. Current per hour 1 knot, W. Winds: E., E., S. E.; for 20 hours squalls from N. E., E., to S. S. E.; thunder, lightning, and rain.

Dec. 27. Lat. 4° 20′ S.; long. 32° 30′ W. Barometer, 29.9. Winds: S. E., S. E., S. S. E.; squally, with much lightning; tacked several times.

Dec. 28. Lat. 6° 36′ S.; long. 32° 32′ W. Barometer, 29.9. Winds: S. E., S. E., E. N. E.; squally, with lightning.

Dec. 29. Lat. 9° 50′ S.; long. 33° 18′ W. Barometer, 29.9. Winds: S. E., S. E., E. S. E.; fresh breezes, and pleasant.

NEW ORLEANS, *March* 22, 1853.

SIR: Having taken passage in the barque Hazard, of Salem, George M. Pollard, master, for Rio de Janeiro and back to New Orleans, Captain P. requested me to keep an abstract journal, which he received from your agent with a set of *Wind and Current Charts*, having engaged that it should be sent you on his return to the United States.

I now take the liberty of transmitting it to you, with the hope that you may find something therein to repay the examination. I would also take the liberty of making some remarks.

It was Captain Pollard's intention to follow in the track to the line that you recommended, as nearly as possible; but strong southerly winds, soon after leaving New York, drove the barque to the eastward, and when the track was regained, it was impossible to cross the line, as advised, without wasting time in beating to eastward in the Doldrums. Having myself, in 1818, in ship Commerce, of Salem, about same season, crossed the line in about 34°; and, although a wooden-bottomed ship, passed Pernambuco in 9 days from the line, after making the land 10 or 12 miles to leeward of St. Roque; I advised Captain Pollard to stand boldly across in 34°, the Hazard being a fast vessel. The result proved as was expected, passing Pernambuco in only 4¾ days from the equator, in long. 34°, notwithstanding falling 20 miles to leeward of St. Roque.

From these examples, and the information gathered from traders between Maranham and Rio de Janeiro, I should not hesitate crossing the line in 36°, even in a good sailing vessel, feeling confident of beating round St. Roque by making short tacks on soundings which are very regular, and may be trusted to. Off soundings, the current sets very strongly to westward.

On my arrival at Bahia, in December, 1818, I found that the passage from the latitude of Cape Verdes was from 10 to 20 days shorter than any other vessels. The conclusion I then came to was that the best track was 8 to 10° west of the Cape Verdes, passing the equator from 28° and 32° according to season. This is now proved beyond a doubt by your Charts, which are of incalculable benefit to all navigators.

I would suggest more particular inquiry about the monsoon, if I may so call it, that prevails along the Brazil coast from N. E. to N. N. E. during January and February, sometimes in December, which makes it very difficult to reach the equator from Rio. Dull vessels are often 30 days or more to Bahia and Pernambuca from Rio, and should they fall to leeward of St. Augustine, bound north, find it almost impossible to beat around, the currents set so strong to S. W. During the winter months, the prevailing winds are southerly and S. W., but not so steady and constant as the N. E. in summer.

I have added to the Journal an abstract of the Hazard's passage from New York to Rio, in 1851, in 31 days, the shortest ever made by a merchant vessel loaded with a full cargo, or probably than any; also, some memorandums of her six passages from Boston and New York to the equator, showing an average of only 26½ days; her tracks being always those which you recommend, and they are very conclusive evidence of the correctness of your advice, if any farther evidence was wanting of its superiority over the old ones.

I remain very respectfully,

Your obedient and obliged servant,

JOHN GARDNER.

LIEUTENANT MAURY, U. S. N.

National Observatory, Washington, D. C.

I have investigated the subject of the so-called monsoons along the coast of Brazil.—See *Pilot Chart of the Coast of Brazil.* I find none upon a scale for that Chart of 2° of lat. by 1° of long. During some seasons of the year, certain winds are more prevalent than at others, as winds with northing in them in *our* winter and spring; but these winds do not partake of the characteristics of monsoons.

Farther, in reply to this very clever letter, I may remark that, though a vessel may occasionally cross the line as far west as 36°, and clear St. Roque, yet all that do get clear without delay, after crossing so far west, may consider themselves *very* lucky.

Ship Tuscany (Thomas Mayo), New York to San Francisco, twenty-two days out.

Dec. 20, 1853. Lat. 21° 58′ N.; long. 34° 35′ W. Barometer, 29.09; temperature of air, 75°; of water, 74°. Winds: North, N. by E., N. E.; good breezes; squalls of wind and rain, with a heavy sea from N. N. W. Barometer frequently fluctuating a tenth in the course of two hours.

Dec. 21. Lat. 19° 30′; long. 34° 15′. Barometer, 29.09; temperature of air, 74°; of water, 76°. Winds: E. N. E., E. by N., E. Throughout good breezes, attended with frequent squalls of rain. At 10 hours 30 min. A. M. observed tide rips, with every indication of a strong current, although we have not experienced any. A confused sea from north.

Dec. 22. Lat. 16° 58′ N.; long. 33° 40′ W. Barometer, 29.09; temperature of air, 74°; of water, 76°. Winds: E. by S., E., E. All of these twenty-four hours, fresh breezes; first and middle parts squally, with considerable sea from N. N. E.; observed tide rips several times during the day.

Dec. 23. Lat. 14° 25′ N.; long. 33° 15′ W. Current S. W. by W. three miles throughout. Barometer, 30.00; temperature of air, 76°; of water, 74°. Winds: E. by S., E. S. E., E. Fine pleasant weather, with steady trades.

Dec. 24. Lat. 12° 00′ N.; long. 32° 44′ W. Barometer, 29.09; temperature of air, 76°; of water, 75°. Winds: E., E. by N., E. First part fresh breezes and pleasant, middle and latter parts moderate and cloudy.

Dec. 25. Lat. 9° 50′ N.; long. 32° 17′ W. Barometer, 29.08; temperature of air, 76°; of water, 78°. Winds: E., E. by N. E. Throughout, moderate breezes, with hazy weather.

Dec. 26. Lat. 7° 25′ N.; long. 31° 18′ W. Barometer, 29.07; temperature of air, 76°; of water, 78°. Winds: E. by N., E. N. E., E. by N. Moderate breezes, with hazy weather.

Dec. 27. Lat. 5° 52′ N.; long. 30° 30′ W. Current W. half knot per hour. Barometer, 29.07; temperature of air, 78°; of water, 76°. Winds: E. N. E., E., E. S. E. First part, moderate breezes as per column; middle and latter parts squally, raining in torrents.

Dec. 28. Lat. 4° 46′ N.; long. 30° 12′ W. Current N. W., half knot per hour. Barometer, 29.06; temperature of air, 78°; of water, 77°. Winds: S. E. to S., S. E. to S. W., calm. Throughout these 24 hours light baffling winds from S. E. to S. W., with much rain, thunder, and lightning.

Dec. 29. Lat. 4° 35′ N.; long. 29° 57′ W. Current N. W., half knot per hour. Barometer, 29.07; temperature of air, 79°; of water, 78°. Winds: calm, E. to S., E. N. E. to S. W. Squally throughout, with rain, thunder, and lightning, with a confused sea from S. S. E.

Dec. 30. Lat. 4° 10′ N.; long. 29° 52′ W. Current W., half knot per hour. Barometer, 29.06; temperature of air, 79°; of water, 80°. Winds: E. to S., calm. Calm throughout, light baffling winds with rain. Sea from S. S. E. Exchanged signals with British brig Corsair, standing to the northward and eastward.

Dec. 31. Lat. 3° 32′ N.; long. 30° 15′ W. Current W., half knot per hour. Barometer, 29.07; temperature of air, 80°; of water, 80. Winds: calm, S. S. E., S. E. by S. Squally, with much rain, thunder, and lightning, from S. W.

Jan. 1, 1853. Lat. 3° 02′ N.; long. 30° 47′ W. Current W. N. W., half knot per hour. Barometer, 29.06; temperature of air, 78°; of water, 79°. Winds: S. E. by S., S. S. E., S. S. E. Light baffling airs from S. E. to S., with much sea from S. S. E. Rain, &c.

Jan. 2. Lat. 2° 42′ D. R.; long. 31° 17′ W. Barometer, 29.07; temperature of air, 79°; of water, 78°.

Winds: S. E. by S., S. S. E., S. E. by S. Light airs from S. E. to S., with frequent rain squalls. Lightning from westward.

Jan. 3. Lat. 2° 02′ N.; long. 31°42′ W. Current, for the last 48 hours, 35 miles W.N.W. Barometer, 29.06; temperature of air, 78°; of water, 80°. Winds: S. S. E., S., S. by E. First part, moderate breezes from S. S. E.; at 7 P.M. tacked to the eastward. Ends with light airs. Sea from the northward.

Jan. 4. Lat. 2° 16′ N.; long. 31° 12′ W. Current, W. N. W., 20 miles. Barometer, 29.07; temperature of air, 77°; of water, 79°. Winds: S., S. S. E., S. E. by S. Throughout, light breezes, with a very irregular sea from all points of the compass.

Jan. 5. Lat. 1° 48′ N.; long. 31° 56′ W. Current, W. N. W., 15 miles. Barometer, 29.08; temperature of air, 79°; of water, 80°. Winds: S.E. by S., S. S. E., S. by E. Light baffling airs at 9 P.M. I find the current to run at an average rate of 0.7 per hour, for the last five days set W. N. W., true.

Jan. 6. Lat. 2° 12′ N.; long. 31° 16′ W. Current, W. N. W., fifteen miles; barometer, 29.07; temperature of air, 80°; of water, 80°. Winds: S. by E., S. S. E., S. E. by S.; light breezes from S. by E. to S. E. by S.; ship moving slowly against a head sea and making much drift.

Jan. 7. Lat. 1° 46′ N.; long. 31° 37′ W. Current, 0.7 knot per hour. Barometer, 29.07; temperature of air, 79°; water, 82°. Winds: S. S. E., south, S. by W.; light airs, with a high, irregular sea from S. S. E.; latter part, calm, bad sea on.

Jan. 8. Lat. 1° 18′ N.; long. 31° 10′ W. Current, 0.7 knot per hour. Barometer, 29.06; temperature of air, 81°; of water, 81°. Winds: calm, S. E., S. E.; first part, calm. At 2 hours 30 min. P. M. wind sprung up from S. E., attended with frequent showers of rain.

Jan. 9. Lat. 0° 10′ N.; long. 31° 47′ W. Current, 0.6 knot per hour. Barometer, 29.07; temperature of air, 83°; of water, 82°. Winds: S. E. by E., S. E. by E., E. S. E.; steady breezes; every indication of S. E. trades.

Jan. 10. Lat. 1° 30′ S.; long. 32° 17′ W. Current, 0.4 knot per hour. Barometer, 29.08; temperature of air, 83°; of water, 82°. Winds: S. E. by E., S. E., S. S. E.; moderate breezes; stood to the eastward 4 hours.

Jan. 11. Lat. 3° 34′ S.; long. 32° 46′ W. Current, 0.6 knot per hour. Barometer, 29.07; temperature of air, 82°; water, 81°. Winds: S. E. by S., S. E., E. S. E. Moderate breezes, and a smooth sea. At 11 hours 30 min. A. M., saw the island Fernando de Noronha.

Jan. 12. Lat. 4° 53′ S.; long. 33° 37′ W. Current, 0.9 knot per hour. Barometer, 29.08; temperature of air, 83°; of water, 81°. Winds: S. E., S. E., S. S. E; moderate winds, and pleasant; strong westerly set.

Jan. 13. Lat. 6° 36′ S.; long. 33° 58′ W. Current, 0.5 knot per hour. Barometer, 29.07; temperature of air, 83°; of water, 82°. Winds: S. E., E. S. E., E. S. E; steady breezes, and pleasant.

Jan. 14. Lat. 8° 21′ S.; long. 34° 24′ W. Current, slight, N. W. Barometer, 29.08; temperature of air, 82°; of water, 81°. Winds: E. S. E., E., E. S. E.; steady breezes, and pleasant. I have found no difficulty in passing St. Augustine, although I crossed the equator in 31° 53′; and this in a vessel that

seldom goes over seven knots within seven points of the wind. In future, I shall not think of crossing east of 30°.

Clipper Ship Winged Racer (Wm. Homans), New York to San Francisco, fourteen days out.

Dec. 26, 1852. Lat. 21° 20′ N.; long. 34° 55′ W. Barometer, 29.7; temperature of air, 76°; of water, 76°. Wind: E. S. E.

Dec. 27. Lat. 17° 53′; long. 33° 37′. Barometer, 29.7; temperature of air, 77°; of water, 76°. Wind: east.

Dec. 28. Lat. 14° 14′ N.; long. 31° 48′ W. Barometer, 29.70; temperature of air, 76°; of water, 78°. Wind: E. by N.

Dec. 29. Lat. 10° 14′ N.; long. 30° W. Barometer, 29.5; temperature of air, 79°; of water, 79°. Wind: E. by N.

Dec. 30. Lat. 6° 5′ N.; long. 28° 35′ W. Barometer, 29.5; temperature of air, 81°; of water, 80°. Wind: E. by N.

Dec. 31. Lat. 3° 50′ N.; long. 28° 1′ W. Barometer, 29.5; temperature of air, 82°; of water, 80°. Winds: first part, E. by N.; middle part, variable, from N. E. to S. E.; latter part, variable.

Jan. 1, 1853. Lat. 3° N.; long. 28° 19′ W. Barometer, 29.5; temperature of air, 82°; of water, 80°. Winds: first and middle part, N. to E.; latter part, S. E.

Jan. 2. Lat. 1° 55′ N.; long. 29° 44′ W. Current, W. N. W., 30 miles; barometer, 29.5; temperature of air, 82°; water, 80. Wind: variable.

Jan. 3. Lat. 0° 24′ S.; long. 31° 32′ W. Current, W. N. W., 20 miles; barometer, 29.5; temperature of air, 83°; of water, 79°. Winds: first part, S. S. E.; middle and latter part, S. E. At 8 A. M. crossed the equator in long. 31° 16′ W., 21 days and 21 hours from New York. Distance sailed, by log, 4,086 miles; by Maury's calculations, 4,115 miles.

Jan. 4. Lat. 3° 11′ S.; long. 33° 4′ W. Barometer, 29.5; temperature of air, 83°; of water, 79°. Winds: first part, S. E.; middle part, S. E. by S.; latter part, S. E.

Jan. 5. Lat. 6° 38′ S.; long. 33° 52′ W. Barometer, 29.5; temperature of air, 83°; of water, 79°. Winds: first part, S. E.; middle and latter part, S. E. by E.

New York to Rio.—JANUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From 40° 27′N.	74° 00′to										
40 27	70 00	E.	182	6.2	193	2.0	6.0	5.0	87.0	2.1	97
38 52	65 00	E. S. E.	249	7.4	266	2.4	5.6	5.6	86.4	0.8	118
38 52	60 00 *d*	E.	243	6.7	249	0.9	3.6	*w* 11.7	83.8	3.4	113
37 14	55 00	E. S. E.	255	7.5	274	2.4	3.2	*w* 8.8	85.6	0.0	128
35 35	50 00	E. S. E.	260	8.3	283	3.0	7.0	8.0	82.0	4.5	105
35 00	48 17 *d*	E. S. E.	92	11.4	103	4.4	6.6	*w* 13.2	75.8	0.0	91
30 00	45 49	S. S. E.	324	12.1	362	1.9	15.2	*w* 19.0	63.9	10.0	54
29 44	45 00	E. S. E.	42	25.7	53	8.4	*w* 25.2	11.8	49.8	4.2	24
25 20	40 00	S. E.	347	13.6	425	3.3	*w* 16.4	8.2	72.1	1.6	61
25 00	39 38 *d*	S. E.	34	28.0	43	13.2	8.7	*w* 11.0	67.0	3.3	88
20 00	37 16	S. S. E.	324	6.4	344	2.5	5.5	5.5	87.5	0.0	80
15 00	35 00	S. S. E.	324	7.7	348	0.0	*w* 15.8	10.5	73.7	0.0	19
10 00	32 53	S. S. E.	324	0.4	325	0.0	*w* 3.0	0.0	97.0	0.0	33
5 00	30 48 *d*	S. S. E.	324	1.6	329	0.0	*w* 8.0	0.0	92.0	0.0	25
Equator	30 48	S.	300	0.7	302	0.0	*w* 6.6	0.0	93.4	0.0	88
1 00 S.	31 13	S. S. W.	65	3.7	67	0.0	*w* 15.0	0.0	85.0	0.3	294
2 54	32 00	S. S. W.	123	6.1	130	0.0	*w* 23.9	0.0	76.1	0.0	46
5 00	32 52 *d*	S. S. W.	137	5.8	145	0.0	*w* 28.6	0.0	71.4	0.0	21
5 08	33 00	S. W.	12	0.0	12	0.0	0.0	0.0	100.0	0.0	29
7 00	34 00	S. S. W. ½ W.	136	5.1	143	0.0	*w* 14.4	0.0	85.5	0.0	28
9 00	34 50	S. S. W.	130	5.3	137	2.9	2.9	0.0	97.1	8.0	34

Shortest distance to the equator by this route, 3,640 miles. Average distance to be sailed on account of adverse winds, 3,899 miles. The Surprise, in January, 1851, accomplished it in 24 days, and 3,852 miles per log.

The courses from 35° N. to 30° N., and from 7° S. to 9° S., run through a part of the ocean that is liable to calms. In the adjacent wind-roses, to the east of these (see *Pilot Charts*), there is less liability to calms. From New York to the parallel of 25° N., in this month, the south is generally the windward side. Thence to the line it is to leeward. Prefer, therefore, in this month, to cross 25° N. to the E. of 40°, and 7° S. to the E. of 34° W. longitude.

Ship John Bertram (F. Lendholm), Boston to San Francisco, sixteen days out.

December 28, 1851. Lat. 16° 16′ N.; long. 43° 15′ W. Current, ¾ of a mile per hour, S. E. Barometer, 30.42; thermometer, not observed. Winds: E. S. E., E. by N. to S. E., S. E. by S. First part, wind light, and baffling; a strong ripple on the water like a current. Barometer, rising and falling rapidly through the 24 hours; in the evening, heavy clouds rising from the W. S. W., with sharp lightning; clouds rising all around the horizon, and settling where they started from; latter part, winds light and baffling, weather pleasant. Barometer falling to 30.35, which is not an indication of the N. E. trades.

Dec. 29. Lat. 16° 51′ N.; long. 41° 30′ W. Current, during the 24 hours, 22 miles, N. E. Barometer, 30.30. Winds: S. E. by S., S. S. E., and S. by E.; light breezes, and pleasant weather; middle part, light air and a short chopping sea, running from the E. N. E., by which I judge the trades are not far off. Latter part, light airs, and cloudy, hazy weather.

Dec. 30. Lat. 16° 47′ N.; long. 40° 00′ W. Current, during twenty-four hours, nine miles north; barometer, 30.30. Winds: S. by E., variable and calm, S. by W. to S. by E.; light baffling winds and hazy weather; middle part, light variable airs and calm, with heavy thunder and sharp flashes of lightning; morning pleasant, with light airs from the south; latter part, gentle breezes and appearances of squally weather.

Dec. 31. Lat. 16° 13′ N.; long. 38° 39′ W. Barometer, 30.35. Winds: S. S. W., S. S. W., and calm; first part, light breezes and squally weather; middle part, light airs and cloudy; latter part, calm with rainy weather.

Jan. 1, 1852. Lat. 15° 11′ N.; long. 33° 13′ W. Current, during twenty-four hours, thirty-nine miles, E. N. E.; barometer, 30.42. Winds: variable airs, calm, and E. S. E.; first and middle part, light variable airs and calms, with heavy showers of rain; latter part, light breezes and squally weather.

Jan. 2. Lat. 11° 59′ N.; long. 38° 13′ W. Barometer, 30.40. Wind: S. E. by E.; first part moderate breezes and heavy weather; strong rips on the water at times, again very smooth, as though there might be current, but found none; middle and latter part, fresh and moderate breezes with hazy weather.

Jan. 3. Lat. 10° 27′ N.; long. 36° 55′ W. Barometer, 30.39. Winds: E. S. E., East, and E. N. E.; first part, light breezes and hazy weather; middle part, moderate breezes and hazy; first appearance of dew in the night; latter part, fine breezes with pleasant weather and passing clouds. I suppose this to be the first of the N. E. trades; hope I shall not be disappointed this time, as I was eight days ago, in lat. 21° N.

Jan. 4. Lat. 7° 49′ N.; long. 35° 07′ W. Barometer, 30.37. Winds: E. by N., E. by N., and East; during these twenty-four hours, fine breezes and passing clouds; quite a heavy dew falling, second night.

Jan. 5. Lat. 6° 09′ N.; long. 32° 22′ W. Current, during twenty-four hours, twenty-eight miles East; barometer, 30.40. Winds: E. by N., E. N. E., E. N. E.; first and middle part, moderate breezes and pleasant weather; latter part, brisk trades and passing clouds.

N. B. I have experienced this easterly current two voyages previous to this, at about the same season, and nearly in the same place; perhaps one, or one and a half degree further east.

Jan. 6. Lat. 3° 30′ N.; long. 29° 35′ W. Current, during 24 hours, 27 miles, N. N. E. Winds: E. N. E., E. by N., and E. N. E. throughout these 24 hours; brisk breeze, and passing clouds.

Jan. 6. Lat. 1° 17′ N.; long. 29° 04′ W. Barometer, 30.38. Winds: E. S. E., E. by S., E. S. E.; first part, light wind, and pleasant; middle part, moderate breezes with passing squalls of rain; latter part, light breeze, and pleasant.

Jan. 8. Lat. 00° 47′ S.; long. 30° 02′ W. Current, N., 17 miles. Barometer, 30.38. Winds: S. E., S. E. by S., S. S. E.; first part, light, baffling wind, and squally appearance. At 3 P. M. made St. Paul's

Rock, bearing S. W. ½ W.; strong ripplings on the water; middle part, moderate breeze and passing clouds. At 4h. 30m. P. M. the ship was on the equator, in long. 29° 40′ W.; 27 days and 16 hours from Boston.

Jan. 9. Lat. 3° 01′ S.; long. 31° 01′ W. Current, during 24 hours, 9 miles, W. Barometer, 30.37. Winds: S. E. by S., S. E. by S., and S. S. E. Throughout light.

Jan. 10. Lat. 5° 50′ S.; long. 32° 14′ W. Current, 13 miles, S. W. ½ W. Winds: S. E. by S., S. E., S. E.; first part, light breeze, and pleasant. At 2 P. M. spoke the English schooner Harriet, 35 days out from St. John, N. F.; bound to Pernambuco; reported having crossed the equator in 25° 30′ W., and had no calm; reported also having taken the N. E. trade in lat. of 22° N., and had fresh trades; his passage being only five days longer than mine. I had great curiosity to know how he had been steering with so much difference in the two vessels' sailing; so much so, that, from the time I could just see him from the deck ahead, until I lost sight of him astern, did not exceed eight hours. I sent my first officer on board with letters to be forwarded to the U. S.; also to gain some information about his passage; the track on his chart showed that he had kept well to the eastward, and had good runs, especially from 22° N., when he first took the trades. [The passage from St. John's to the line ought to be several days shorter than from New York.] Middle and latter part, moderate trade, and pleasant.

Captain Curwen, of the Golden West, to Lieut. Maury.

SAN FRANCISCO, *April* 29, 1853.

DEAR SIR: I herewith inclose abstract log of ship Golden West, from Boston to San Francisco. You will perceive that I took the N. E. trades on the Atlantic, in latitude 30° N., and longitude 40° W.; and that I had them throughout from E. to S. E.; never to northward of east. Carried them to latitude 00° 53′ N.; longitude, 33° 37′ W., when wind hauled to S. S. E., and obliged me to tack, 21 days out. From this time, until January 10 (28 days out), when I crossed the equator, experienced light baffling airs and calms, with strong N. W. current most of the time.

Although mine was an unusually bad chance, still, I think that 28 days to the equator would be considered a fair passage by the old route. You will also notice, that from latitude 25° to 22° S. on the Pacific, where I should have had S. E. trades—had very light northerly airs and calms—have experienced strong westerly currents from latitude 20° S. to 20° W., in the Pacific.

I shall continue keeping an abstract, and will forward the same to you from time to time.

Ship Golden West (Samuel R. Curwen), fourteen days out.

Dec. 28, 1853. Lat. 19° 48′ N.; long. 38° 27′ W. Barometer, 29.90; temperature of air, 80°; of water,* 78°. Winds: E. by S., to S. E. First and middle parts brisk trades, and squally with rain; latter part moderate.

Dec. 29. Lat. 15° 47′ N.; long. 38° 20′ W. Barometer, 30.10; temperature of air, 78°; of water,*

* 22 feet below the surface.

78°. Winds: E. S. E., E. by S., S. E. by E. First part, moderate and pleasant; middle and latter parts, brisk breezes and squally, with rain. No gulf-weed seen to-day. Great numbers of flying-fish.

Dec. 30. Lat. 11° 40′ N.; long. 37° 23′ W. Barometer, 30.00; temperature of air, 74°; of water, 76°. Winds: E. by S. to S. E. by E. Brisk trades and passing clouds; squally at times.

Dec. 31. Lat. 7° 20′ N.; long. 35° 28′ W. Current, N. 29° E., 1½ knots per hour. Barometer, 29.90; temperature of air, 78°. Winds: from E. by S. to S. E. by E. throughout the day. Strong trades and cloudy; light showers occasionally; going from 10½ to 11½ knots. Distance per log, 262 miles.

Jan. 1, 1853. Lat. 5° 08′ N.; long. 34° 01′ W. Current, N. 29° E., 1½ knots per hour. Barometer, 30.00; temperature of air, 77°; of water (22 feet below surface), 79°. Winds: E. S. E., E. S. E. to S. S. E., E. Brisk breezes, and squally appearances; night squally and baffling, with rain; ends pleasant, with moderate breezes. Distance per log, 211 miles.

Jan. 2. Lat. 2° 33′ N.; long. 32° 56′ W. Barometer, 29.90; temperature of air, 74°. Winds: E. S. E., S. S. E., S. S. E. Commences moderate and hazy; throughout the middle and latter parts squally, with heavy rain; much thunder and lightning. Distance per log, 173 miles.

Jan. 3. Lat. 00° 53′ N.; long. 33° 37′ W. Barometer, 29.90. Winds: S. E. by E., S. E., S. S. E. to S. E. First part squally, with thick rainy weather. At 4 P. M. clear and pleasant; midnight squally, with much rain. At 8 A. M., wind S. S. E., tacked to the eastward. Ends moderate and pleasant. Distance per log, 171 miles.

Jan. 4. Lat. 00° 20′ N.; long. 34° 16′ W. Barometer, 29.90; temperature of air, 88°. Winds: S. E., E. to S. E., S. S. E. First and latter part, light winds and pleasant; middle part, squally. At 7 P. M. tacked to the southward 64 miles. Current setting N. 76° W. Distance per log, 137 miles.

Jan. 5. Lat. 1° 18′ N.; long. 32° 55′ W. Barometer, 29.90; temperature of air 81°. Winds: S. S. E., S. by E., to S. E. by S. Moderate and hazy throughout. At 5 P. M. tacked to the eastward. Distance per log, 178 miles.

Jan. 6. Lat. 3° 20′ N.; long. 30° 51′ W. Barometer, 29.90; temperature of air, 84°. Winds: S. E. to S. S. E. Moderate throughout, with passing clouds. *Standing to eastward* 41 miles. Current, setting N. 46° W. Distance per log, 171 miles.

Jan. 7. Lat. 1° 52′ N.; long. 29° 03′ W. Barometer, 30.00; temperature of air, 74°; of water (22 feet below surface), 79°. Winds: S. S. E., N. E. to east, E. N. E. First part, light airs and calm; night, squally; much rain, thunder, and lightning; latter part, light airs and cloudy. No observation. Allow the same current as yesterday. Heavy swell from N. E. Tacked to the southward at 6 P. M. Distance per log, 133 miles.

Jan. 8. Lat. 2° 06′ N.; long. 30° 25′ W. Barometer, 30.00; temperature of air, 88°. Winds: S. E. to S. by E. Calm at intervals. Very heavy swell from E. N. E. A two-knot current setting N. N. W. Ship heading easterly. Distance per log, 71 miles.

Jan. 9. Lat. 1° 36′ N.; long. 30° 08′ W. Currents, N. 29° W., one and a half knot per hour. Barometer, 30.00; temperature of air, 77°; of water (22 feet below surface), 80°. Winds: S. to S. S. W., S. to

S. S. W., S. E. by E. Light airs throughout, with passing showers. At 2 P. M. tacked to the eastward, and at 4 A. M. to the southward and westward. Distance per log, 122 miles.

Jan. 10. Lat. 00° 46′ S.; long. 32° 02′ W. Barometer, 29.90; temperature of air, 85°. Winds: S. and S. by E., S. and S. by E., S. S. E., and S. E. by S. First and middle parts, gentle breezes and passing clouds; latter part, brisk wind. No current. Distance per log, 182 miles.

Clipper Barque Storm (J. J. Roberts), from San Francisco, ten days out.

Dec. 31. Lat. 21° 41′ N.; long. 39° 25′ W. Barometer, 30.19; temperature of air, 76°; of water, 74°. Winds: E. S. E., E. by S., E. by S. Heavy weather and high seas. Lost fore-topgallant-mast; shipping whole seas over the bows.

Jan. 1, 1853. Lat. 17° 58′ N.; long. 38° 13′ W. Barometer, 30.20; temperature of air, 78°; of water, 75. Winds: E. by S. Weather, the same as yesterday.

Jan. 2. Lat. 14° 20′ N.; long. 37° 00′ W. Barometer, 30.10; temperature of air, 78°; of water, 77°. Winds: E. S. E., E. S. E., E. by S. Fresh breezes and fine weather.

Jan. 3. Lat. 10° 55′ N.; long. 35° 27′ W. Barometer, 30.15; temperature of air, 78°; of water, 77°. Winds: E. by S. Heavy weather and frequent squalls. For the last three days, I notice the barometer falls during the day, and towards night rises again without any material change in the weather.

Jan. 4. Lat. 7° 06′; long. 33° 42′ W. Barometer, 29.95; temperature of air, 80°; of water, 79°. Winds: E. by S., E. by S., E. S. E.; first and middle parts, heavy weather and squally—barometer very changeable; latter part, more moderate.

Jan. 5. Lat. 3° 26′ N.; long. 33° 16′ W. Barometer, 29.90; temperature of air, 80°; of water, 80°. Winds: E. S. E., E. S. E., S. E.; first and middle parts, moderate winds and rainy; latter part rain and calms; three inches of rain fell in an hour.

Jan. 6. Lat. 2° 24′ N.; long. 34° 14′ W. Barometer, 29.94; temperature of air, 80°; of water, 80°; winds: calm, S. S. E., S. S. E., S. S. E.; first part, fine and calm; middle, light airs; latter, light breeze. The foretopmast trestle-trees broke short off, and let the mast down by the run.

Jan. 7. Lat. 1° 10′ N.; long. 35° 16′ W. Barometer, 29.98; temperature of air, 80°; of water, 80°; winds, first and middle parts, light and baffling to south, and calms, latter part S. E. Fine weather and light airs. Looks rather dubious; about clearing Cape St. Roque; however, I shall stand on, and trust to luck. [That's right.] It is my own fault if I fall to leeward, and get jammed, for I might easily have made more easting by sailing close-hauled.

Jan. 8. Lat. 00° 15′ S.; long. 35° 33′ W. Barometer, 30.05; temperature of air, 82°; of water, 80°. Winds: S. E. by S., E., S. E.; first part, light breeze. At 5 P. M. a heavy squall from E. N. E.; carried away the larboard cathead, from the strain on the jib-guys, and wrung the bowsprit head and cap badly. All the trestle-trees, fore and aft have given away, owing to bad material, and being too light, and I am obliged to be easier with her than I should otherwise have been. Crossed the line in 17 days and 16 hours, from Sandy Hook. At 10 A. M. took the trades at S. E. light.

Jan. 9. Lat. 2° 14′ S.; long. 36° 26′ W. Current, ½ knot per hour, W. Barometer, 30.00; temperature of air, 82°; of water, 80°. Wind: S. E. Fine weather, and light winds; observed westerly current for the first time.

Jan. 10. Lat. 3° 23′ S.; long. 36° 29′ W. No current. Barometer, 29.90; temperature of air, 81°; of water, 79°. Winds: S. E., E. S. E., S. E. by E. Fine weather, and moderate breezes.

Jan. 11. Lat. 3° 14′ S.; long. 36° 08′ W. Current, 1 knot per hour, W. Barometer, 29.93; temperature of air, 82°; of water, 79°. Winds: E. S. E., E. S. E., S. E. by E. First part, fresh breeze, and heavy S. E. swell—tacked to N. E., Point Tubarao bearing south, 35 miles distant, at 8 P. M. Latter part fine.

Jan. 12. Lat. 1° 25′ S.; long. 34° 36′ W. Current per hour, 1 mile, N. W. Barometer, 29.90; temperature of air, 81°; of water, 79°. Winds: S. E. by E., S. E., S. E.; fine weather and moderate breezes.

Jan. 13. Lat. 1° 27′ S.; long. 35° 45′ W. Barometer, 29.90; temperature of air, 82°; of water 80°. Winds: S. E. by S.; S. S. E., S. E. Light wind, and rain squalls.

Jan. 14. Lat. 3° 52′ S.; long. 34° 31′ W. Current, 1 mile per hour, N. W. Barometer, 29.90; temperature of air, 83°; of water, 79°. Winds: S. E., S. E. by E., S. E. by E.; fine weather and light breeze; middle, fresh. Twenty-four days out, and I shall be very well satisfied if I can lay along the coast.

Jan. 15. Lat. 5° 55′ S.; long. 34° 42′ W. Current, same as yesterday. Barometer, 29.90; temperature of air, 84°; of water, 80.° Wind: E. S. E.; fine weather and moderate. No sounding with 90 fathoms.

Jan. 16. Lat. 8° 10′ S.; long. 34° 30′ W. Barometer, 29.90; temperature of air, 85°; of water, 80°. Winds: E. N. E., E., S. by E. At 2 P. M. made Point Pipa, west, 13 miles distant. The more we draw in shore the more the wind favors us. At midnight, passed within 5 miles of Cape Blanco.

[The "Storm" behaved to admiration after she found herself jammed; she followed her guide, put off beating as long as she could, trusting to chance for a slant of wind. Though she crossed the equator as far as 35° 30′—and which is farther than is desirable, yet in 24 days out, from New York, she was clear of Cape St. Roque, despite that great old phantom of a bugbear, the westerly current.]

Flying Childers (J. Dain White), Boston to San Francisco, 1852–3, 12 days out.

Dec. 30. Lat. 20° 05′ N.; long. 43° 38′ W. Barometer, 30.10.; temperature of air, 75°; of water, 77°. Winds: E., E. N. E., E. N. E.; moderate trades.

Dec. 31. Lat. 17° 58′ N.; long. 41° 59′ W. Barometer, 30.10; temperature of air, 76°; of water, 77°. Winds: E. N. E., E. E.; moderate trades.

Jan. 1, 1853. Lat. 15° 31′ N.; long. 41° 30′. Barometer, 30.00; temperature of air, 77°; of water, 78°. Winds: E. S. E., S. E., E.; moderate trades.

Jan. 2. Lat. 13° 14′ N.; long. 40° W. Barometer, 30.00; temperature of air, 77°; of water, 78°. Winds: E., E., E. N. E.; moderate trades.

Jan. 3. Lat. 11° 10′ N.; long. 38° 25′ W. Barometer, 30.00; temperature of air, 77°; of water, 78°. Winds: E. N. E., E. N. E., E.; moderate trades.

Jan. 4. Lat. 9° 24′ N.; long. 36° 10′ W. Barometer, 30.00; temperature of air, 78°; of water, 78°. Winds: E. N. E., E. N. E., E. N. E.; moderate trades.

Jan. 5. Lat. 7° 17′ N.; long. 34° 10′ W. Barometer, 30.00; temperature of air, 78°; of water, 78°. Winds: E. N. E., E. N. E., E. N. E.; moderate trades.

Jan. 6. Lat. 5° 19′ N.; long. 33° 08′ W. Barometer, 30.00; temperature of air, 78°; of water, 78°. Winds: S. E., E., E. N. E.; light breezes with rain squalls.

Jan. 7. Lat. 4° 27′ N.; long. 30° 09′ W. Barometer, 30.00; temperature of air, 79°; of water, 79°. Winds: N. E., N. E., N. E.; gentle breezes with heavy rain squalls.

Jan. 8. Lat. 2° 55′ N.; long. 30° 04′ W. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: E. S. E., E. S. E., E. S. E.; first part squally, middle part fresh breezes, latter part calm.

Jan. 9. Lat. 2° 14′ N.; long. 30° 15′ W. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: S. W., S. E.; light airs and calm—all around the compass.

Jan. 10. Lat. 0° 09′ N.; long. 30° 29′ W. Barometer, 30.10; temperature of air, 82°; of water, 80°. Winds: S. E., S. E., S. E.; light trades, with fine weather.

Jan. 11. Lat. 2° 38′ S.; long. 31° 30′ W. Current, W., 20 miles. Barometer, 30.10; temperature of air, 81°; of water, 79°. Winds: S. E., S. E., S. E. Gentle breezes and clear.

Jan. 12. Lat. 5° 04′ S.; long. 32° 50′ W. Current, W. N. W., 30 miles. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: S. E., S. E., S. E. by E. Fine breezes and clear.

Ship Bald Eagle (P. Dumaresq), New York to San Francisco.

Jan. 16, 1853. Lat. 18° 56′ N.; long. 40° 32′ W. Barometer, 29.98; temperature of air, 77°; of water, 76°. Wind light and pleasant, S. ½ E., S. by E., S. S. E.

Jan. 17. Lat. 16° 13′ N.; long. 40° 7′ W. Barometer, 30.04; temperature of air, 76°; of water, 76°. Wind light and pleasant; braced sharp up; S. S. E., E. S. E., E. by S.

Jan. 18. Lat. 12° 44′ N.; long. 38° 26′ W. Barometer, 30.00; temperature of air, 76°; of water, 77°. Wind fresh and pleasant; braced sharp up; S. by E., E. by S., E. ½ S.

Jan. 19. Lat. 9° 49′ N.; long. 36° 12′. Barometer, 29.97; temperature of air, 76°; of water, 78°. Wind moderate and pleasant, braced sharp up; E., E. by S., latter part, east.

Jan. 20. Lat. 6° 41′ N.; long. 34° W. Barometer, 29.93; temperature of air, 78°; of water, 80°. Wind moderate and pleasant; braced sharp up; E., E., E. ½ N.

Jan. 21. Lat. 4° 19′ N.; long. 31° 50′ W. Barometer, 29.90; temperature of air, 80°; of water, 80°. Wind light; braced sharp up; E. ½ N., E., E. by N.

Jan. 22. Lat. 2° N.; long. 30° 8′ W. Barometer, 29.90; temperature of air, 82°; of water, 80°. Wind light through the night; repeated squalls; E. by N., E., E. by N.

Jan. 23. Lat. 0° 1′ S.; long. 31° 13′ W. Barometer, 29.92; temperature of air, 82°; of water, 80°. Light trades, with a few squalls; first part, S. E. by S., S. E. ½ S., S. E. Crossed the equator; averaged 144 miles per day.

Jan. 24. Lat. 2° 9′ S.; long. 32° 20′ W. Barometer, 29,88; temperature of air, 82°; of water, 79°. Light trade-winds, S. E. ½ S., S. E. by S., S. E.

Jan. 25. Lat. 5° 5′ S.; long. 33° 30′. Barometer, 29.88; temperature of air, 82°; of water, 79°. Moderate trades, S. E., S. E., S. S. E. Passed to the westward of Fernando de Noronha.

Jan. 26. Lat. 8° 22′ S.; long. 34° 8′. Barometer, 29.94; temperature of air, 83°; of water, 80°. Moderate trades; braced sharp up; S. E. by E., S. E. by E., S. E. ½ E.

Jan. 27. Lat. 11° 27′ S.; long. 34° 37′ W. Barometer, 29.90; temperature of air, 83°; of water, 80°. Light trades; checked the braces, and set studding sails, the first chance since leaving New York; E. S. E., E. S. E., E.

Ship Eagle (John S. Tarson), from New York to San Francisco, eighteen days out.

Jan. 25, 1853. Lat. 20° 01′ N.; long. 32° 58′ W. Barometer, 30.00; temperature of air, 74°; of water, 72°. Winds: E. by S., E. by N., E. by S. Strong breezes, first and middle, flawy; latter part, fair.

Jan. 26. Lat. 16° 43′ N.; long. 32° 10′ W. Barometer, 29.94; temperature of air, 76°; of water, 73°. Winds: E. by S., E. by S., E. Fine weather.

Jan. 27. Lat. 13° 37′ N.; long. 31° 35′ W. Barometer, 29.85; temperature of air, 76°; of water, 73°. Winds: E. N. E., E. by S., E. Fine weather.

Jan. 28. Lat. 11° 08′ N.; long. 30° 47′ W. Barometer, 29.86; temperature of air, 77°; of water, 75°. Winds: E. by N., E. N. E., E. by N. Light, with passing clouds from the S. W., and fair.

Jan. 29. Lat. 7° 59′ N.; long. 30° 16′ W. Barometer, 29.90; temperature of air, 81°; of water, 78°. Winds: E. by N., east, E. by S. Moderate and fair; clouds passing from S. S. W. At 10 A. M. we had the first light shower.

Jan. 30. Lat. 4° 13′ N.; long. 29° 5′ W. Barometer, 29.86; temperature of air, 79°; of water, 79°. Winds fresh, E. S. E. First, cloudy; middle, do.; latter, dark cloudy weather and heavy sea on.

Jan. 31. Lat. 0° 46′ N.; long. 29° W. Barometer, 29.86; temperature of air, 79°; of water, 76°. Winds: E. S. E., E. by S., E. by S. fresh. First, cloudy; middle and latter, squally, with hard rain occasionally; latter part, wind variable, from E. N. E. to S. E.

Feb. 1. Lat. 1° 36′ S.; long. 29° 8′ W. Barometer, 29.85; temperature of air, 78°; of water, 78°; Winds: E. to E. N. E., N. E. to S., and E. to N. Variable winds and weather throughout, with dark cloudy weather and frequent hard squalls of heavy rain. At 3 P. M. a large shoal of porpoises going from S. W. to N. E.; at noon, a whirlwind passed astern of the ship.

Ship Tornado (O. R. Mumford), New York to San Francisco, fifteen days out.

Jan. 26, 1853. Lat. 22° 30′ N.; long. 37° 25′ W. Barometer, 30.15; temperature of air, 73°; of water, 74°. Wind: E. by N. during the 24 hours. Moderate breezes and fine weather. Distance, 203 miles. Ends with fresh breezes and fine weather.

Jan. 27. Lat. 18° 46′ N.; long. 35° 49′ W. Barometer, 29.95; temperature of air, 74°; of water, 75°.

Winds: E. by N., east, and east. Fresh breezes, and cloudy rainy weather. Distance, 242 miles. During the afternoon frequent squalls of wind and rain, which appeared to rise in the N. E. and S. E., and meet, when the rain came down in torrents. Ends with rainy weather.

Jan 28. Lat. 15° 16′ N.; long. 33° 53′ W. Barometer, 29.99; temperature of air, 71°; of water, 74°. Winds during the day east. Fine breezes and squally weather. Strong current riffs. Distance, 238 miles. At 6 P.M. saw a ship bound south, bearing E.S.E., distant 10 miles. Ends with moderate and baffling winds.

Jan. 29. Lat. 12° 20′ N.; long. 33° W. Barometer, 29.94; temperature of air, 73°; of water, 75°. Winds: E. by S., E. S. E., and E. by S. Moderate breezes and fine weather. Distance, 183 miles. The ship we saw last evening, bearing N. by E., 13 miles distant. Strong current riffs. Ends, moderate breezes and fine weather.

Jan. 30. Lat. 9° 43′ N.; long. 31° 30′ W. Current, 18 miles, N.; barometer, 29.95; temperature of air, 78°; of water, 80°. Winds: E. by N., east, and east. Moderate breezes and fine weather. Distance, 180 miles. At 6 P.M. strong current riffs. Ends with fine breezes and fair weather; southerly sea. Distance sailed this month, by log, 3,532; by abstract, from noon to noon, 3,443.

Jan. 31. Lat. 5° 58′ N.; long. 30° 11′ W. Current, ¾ miles, N. 62° W. Barometer, 29.94; temperature of air, 79°; of water, 79°. Winds: E., E. by S., and E. by S. Fine breezes and cloudy weather. Distance, 238. Short heavy sea. Ends, fine breezes and fine weather.

Feb. 1. Lat. 1° 56′ N.; long. 29° 49′ W. Barometer, 29.87; temperature of air, 79°; of water, 79°. Winds: E., E. by S., and east. Fine breezes and fine weather. At 4 P.M. discovered a strong westerly current. Ends moderate breezes and fine weather.

Feb. 2. Lat. 1° 09′ S.; long. 30° 20′ W. Current, S. 80° W., 1½ mile per hour. Barometer, 29.89; temperature of air, 83°; of water, 81°. Winds: E. by S., E. by S., and E. S. E.; moderate breezes, and fine weather. At 2 P.M. crossed the equator, in long. 30° 06′ W. Ends light airs, inclined to calm. Dist. by log to the equator, 3,989; by observation, from noon to noon, 3,804.*

Feb. 3. Lat. 2° 41′ S.; long. 30° 40′ W. Barometer, 29.88; temperature of air, 80°; of water, 81°. Winds: E. S. E., E. S. E., and S. S. E.; light airs and squally, with rain; during the afternoon, wind veering from S. E. to N. E.; latter part steady, from the S. E. by S.

From H. T. Walter, of the Phantom.

We inclose herewith, the barque Phantom's abstract log, besides a few small collections of sea-weed. I noticed in your peculiar work, the longer the voyage the more information; ours, for that reason, ought to be acceptable.

We have not put down the strength of the current, for the reason we had no opportunity of ascertaining its *correct rate*, and, unless such is done, it is more apt to mislead than to be beneficial. Likewise, our

* You will please note the distance differs but 90 miles, as given in your table, for the month of January.

navigation is omitted, as the morning and evening amplitudes differed several degrees. I did not like to mix aberration with variation, as it was only useful for us. Neither have we troubled our readers in the log with our misfortunes; although, three days from Cape Henry, we lost our jib-booms, gallantmast, etc., besides leaking badly, and hence we were not able at times to keep the vessel by the wind, and were compelled to go to eastward of your track, for fear we had to beat, which would have been a bad job without a jib. But we have paid the utmost attention to barometer, thermometer, state of weather, etc.

The barque Reindeer, which left the Capes with us, arrived the same day at Rio. I believe she crossed the line in 28° 00′.

The brig W. A. Steward, left the Cape three or four days before us; arrived the same day with us; she sighted Fernanda de Noronha, and arrived with us the same day.

On an average, vessels which sailed before and with us, had very long passages for the time of the year.

The barque Inca, which sailed from Baltimore the 2d of January, arrived some days after us; her passage is therefore from 80 to 90 days. On the other hand, two vessels left Baltimore after us; one made the passage in 35, the other in 41 days. Last year, about the same month and date, I found strong winds from E. S. E. to E. N. E. in the same latitudes, where we had this time, W., S. W., and S. winds.

I crossed last year, in 20°, in 43°, 9° 46′, in 40° 00′, and 0° 15′ N., 33° 53′; tried to beat to windward, between 2° and 3° S., but lost some days for nothing. We then made the land to leeward of Cape St. Roque, and in beating for some days close in shore, weathered the land, having that voyage 57 days to Rio.

Ship Phantom (A. J. Hallett), Boston to San Francisco, seventeen days out.

Jan 24, 1853. Lat. 20° 55′ N.; long. 42° 00′. No perceptible current; variation observed, 16° W. Barometer, 30.2; temperature of air, 76°; of water, 75°. Winds: S. E. by E., E. S. E.; gentle breezes and squally, with rain at times. Still heavy clouds lying along in the S. and W.; unfavorable trades.

Jan. 25. Lat. 17° 40′ N.; long. 42° 40′ W. Heavy ripples; variation observed, 16° W. Barometer, 30.00; temperature of air, 76°; of water, 74°. Winds: E. S. E., S. E. by E., E. S. E.; squally with rain; with lightning, during the night.

Jan. 26. Lat. 14° 10′ N.; long. 41° 29′ W. Ripples. Variation observed, 15° W. Barometer, 30.00; temperature of air, 77°; of water, 74°. Winds: E. by S., E. by N., E by N.; squally weather with rain. Sea very blue and transparent. Doing my best to fetch Cape St. Roque, as I have every confidence in your *Wind and Current Charts.*

Jan. 27. Lat. 11° 20′ N.; long. 39° 05′ W. Heavy tide rips. Variations observed, 4° W. Barometer, 30.00; temperature of air, 78°. Wind: E. N. E. throughout. Gentle breezes during the day. Passed several heavy ripples, apparently tide rips; passing clouds during the 24 hours, and smooth sea. Saw plenty of flying-fish.

Jan. 28. Lat. 8° 40′ N.; long. 37° 43′ W. Variations observed, 3° W. Barometer, 29.8; temperature of air, 79°; of water, 78°. Wind: E. N. E. throughout. Moderate breezes throughout the day, and passing clouds. Saw lots of flying-fish.

Jan. 29. Lat. 6° 12′ N.; long. 35° 03′ W. Ripples at times. Variations observed, 3° W. Barometer, 29.9; temperature of air, 80°; water, 79°. Wind: N. E. by E. throughout. Moderate breezes and cloudy, with squalls of wind and rain.

Jan. 30. Lat. 3° 40′ N.; long. 33° 13′ W. Current (if any) to the S. E. Variations observed, 3° W. Barometer, 29.8; temperature of air, 80°; of water, 79°. Winds: E., S. E., E. N. E; Gentle breezes throughout the day, with squalls of rain, and smooth sea.

Jan. 31. Lat. 0° 40′ N.; long. 32° 55′ W. Variations observed, 2° W. Barometer, 29.9; temperature of air, 78°; of water, 78°. Winds: E. N. E., E. N. E., N. E. Gentle breezes, and squally.

Feb. 1. Lat. 1° 54′ S.; long. 31° 55′ W. Variations observed, 2° W. Barometer, 29.9; temperature of air, 80°; of water, 79. Winds: E., N. E., calm, N. E. by E. First and latter parts, light breezes. Middle calm, with plenty of rain.

Feb. 2. Lat. 4° 06′ S.; long. 31° 45′ W. Variations observed, 2° W. Barometer, 29.8; temperature of air, 81°; of water, 79. Winds: E., S. E., S. E. Light breezes, and squally, with a smooth sea.

Ship A. Chiseborough (R. C. Chiseborough), New York to San Francisco, thirteen days out.

Jan. 26, 1853. Lat. 22° 13′ N.; long. 43° 00′ W. Barometer, 30.10; temperature of air, 76°; of water, 77°. Winds: S. E. by E., E., E. S. E. First part, strong gales; middle part, with heavy squalls; latter pleasant. I must here remark that, during the many passages I have made through the so-called N. E. trades, I have never known them to hang so far to the south at this season, in this latitude and longitude. [What do the *Pilot Charts* say?]

Jan. 27. Lat. 20° 03′ N.; long. 41° 05′ W. Barometer, 29.90; temperature of air, 76°; of water, 77°. Winds: E. S. E., E. N. E., N. E. by E. First part, strong gales. At 4 P. M. wind changed to E. N. E.; middle part the same. At 4 A. M. wind fresh from N. E. by E.; latter part the same, with pleasant weather; close by the wind.

Jan. 28. Lat. 18° 01′ N.; long. 39° 30′ W. Barometer, 29.90; temperature of air, 77°; of water, 77°. Wind; E. N. E. Heavy rain, squalls throughout.

Jan. 29. Lat. 16° 36′ N.; long. 38° 15′ W. Barometer, 29.70; temperature of air, 76°; of water, 78°. Winds: E. N. E., E. S. E., E. N. E. Begins with moderate breezes and light rain squalls; middle part, light and pleasant. At 2 A. M. wind variable from E. S. E, to S. At 10, wind steady at E. N. E.; latter part, the same.

Jan. 30. Lat. 14° 23′ N.; long. 36° 48′ W. Current, E. S. E., 24 miles. Barometer, 29.90; temperature of air, 76°; of water, 78°. Winds: E. N. E., E. S. E., E. S. E. First part, wind light and pleasant; middle and latter parts, light and pleasant. At 2 P. M. wind at E. S. E. I have this day found an easterly set of 1 mile. In my previous voyages across the line, I have often experienced such a current between 5° and 8° north latitude, and 36° and 32° west longitude, but never so far north before.

Jan. 31. Lat. 11° 54′ N.; long. 36° 22′ W. Barometer, 29.80; temperature of air, 78°; of water,

78°. Winds: E., E. S. E., E. by S. First part, moderate breezes, and clear; middle and latter parts variable, and inclining to the southward.

Feb. 1. Lat. 9° 56′ N.; long. 34° 56′ W. Barometer, 29.80; temperature of air, 79°; of water, 80°. Winds: E., E. by N., E. N. E. Pleasant breezes, and clear; at midnight, wind more to the northward and eastward.

Feb. 2. Lat. 8° 11′ N.; long. 32° 55′ W. Barometer, 29.80; temperature of air, 80°; of water, 80°. Winds: E. by N., E. N. E., E. N. E. Fine breezes, with light rain squalls, latter part.

Feb. 3. Lat. 6° 21′ N.; long. 31° 15′ W. Barometer, 29.80; temperature of air, 80°; of water, 80°. Winds: E. N. E., E. by N. E. Moderate and light breezes, and pleasant weather, with occasionally rain squalls.

Feb. 4. Lat. 4° 35′ N. (D. R.); long. 29° 50′ W. Barometer, 29.70; temperature of air, 82°; of water, 81°. Winds: E. N. E., do. N. E. Begins with light winds and light rains. Middle, squally and rainy; latter part, N. E., wind with light rain and every appearance of losing the trades.

Feb. 5. Lat. 3° 08′ N.; long. 28° 40′ W. Barometer, 29.80; temperature of air, 80°; of water, 81°. Winds: N. E., E., E. N. E. Winds light and variable, with heavy rain squalls during the first and middle; latter part clear and steady.

Feb. 6. Lat. no obs.; long. 28° 30′ W. (D. R.). Barometer, 29.70; temperature of air, 80°; of water, 80°. Winds: E. S. E., calm, S. E. First part, light airs; middle part, heavy; 2 A. M. a light breeze. Ends moderate with passing clouds. Barometer, 29.70 to 29.95.

Feb. 7. Lat. 1° 40′ N.; long. 28° 20′ W. (D. R.) Barometer, 29.70; temperature of air, 80°; of water, 81°. Winds: E. S. E., calm. Begins with a moderate breeze and cloudy. Middle and latter parts, calm with light rain.

Feb. 8. Lat. 1° 39′ N.; long. 29° 40′ W. Barometer, 29.70; temperature of air, 80°; of water 81°. Winds: variable, calm, S. E. Begins with light airs from S. E. to S., with light rain squalls. Ends with light airs and clear.

Feb. 9. Lat. 1° 07′ N.; long. 31° 15′ W. Barometer, 29.90; temperature of air, 82°; of water, 81°. Winds: calm, S. S. W., S. S. W. At 8 P. M. light breeze with rain. Midnight clear. Ends moderate and clear. At noon tacked to the eastward.

Feb. 10. Lat. 0° 30′ N.; long. 31° 14′ W. Barometer, 29.80; temperature of air, 83°; of water, 82°. Winds: S. S. W., to S. S. W., S. E. Commences light and clear; 8 P. M. tacked to westward. At 1 A. M. squally with rain, wind light and variable. Ends light and steady.

Feb. 11. Lat. 1° 11′ S.; long. 31° 28′ W. Barometer, 29.80; temperature of air, 82°; of water, 82°. Winds: S. E., S. E. by E., do. Light winds and clear. Crossed the equator at 9 h. 20 m. P. M.; long. 31° 20′; 30 days from Sandy Hook.

Feb. 12. Lat. 3° 16′ S.; long. 31° 49′ W. Barometer, 29.70; temperature of air, 82°; of water, 82°. Winds: S. E. by E., do., S. E. First and middle parts, light and pleasant; latter moderate.

Feb. 13. Lat. 5° 42′ S.; long. 33° 12′ W. Barometer, 29.90; temperature of air, 82°; of water, 82°.

Winds: S. E. by S., S. E. by E., do. Moderate breezes and clear. 1 h. 30 m. P. M. made the island Fernando de Noronha, bearing per comp. S. W. 45 miles; passed within six miles of it.

Ship Esther, Boston to San Francisco.

Jan. 26, 1853. Lat. 19° 05′ N.; long. 37° 50′ W. Variation, 11° westerly. Barometer, 29.40; temperature of air, 74°; of water, 75°. Winds: E., E. N. E., and E. N. E. First part, squally; latter part, strong breeze.

Jan. 27. Lat. 16° 08′ N.; long. 36° 22′ W. Variation, 14° W. Barometer, 29.40; temperature of air, 74°; of water, 75. Winds: E. N. E., N. N. E., and E. by N. Fine breezes, a squall from the S. S. W. at midnight.

Jan. 28. Lat. 13° 48′ N.; long. 35° 15′ W. Barometer, 29.30; temperature of air, 74°; of water, 75°. Winds: E., E. by S., and E. by S. Light breezes and pleasant weather.

Jan. 29. Lat. 11° 40′ N.; long. 34° 25′ W. Temperature of air, 76°; of water, 77°. Winds: E., and E. by S. Light breezes, with squalls from the south.

Jan. 30. Lat. 9° 56′ N.; long. 32° 35′ W. Temperature of air, 77°; of water, 78°. Wind: E. N. E. throughout. Light breezes.

Jan. 31. Lat. 7° 25′; long. 31° 05′ W. Temperature of air, 79°; of water, 80°. Wind: E. N. E. throughout, fresh breezes and cloudy, with occasional rain.

Feb. 1. Lat. 4° 40′ N.; long. 30° 05′ W. Barometer, 29.30; temperature of air, 79°; of water, 80°. Winds: E. by S., E. N. E., and E. N. E. Moderate, with squalls; a heavy head sea.

Feb. 2. Lat. 2° 04′ N.; long. 30° 00′ W. Current, 18 miles, N. W. Variation, 11° W. Barometer, 29.40; temperature of air, 81°; of water, 80°. Winds: east, east, and N. E. Pleasant breezes, all sail set. I think I have shortened my passage to the equator ten days by following Maury's Directions, or Chart.

Feb. 3. Lat. 00° 15′ N.; long. 30° 10′ W. Current, 20 miles, W. N. W. Barometer, 29.40; temperature of air, 81°. Winds: east, E. N. E., and E. by N. Pleasant breezes.

Feb. 4. Lat. 1° 25′ S.; long. 31° 00′ W. Current, 15 miles, west. Variation, 8° W. Temperature of air, 80°; of water, 81°. Winds: E. S. E., S. E., and S. E. by S. First part, light breezes; middle part, heavy squall; latter part, fresh.

Feb. 5. Lat. 3° 20′ S.; long. 32° 05′ W. Current, 15 miles, west. Barometer, 29.40; temperature of air, 80°; of water, 81°. Wind: S. E. by S. throughout; pleasant breezes.

Feb. 6. Lat. 5° 45′ S.; long. 33° 05′ W. Barometer, 29.40; temperature of air, 81°; of water, 81°. Wind: S. E. by E.; pleasant breezes. At 6 P. M. passed the Island of Fernando de Noronha, about 6 miles to leeward of it.

Ship Masconoma (A. D. Cobb), Boston to San Francisco, 21 days out.

Jan. 27, 1853. Lat. 19° 18′ N.; long. 31° 11′ W. Current per hour, three-quarter knot, south. Baro-

meter, 29.00; temperature of air, 68°; of water, 73. Winds: east; variable, E. by S. Strong winds, with heavy squalls in middle part.

Jan. 28. Lat. 17° 17′ N.; long. 29° 22′ W. Current, three-quarter knot, S. W. Barometer, 29.00; temperature of air, 70°; of water, 72°. Winds: E. by S., E. N. E., E. N. E. First part, strong winds, with frequent rain squalls; middle and latter parts, steady breezes, with fine weather.

Jan. 29. Lat. 16° 15′ N.; long. 28° 13′ W. Barometer, 29.50; temperature of air, 72°; of water, 73°. Winds: E. by N., east, E. by N. Moderate breezes.

Jan. 30. Lat. 14° 07′ N.; long. 27° 22′ W. Current, half knot, S. S. E. Barometer, 30.00; temperature of air, 73; of water, 73°. Winds: E. by N., east, do. First part, light variable airs; middle, moderate; latter, strong winds, with a heavy N. E. swell. Saw a number of sperm whales.

Jan. 31. Lat. 11° 34′ N.; long. 25° 35′ W. Barometer, 30.00; temperature of air, 72°; of water, 75°. Winds: E., E. by N., E. by N.; strong wind and cloudy, with passing squalls.

Feb. 1. Lat. 8° 39′ N.; long. 23° 45′ W. Barometer, 29.00; temperature of air, 75°; of water, 77°. Winds: E. by N., E. by N., E. N. E.; first part strong breezes and cloudy; middle light with rain squalls; latter, fine breezes; pleasant weather.

Feb. 2. Lat. 5° 55′ N.; long. 23° 13 ′W. Current, ½ knot, S. Barometer, 28.50; temperature of air, 77°; of water 78. Winds: E. N. E., E. N. E., E. N. E.; pleasant breezes.

Feb. 3. Lat. 4° 29′ N.; long. 22° 42′ W. Current, ½ knot, S. S. E. Barometer, 28.50; temperature of air, 78°; of water, 78. Winds: N. E., E. by S., N. E.; light winds, and pleasant.

Feb. 4. Lat 3° 38′ N.; long. 22° 15′ W. Barometer, 28.00; temperature of air, 78°; of water, 80°. Winds: N. N. E., S. E., S.; first part light winds, and cloudy; middle and latter light, variable winds, with rain.

Feb. 5. Lat. 3° 13′ N.; long. 22° 25′ W. Barometer, 28.00; temperature of air, 78; of water 80°. Winds: N. by E., N. E., E.; light and variable, rain, *thunder and lightning.*

Feb. 6. Lat. 2° 39′ N.; long. 22° 35′ W. Barometer, 28.00; temperature of air, 78°; of water, 80°. Winds: N. N. E., S. E., N. E.; wind and weather, the same as yesterday.

Feb. 7. Lat. 1° 55′ N.; long. 22° 47′ W. Barometer, 28.00; temperature of air, 78°; of water, 79°. Winds: N. N. E., E., N. N. E.; light and variable, and calm; abundance of rain.

Feb. 8. Lat. 1° 44′ N.; long. 22° 47′ W. Current, 1 knot, N. N. E. Barometer, 28.82; temperature of air, 78°; of water, 79°. Winds: E., N. W., S. W. by S.; light airs, and calm. Having good observations find a N. E. current, during the last four days, but owing to unsteadiness of winds, cannot determine the amount.

Feb. 9. Lat. 1° 26′ N.; long. 23° 10′ W. Current, ¾ knot, N. W. Barometer, 28.82; temperature of air, 75°; of water, 79°. Winds: S. S. W., S., S. by W.; light baffling airs, and clear.

Feb. 10. Lat. 0° 37′ N.; long. 24° 57′ W. Current, 1 knot, W. Barometer 28.83; temperature of air, 78°; water, 78°. Winds: S., S. by E., S. by E.; light wind, and fine weather.

Feb. 11. Lat. 0° 38′ S.; long. 25° 25′ W. Current, ½ knot, S. W. Barometer, 29.00; temperature of

air, 78°; of water, 79°. Winds: S. S. E., S. E. by E., S. E. by E.; first, and middle parts light wind, latter part calm.

Feb. 12. Lat. 1° 39′ S.; long. 26° 42′ W. Current, ¾ knot, S. W. Barometer, 29.00; temperature of air, 80°; of water, 81°. Winds: S. E. by S., S. by E., S. by E.; light wind, and pleasant.

Feb. 13. Lat. 2° 47′ S.; long. 28° 22′ W. Barometer, 28.90; temperature of air, 81°; of water, 81°. Winds: S. by W., S. by W., S. by E.; light winds and pleasant. I find the *old route* bad; shall try the new next time. [We are determined to purchase this conclusion by your own experience.]

Feb. 14. Lat. 4° 9′ S.; long. 29° 12′ W. Barometer, 28.85; temperature of air, 81°; water, 81°. Winds: S., S. by E., S. S. E.; light winds and fine weather. Barometer rises and falls about $\frac{5}{10}$ since we passed 6° N.; rising in the morning and falling about 4 or 5 P. M. [See what Roberts, of the Storm, p. 435, says about it in north lat.]

New York to Rio.—FEBRUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From 40° 27′ N.	74° 00′ W.	to									
39 11	70 00	E. S. E.	199	5.1	209	1.3	7.3	5.9	85.5	6.2	303
37 33	65 00	E. S. E.	256	2.7	263	0.0	5.7	2.3	92.0	4.5	87
35 53	60 00	E. S. E.	263	1.2	280	7.0	9.0	6.0	84.0	1.0	100
35 53	55 00 *d*	E.	243	7.2	260	3.0	5.0	4.0	88.0	1.0	100
35 00	53 12	E. S. E.	144	5.7	151	1.3	12.2	14.8	78.4	4.0	74
33 21	50 00	S. E.	225	0.0	225	0.0	0.0	0.0	100.0	3.5	28
32 54	48 13	E. S. E.	98	2.1	100	0.0	5.5	5.5	88.9	0.0	18
30 00	45 00	S. E.	240	3.8	249	0.0	5.5	11.1	83.4	0.0	18
25 38	40 00 *d*	S. E.	372	0.0	372	0.0	0.0	0.0	100.0	0.0	20
25 00	40 00	S.	38	11.5	42	3.7	14.8	7.4	74.1	18.2 *e*	27
20 00	37 45	S. S. E.	324	9.3	354	4.8	1.6	3.2	90.3	3.1	62
15 00	35 35	S. S. E.	324	1.6	329	0.0	*w* 8.0	0.0	92.0	0.0	25
10 00	33 28	S. S. E.	324	0.0	324	0.0	0.0	0.0	100.0	0.0	31
5 00	31 23 *d*	S. S. E.	324	0.0	324	0.0	0.0	0.0	100.0	5.3 *e*	18
Equator	31 23 *d*	S.	300	3.7	311	0.0	*w* 14.7	0.0	85.3	2.7	108
1 00 S.	32 00	S. S. W. ¾ W.	72	5.1	76	0.0	*w* 19.0	0.0	81.0	1.7	289
3 00	32 50	S. S. W.	130	6.5	138	0.0	*w* 21.6	0.0	78.4	0.0	28
3 24	33 00	S. S. W.	26	0.0	26	0.0		0.0	100.0	0.0	9
5 00	33 40	S. S. W.	104	3.0	107	0.0	*w* 25.0	0.0	75.0	0.0	12
7 00	33 40 *d*	S.	120	0.0	110	0.0	0.0	0.0	100.0	0.0	11
7 48	34 00	S. S. W.	52	0.0	52	0.0	0.0	0.0	100.0	0.0	22
9 00	34 30	S. S. W.	78	5.2	82	0.0	*w* 13.0	0.0	87.0	0.0	23

Shortest distance to the equator by this route, 3,674 miles. Average distance to be sailed on account of adverse winds, 3,793.

The route for this month is the most favorable. In no part of it is the average of winds that are entirely fair, less than 74 in 100; and generally the northern or larboard side is the windward side. The

passage to the line has been frequently made by vessels that have followed this route, in 19 and 20 days, and even in 17 days.

Ship Lucknow (D. Plumer), Boston to California, fourteen days out.

January 29, 1853. Lat. 19° 59′ N.; long. 35° 22′ W. Barometer, 30.00; temperature of air, 74°; of water, 76°. Winds: E. by N., east, E. by S. Brisk trade-winds, and cloudy, with occasional rain squalls, during which the wind invariably hauls two or three points to the S. E. Barometer at a stand.

Jan. 30. Lat. 16° 11′ N.; long. 34° 18′ W. Barometer, 30.00; temperature of air, 72°; of water, 75°. Winds: E. by S., baffling, in squalls to S. E., throughout. Brisk breezes, and cloudy, with frequent squalls from S. E., and showers of rain throughout.

Jan. 31. Lat. 13° 05′ N.; long. 33° 21′ W. Barometer, 30.00; temperature of air, 73°; of water, 76°. Winds: E. by S., E. by S., east; first and middle parts, strong breezes, with frequent squalls; latter part, fresh breezes, and pleasant. Saw an unusual number of flying-fish.

Feb. 1. Lat. 10° 06′ N.; long. 31° 50′ W. Current, 10 miles, east. Barometer, 29.92; temperature of air, 76°; water, 79°. Wind east. Fine breezes and cloudy, with occasional light showers.

Feb. 2. Lat. 7° 19′ N.; long. 29° 46′ W. Barometer, 29.90; temperature of air, 78°; of water, 79°. Wind E. by N.; fine trades, and hazy; strong tide rips at times, but found no current.

Feb. 3. Lat. 4° 34′ N.; long. 28° 04′ W. Current, 24 miles, S. 42° E. Barometer, 29.86; temperature of air, 80°; of water, 81°. Wind E. by N. Light trades, and pleasant; sea unusually smooth; some tide rips.

Feb. 4. Lat. 2° 55′ N.; long. 28° 01′ W. Barometer, 29.85; temperature of air, 81°; of water, 81°. Winds: E. by S., E. S. E. by S. Light air from east to S. S. E; baffling, with calms, and light rain squalls.

Feb. 5. Lat. 1° 31′ N.; long. 28° 39′ W. Current, 27 miles N., 57° E. Barometer, 29.84; temperature of air, 82°; of water, 81°. Winds: S. E. by S., S. E. by S., S. S. E. Light airs from S. E. to S. S. E., and pleasant; sea very smooth.

Feb. 6. Lat. 0° 06′ N.; long. 30° 33′ W. Current, 15 miles, west. Barometer, 29.62; temperature of air, 81°; of water, 80°. Winds: S. S. E., S. S. E., S. by E. Light airs from S. S. E., and pleasant, first and middle parts. At midnight, being, by account, up with St. Paul's, and having the water unusually smooth, suppose we passed to leeward of it, very near; but, being rather hazy, saw nothing. Latter part, brisk breezes, and pleasant, but a little too far to the southward to suit me; but I trust the wind will be a little farther to the eastward before long. Strong tide rips through the night.

Feb. 7. Lat. 1° 07′ S.; long. 31° 32′ W. Barometer, 29.84; temperature of air, 81°; of water, 80°. Winds: southward, east, S. by E., S. by E., south and S. S. E. Moderate breezes, and pleasant. At 1 hour 30 min. P. M. crossed the equator, just 22 days from Boston Light, on the meridian of 30° 40′ W., having sailed, by log, 3,803 miles, and courses made good, 3,782. [No circumstance, not even the actual performance of the passage within a given time, tends so strikingly to prove the correctness of the data upon which these Charts are founded, and the accuracy of the calculations derived from them. Taking into account

the detour which a ship has to make on account of head winds, the distance to be sailed is calculated. The Lucknow tries it, and her distance sailed differs only 10 miles from the computed distance.] At 8 tacked to the eastward, and at noon to S. W.

Feb. 8. Lat. 2° 37′ S.; long. 32° 33′ W. Barometer, 29.82; temperature of air, 82°; of water, 81°. Wind: S. S. E. Light airs from S. by E. to S. E.; standing to the southward and westward; weather fine, and sea smooth.

Feb. 9. Lat. 4° 16′ S.; long. 33° 24′ W. Current, 20 miles S., 62° W. Barometer, 29.87; temperature of air, 81°; of water, 81°. Winds: S. E., S. E. by E., S. E. Light airs throughout, with the exception of a brisk breeze for an hour or two after sunrise. Passed the Roccas without seeing them, but saw thousands of birds which I have noticed before in this vicinity.

Bark Falcon (John A. Phipps), Boston to Canton, thirteen days out.

Jan. 28, 1852. Lat. 26° 45′ N.; long. 42° 22′ W. Current, one mile per hour, N. N. W. ½ W. Barometer, 30.40; temperature of air, 72°; of water, 72°. Winds: E. S. E. squally, the wind flying from S. E. to E. by S. I had rather take my chance on the N. E. tack at present; if it was winter, I should think otherwise.

Jan. 29. Lat. 28° 14′ N.; long. 41° 26′ W. Current, one-quarter of a knot per hour, W. ½ S. Barometer, 30.50; temperature of air, 70°; of water, 71°. Winds: E. S. E., S. E., S. E. by E.; strong breezes and hard squalls; wind hauling from S. S. E. to E. S. E. with a high sharp sea. I have been eighteen years master of a ship in about this same track, and never experienced the like before.

Jan. 30. Lat. 29° 56′ N.; long. 39° 42′ W. Current, one knot per hour, N. W. Barometer, 30.45; temperature of air, 69°; of water, 68°. Winds: E. S. E., E. S. E., S. S. E.; begins good breezes and the same squalls of wind.

Jan. 31. Lat. 30° 10′ N.; long. 38° 32′ W. Current, three-quarters of a knot per hour, N. W. by W. Barometer, 30.45; temperature of air, 68°; of water, 68°. Winds: S. S. E. South, S. by W.; during these twenty-four hours unsteady, with some squalls.

Feb. 1. Lat. 30° 29′ N.; long. 37° 36′ W. Current, three-quarters of a knot per hour, North; barometer, 30.45; temperature of air, 68°; of water, 69°. Winds: S. S. E., South, calm; baffling winds and very light airs; some calms. I have been both sides of the January track, and find it all alike this time.

Feb. 2. Lat. 30° 22′ N.; long. 37° 39′ W. No current. Barometer, 30.40; temperature of air, 69°; of water, 69°. Winds: calm, calm, E. S. E.; first and middle parts calm, with a high swell; ends with light airs. I made up my mind to try your track this time; have been on it, to the westward and eastward of it, and have made up my mind that the old and new are all alike just now. Bad luck follows me so far.

Feb. 3. Lat. 27° 47′ N.; long. D. R. 37° 53′ W. Barometer, 30.40; temperature of air, 68°; of water, 69°. Winds: S. E., S. E., S. E.; strong winds and hard squalls; hard luck this.

Feb. 4. Lat. 24° 53′ N.; long. 38° 31′ W. Barometer, 30.40; temperature of air, 71°; of water, 72°. Winds: S. S. E., S. E., S. E.; brisk breezes with some squalls; all sails set.

Feb. 5. Lat. 21° 53′ N.; long. 37° 27′ W. Current, W. N. W., three-quarters of a knot per hour. Barometer, 30.35; temperature of air, 72°; of water, 72°. Winds: E. S. E., E. by S., E. S. E.; strong breezes and squally; close hauled by the wind; baffling in squalls.

Feb. 6. Lat. 18° 37′ N.; long. 36° 13′ W. Current none. Barometer, 30.30; temperature of air, 73°; of water, 72°. Winds: E. S. E., E. by S., E. by S.; strong winds and flawey; sharp on a wind.

Feb. 7. Lat. 15° 19′ N.; long. 34° 41′ W. Barometer, 30.25; temperature of air, 73°; of water, 74°. Wind: E. by S.; first and middle parts, strong breezes; latter part, more moderate. Passed through several tide rips.

Feb. 8. Lat. 12° 19′ N.; long. 33° 21′ W. Current, W. ½ N., 1½ knots. Barometer, 30.20; temperature of air, 74°; of water, 75°. Winds: E., E. ½ S., E. by S; brisk breezes and hazy.

Feb. 9. Lat. 9° 30′ N.; long. 31° 37′ W. Current, N., ¾ knot. Barometer, 30.20; temperature of air, 75°; of water, 76°. Wind E.; good breezes and hazy.

Feb. 10. Lat. 6° 59′ N.; long. 29° 16′ W. Barometer, 30.10; temperature of air, 76°; of water, 77°. Winds: E., E. by N., E. by N.; brisk breezes, all sail set by the wind.

Feb. 11. Lat. 4° 24′ N.; long. 27° 30′ W. Current, N., ¾ of a knot. Barometer, 30.10; temperature of air, 78°; of water, 78°. Wind: E. N. E.; fine breezes. This day is the first of the N. E. trades with any northing in it. [You should have made a south course good.]

Feb. 12. Lat. 1° 24′ N.; long. 26° 46′ W. Current, N. W., ½ knot per hour. Barometer, 30.10; temperature of air, 79°; of water, 80°. Winds: E. by N., E., E.; fine breezes.

Feb. 13. Lat. D. R. 00° 24′ N.; long. 26° 40′ W. Barometer, 30.10; temperature of air, 79°; of water, 80°. Winds: E., S. E., S. E. At 2 P. M. lost the trade-wind; remainder of the day light airs and variable. [29 days to the line, is not so bad after all.]

Feb. 14. Lat. 01° 10′ S.; long. 27° 37′ W. Current, S. S. W., 1 knot. Barometer, 30.10; temperature of air, 81°; of water, 80°. Wind variable from E. N. E. to S. by E.; light baffling winds, calm at times. [The chances are, that, further west, you would have escaped those calms to a considerable degree at least.]

Ship Astrea (Charles H. Gerrish), New York to San Francisco, 1853, 25 days out.

Jan. 27. Lat. 20° 19′ N.; long. 31° 53′ W. Current, S. 22° E., ½ knot per hour. Variation, 12° 45′ W. Barometer, 29.7; temperature of air, 73°; of water, 73°. Winds: E. N. E., E., E. N. E.; first part, fresh gales thick and squally; middle, more moderate; latter, strong breezes and squally.

Jan. 28. Lat. 17° 40′ N.; long. 31° 02′ W. Barometer, 29.6; temperature of air, 73°; of water, 75°. Winds: E. by N., E. N. E., E. N. E.

Jan. 29. Lat. 16° 27′ N.; long. 30° 31′ W. Barometer, 29.7; temperature of air, 74°; of water, 74°. Winds: E. N. E., E. by S., E. by N.; first part, moderate steady trades; middle and latter, clear and pleasant.

Jan. 30. Lat. 14° 10′ N.; long. 30° 04′ W. Barometer, 29.7; temperature of air, 74°; of water, 74°. Winds: E. N. E., E. S. E., E. N. E.; first part moderate; middle and latter, thick and squally.

Jan. 31. Lat. 11° 20′ N.; long. 29° 5′ W. Variation, 9° 57′ W. Barometer, 29.60; temperature of air, 76°; of water, 76°. Winds: E. by N., E. N. E., E. N. E. Fresh gales and squally throughout.

Feb. 1. Lat. 8° 45′ N.; long. 28° W. Barometer, 29.60; temperature of air, 77°; of water, 79°. Winds: E., E. N. E., and E. N. E. First part, fresh gales and cloudy squally weather; middle and latter part, sharp squall; under double reefs.

Feb. 2. Lat. 6° 30′ N.; long. 27° 4′ W. Barometer, 29.60; temperature of air, 79°; of water, 80°. Wind: E. N. E. First part, strong breezes and cloudy; middle and latter part, moderate and pleasant.

Feb. 3. Lat. 4° 22′ N.; long. 26° 43′ W. Barometer, 29.60; temperature of air, 79°; of water, 80°. Winds: east, E. by S., and east. Pleasant breezes and clear weather.

Feb. 4. Lat. 3° 29′ N.; long. 26° 34′ W. Barometer, 29.60; temperature of air, 79°; of water, 80°. Winds: east, southerly, S. E. All sorts of wind and weather, with rain during the latter part.

Feb. 5. Lat. 3° 9′ N.; long. 26° 40′ W. Barometer, 29.60; variation, 8° W.; temperature of air, 79°; of water, 80°. Winds: S. E., S. S. E., E. N. E. Light airs, and thick squally weather; middle part, rain.

Feb. 6. Lat. 2° 12′ N.; long. 26° 45′ W. Barometer, 29.60; temperature of air, 81°; of water, 80°. Winds: E. by N., S. E., S. S. E. Light breezes, and thick cloudy weather.

Feb. 7. No observation. Barometer, 29.60; temperature of air, 80°; of water, 80°. Winds: S. E. south, and S. S. E. Light variable airs and calms, with thick rainy weather.

Feb. 8. Lat. 1° 46′ N.; long. 27° 14′ W. Barometer, 29.50; temperature of air, 82°; of water, 81°. Winds: south, calm, S. S. W. Light variable airs and calms, with rainy weather.

Feb. 9. No observation. Current, S. 45°; E. 12 miles. Barometer, 29.50; temperature of air, 81°; of water, 80°. Winds: south, S. S. E. and S. E. First part, light airs and calms, and cloudy. Lowered a boat to try the current, and found it to be as mentioned above.

Feb. 10. Lat. 1° N.; long. 27° 50′ W. Current, 10 miles, N. W. Barometer, 29.50; temperature of air, 82°; of water, 80°. Wind: S. S. E., S. E., S. E. Light airs and pleasant weather. Tried the current again with a boat. This satisfies me that there is a current hereabout that changes its set as often as once in 24 hours. "I have frequently noticed, when lying becalmed for two or three days at a time, within two or three days north and south of the line, and east of long. 30° W., that the ship would be set from 10 to 20 miles N. W. one day, and the next day as many miles to the S. and E." I have also noticed a strong easterly current to the E. of 24° 30′ west longitude, but never noticed any westerly set there. Ends pleasant.

Feb. 11. Lat. 18′ N.; long. 27° 52′ W. Barometer, 29.60; temperature of air, 82°; of water, 80°; Winds: S. E., S. E. by S., S. E. Light variable airs, and pleasant.

[Compare this with the Lucknow, p. 446. She was from New York also, but she had 14 days to the parallel of 20° N., which she crossed 3½ degrees west of where the Astrea crossed it. From this parallel to the equator, the western ship had 8, the eastern 15 days. Now compare their tracks with the route per table for February, and see which of the two were following most closely the *Sailing Directions*.]

Feb. 12. Lat. 35′ S.; long. 28° 6′ W. Barometer, 28.50; temperature of air, 84°; of water, 83°. Winds: S. E., S. S. E., and south. Light, variable airs, and pleasant. Crossed the equator at 2 A. M., in longitude 28° W.

Feb. 13. Lat. 00° 24′ S.; long. 27° 57′ W. Barometer, 29.50; temperature of air, 83°; of water, 82°. Winds: S., S S. E., and S.; light, variable airs, and pleasant. Current N., 45° E.; 24 miles.

Feb. 14. Lat. 00° 27′ S.; long. 27° 41′. Barometer, 29.50; temperature of air, 82°; of water, 84°. Winds: S. S. W., S., and S. E.; light, variable airs, and pleasant. Current S., 67° E.; 24 miles.

Feb. 15. Lat. 0° 52′ S.; long. 27° 22′ W. Barometer, 29.50. Current S., 45° E.; 48 miles; temperature of air, 82°; of water, 81. Winds: S. E., E. S. E., and S. E.; light breezes, and pleasant.

Feb. 16. Lat. 2° 16′ S.; long. 28° 33′ W. Current N., 36° W.; 36 miles; variation, 6° 45′ W. Barometer, 29.60; temperature of air and water, 81°. Winds: S. E., S. S. E., and S. E.; light breezes; first part, pleasant; latter part, cloudy.

Feb. 17. Lat. 4° 32′ S.; long. 29° 21′ W. Barometer, 29.60; temperature of air, 82°; of water, 80. Winds: S., S. S. E., S. E.; fresh breezes and flying clouds.

Feb. 18. Lat. 6° 36′ S.; long. 29° 59′ W. Barometer, 29.60; temperature of air, 82°; of water, 81. Winds: S. E., E. by S., S. E.; fresh breezes, and pleasant.

Ship Simoom (M. Smith), New York to San Francisco, ten days out.

Feb. 4, 1853. Lat. 25° 56′ N.; long. 36° 57′ W. Barometer, 29.80; temperature of air, 82°; of water, 82°. Winds: S. E., S. S. E., S. S. E. Commences moderate and showery; latter part, fresh breezes, and squally. At 3 A. M. a brilliant meteor in the east fell from 50° to 15°, visible; a quantity of sea-weed hanging from S. E. to N. W. N. B. From the 22d ult. to the 1st inst. (that is, from the Bermudas to 350 miles S. by W. of the Azores), 11 days, we had the wind from S. S. E. to S. S. W.; and, in the forenoon, it generally inclined two or three points to the eastward; in the afternoon, it changed back. I recollect the last few years (in the Niagara, running to Liverpool), while S. and S. E. of Newfoundland in the summer, it would veer around the compass with the sun, once in 24 hours, for four or five days.

Feb. 5. Lat. 23° 09′ N.; long. 39° 17′ W. Barometer, 29.70; temperature of air, 77°; of water, 73°. Wind: S. S. E. throughout; frequent rain squalls in the night, severe.

Feb. 6. Lat. 21° 17′ N.; long. 41° 17′ W. Barometer, 29.90; temperature of air, 78°; of water, 77°. Winds: S. S. E., S. S. W., S.; squally.

Feb. 7. Lat. 19° 35′ N.; long. 44° 41′ W. Barometer, 29.70; temperature of air; 80°; of water, 77°. Wind south throughout, moderate and cloudy. At 4 P. M. sharp lightning in the west. At noon, tacked ship.

Feb. 8. Lat. 17° 10′ N.; long. 45° 25′ W. Barometer, 29.75; temperature of air, 80°.5; of water, 78°. Winds: S. S. E. to east, S. E., do. Moderate and variable. Midnight, fresh; ends light. At 5 P. M. tacked to the southward.

Feb. 9. Lat. 14° 04′ N.; long. 44° 26′ W. Barometer, 29.70; temperature of air, 78°; of water, 78°.

Winds: E. S. E., E. do. Moderate and squally; in the evening the trade-wind commenced. I have, at no time, had so much southwesterly wind before this; according to your Charts it ought to be N. E., but it is barely east.

Feb. 10. Lat. 11° 40′ N.; long. 43° 27′ W. Barometer, 29.70; temperature of air, 82°; of water, 78°. Wind east throughout. Commences fresh breezes, cloudy, and hazy. Morning, cleared off. 8 A. M. tacked to the northward.

Feb. 11. Lat. 10° 38′ N.; long. 42° 23′ W. Barometer, 29.70; temperature of air, 79°; of water, 78°. Wind east throughout. Moderate and pleasant; tacked south.

Feb. 12. Lat. 8° 12′ N.; long. 40° 15′ W. Barometer, 29.70; temperature of air, 80°; of water, 78°. Winds: E., E. N. E., E. N. E. First part, pleasant; latter, squally.

Feb. 13. Lat. 5° 29′ N.; long. 37° 43′ W. Barometer, 29.65; temperature of air, 82; of water, 78°. Winds: E. N. E. variable, E. N. E., east variable. Commences fresh and squally. The upper strata of clouds are passing to the east by the sun; ends light and cloudy.

Feb. 14. Lat. 4° 04′ N.; long. 36° 53′ W. Barometer, 29.65; temperature of air, 81°; of water, 78°. Winds: east, S. S. E., variable, east. Moderate and showers. Midnight, tacked to the east. At 5 A. M. to S. S. E.; ends light, with passing clouds.

Feb. 15. Lat. 2° 58′ N.; long. 34° 57′ W. Temperature of water, 79°. Winds: S. E., E. N.E., N. E. First part light air; ends light N. E. breezes.

Feb. 16. Lat. 1° 51′ N.; long. 34° 27′ W. Barometer, 29.70; temperature of air, 88°; of water, 82°. of water (ten feet below surface), 81°. Winds: N. E., calm, S. E., S. E. First part, light N. E. wind; midnight, calm; latter, light S. E.; so we passed from the N. E. to the S. E. trades last night.

Feb. 17. Lat. 1° 01′ N.; long. 34° 28′ W. Barometer, 29.65; temperature of air, 87°. Winds: S. E. inclining south, S. E. by S., S. E. by S. to S. E. by E. Commences light and pleasant. At 8 P. M. broke off to S. W. westerly, tacked. At 4 A. M. inclining eastwardly, tacked to S. by W.; ends fresh and cloudy.

Feb. 18. Lat. 1° 15′ S.; long. 35° 03′ W. Barometer, 29° 60; temperature of air, 86°. Winds: E. S. E., E. S. E., S. E. Forepart, fresh. At 8 P. M. flash of lightning E. by N., which, at midnight, passed north of us with a squall; ends light and cloudy; passed the equator at 9 P. M., in 34° 40′, 29 days out, from N. E. of Bermudas 26, with a constant head wind.

Feb. 19. Lat. 0° 11′ S.; long. 34° 07′ W. Barometer, 29.70; temperature of air, 83°; of water (ten feet below surface), 81°. Winds: S. E., E. S. E., E. S. E. Moderate and cloudy. At 30 min. P. M. tacked to E. N. E. Forepart of the night, sheet lightning at the N. E. and N.; ends moderate and cloudy. At 11 A. M. tacked to S. S. W.

Feb. 20. Lat. 3° 31′ S.; long. 35° 48 W.′ Barometer, 29.55; temperature of air, 84°. Wind: S. E. by S. throughout. Fresh breezes and cloudy; running ten and a half to eleven and a half knots during the night; yards very sharp up; are 70 miles from land, and shall fall 60 to leeward of Point Tairo; then for the race, whether the Simoom or Cape St. Roque can beat fastest to windward; this makes the 29th day of head winds.

Feb. 21. Lat. 4° 50′ S.; long. 36° 15′ W. Barometer, 29.10; temperature of air, 83°; of water (ten feet below surface), 80°. Wind east throughout. Fresh winds, inclining more to the north when nearing. Tacked to the north at 7 P. M., to the S. S. E. at 3 A. M., to the north at 11 hours 45 min. A. M.; close to the breakers, W. N. W. from Point Tairo. Current, one and a half miles per hour, W. N. W.

Feb. 22. Lat. 3° 38′ S.; long. 35° 48′ W. Barometer, 29.65; temperature of air, 84°; of water (10 feet below surface) 81°. Winds: E., E. S. E., E. S. E. Forepart, fresh; night, light sheet lightning in the south over the land. Working ahead slowly along the land. Ends with light breezes.

Feb. 23. Lat. 3° 05′ S.; long. 34° 36′ W. Current, five-sixth of a mile per hour, west. Barometer, 29° 75′; temperature of air, 87°. Wind: S. E. throughout. First, fresh and clear; working to the eastward. At midnight, a white meteor with red flashes, "not large," passed rapidly with the horizon, in the S. E. sky, 25° high, 45° in a N. E. direction. Ends hazy.

Feb. 24. Lat. 2° 07′ S.; long. 33° 31′ W. Current, 36 miles W., 14° N. Barometer, 29.65; temperature of air, 86°. Wind: S. E. Moderate and smoky, with passing clouds; towards morning, light and squally. At 8 A. M. tacked to S. S. W.

Feb. 25. Lat. 5° 11′ S.; long. 34° 39′ W. Current, N. 12° W., six-tenths of a mile per hour. Barometer, 29.66; temperature of air, 85°. Winds: S. E., do., S. S. E. Moderate and pleasant; have weathered Cape St. Roque after four days' hard beating.

Feb. 26. Lat. 6° 40′ S.; long. 34° 49′ W. Current (per hour), five-tenths of a mile N., 11° W. Barometer, 29.65; temperature of air, 83°. Winds: S. E., E. S. E., S. E. Fresh and pleasant. At 5 P. M. tacked to N. E. off Rio Grande del Norte. At 10, back again, and at 11.25 to N. E. in 10 fathoms water. Light airs.

Feb. 27. Lat. 7° 06′ S.; long. 34° 27′ W. Barometer, 29.70; temperature of air, 84°. Winds: S. E. Light and variable; working along in from 10 to 15 fathoms water. At noon, light wind at N. E.; the first, since by Bermuda, 35 days; three-fourths of that time it has been straight ahead. Has ever any one had it so contrary before, in January and February? Have made 350 miles the last nine days. At 10 P. M. lightning to the W. S. W. over the land.

[Bad luck you certainly had. But, notwithstanding you fell so far to leeward, and "the time" you had of it in weathering St. Roque, compare your track with the Astrea's (p. 448). She crossed 30° N. in 26° 40′ W., and had thence 13 days to 6° S. You crossed 3° N. in 35°, fell *far* to leeward, yet you crossed 6° S. two days ahead of the Astrea.]

RIO DE JANEIRO, *March* 22, 1853.

I herewith forward the abstract log of the ship Wings of the Morning, from New York to the port of Rio. On the 27th of January, the fifth day from New York, you will perceive that I carried away the main truss and wings of the main yard, together with the main topmast and all three top gallant-masts and jib-boom. For several days after, we had no sail except the fore and mizzen topsails, foresail, and spanker. From that time to sixteen north, with two days' exception, we had the winds principally from south to south-

west. Much of the time blowing fresh gales. Consequently, I was driven far to the eastward of the ship's intended course. From the time the ship lost her spars until I crossed the equator, without one exception, stood on the tack I could make the most latitude. We carried the N. E. trade to five, and took the wind S. S. E. in 2° N. Crossed the line in twenty-eight, and passed out of sight to windward of Noronha. The trades, both north and south, were very light. Your *very, very* valuable Sailing Directions and Charts I consider the best guide ever given to the navigator for pointing out the way to shorten the passage between New York and Rio, when it is practicable to follow them. The abstract of the remaining passages during the voyage will be forwarded from the different ports on my arrival.

Very respectfully yours,

H. H. LOVELL.

LIEUT. M. A. MAURY.

Ship Wings of the Morning (H. H. Lovell), New York, bound to San Francisco, 1853, twenty-two days out.

Feb. 14, 1853. Lat. 30° 08′ N.; long. 36° 48′ W. Barometer, 29.70; temperature of air, 68°. Winds: N. N. E., N. E., N. E.

Feb. 15. Lat. 27° 00′ N.; long. 36° 30′ W. Barometer, 28.0; temperature of air, 68°. Winds: E., S. E., S. E. by S.

Feb. 16. No observations. Barometer, 29.70. Winds: S., S. S. W., S. W. by S. Squally, with rain.

Feb. 17. Lat. 25° 43′ N.; long. 33° 30′ W. Barometer, 29.70. Winds: S. S. W. Ship under single reefs; squally.

Feb. 18. Lat. 24° 44′ N.; no observation for longitude. Barometer, 29.8. Winds: S. S. W., S. by W., S. W. Weather unsettled; single reefs.

Feb. 19. Lat. 23° 09′ N.; long. 29° 43′ W. Barometer, 29.9. Winds: S. S. W., S. W., S. by W. Squalls and rain throughout the day.

Feb. 20. Lat. 21° 50′ N.; long. 27° 28′ W. Barometer, 29.90. Winds: S. S. W., S. W., W. S. W. Weather unsettled, rainy and squally.

Feb. 21. Lat. 20° 00′ N.; long. 27° 08′ W. Barometer, 29.9. Winds: S. W., W. S. W., W. S. W. Changeable weather.

Feb. 22. Lat. 18° 33′ N.; long. 27° 08′ W. Barometer, 29.9; temperature of air, 68°. Winds: W. S. W., calm, W. Cloudy, with rain; thunder and lightning.

Feb. 23. Lat. 17° 12′ N.; long. 27° 08° W. Barometer, 30.00; temperature of air, 70°. Winds: W. S. W., calm, E. N. E.

Feb. 24. Lat. 14° 27′ N.; long. 27° 13′ W. Barometer, 30.00; temperature of air, 70°. Winds: E., E. N. E., E. N. E. All sail set.

Feb. 25. Lat. 11° 57′ N.; long. 27° 13′ W. Barometer, 30.00. Winds: E., E. N. E., E. N. E. All sail set.

Feb. 26. Lat. 10° 05′ N.; long. 26° 40′ W. Barometer, 30.00. Wind: N. E.; ½ knot per hour, easterly current.

Feb. 27. Lat. 8° 51′ N.; long. 26° 40′ W. Barometer, 30.00; temperature of air, 72°. Winds: N. by E., N. by E., N. E. A slight easterly current; winds very light.

Feb. 28. Lat. 7° 03′ N.; long. 26° 40′ W. Barometer, 30.00; temperature of air, 78°. Winds: N. N. E., N. N. E., N. E. Light breezes, and cloudy.

March 1. Lat. 4° 30′ N.; long. 26° 40′ W. Current, ¼ of a knot, east. Barometer, 30.00; temperature of air, 80°. Wind: N. N. E. Weather cloudy.

March 2. Lat. 3° 20′ N.; long. 26° 30′ W. Barometer, 30.00; temperature of air, 80°. Winds: N., N. N. W., S. W. Weather changeable.

March 3. Lat. 2° 04′ N.; long. 26° 30′ W. Barometer, 30.00; temperature of air, 80°. Winds: N. W., N., S. E. Rain.

March 4. Lat. 1° 06′ N.; long. 26° 31′ W. Barometer, 30.00; temperature of air, 80°. Winds: N., calm, S. E. Heavy looking squalls, but unattended with wind, and much rain.

March 5. Lat. 00° 55′ S.; long. 28° 22′ W. Barometer, 30.00; temperature of air, 81°. Winds: S. S. E., S., S. S. E. Pleasant weather.

March 6. Lat. 3° 20′ S.; long. 30° 00′ W. Current ½ knot per hour, W. Barometer, 30.00; temperature of air, 82°. Wind: S. S. E.

March 7. Lat. 5° 27′ S.; long. 31° 34′ W. Current same as yesterday. Barometer, 30.00; temperature of air, 82°. Winds: S. S. E., S. E., S. E. Light airs.

March 8. Lat. 7° 01′ S.; long. 31° 50′ W. Barometer, 29.9; temperature of air, 82°. Winds: S. E., E., E. Pleasant; all sail.

Golden Racer (B. M. Melcher), Boston to San Francisco, 22 days out.

Feb. 21, 1853. Lat. 19° 17′ N.; long. 30° 48′ W. Barometer, 30.00; temperature of air, 75°; of water, 74°. Winds: W., W. N. W., N. W. Light airs, and hazy.

Feb. 22. Lat. 18° 20′ N.; long. 30° 11′ W. Barometer, 30.00; temperature of air, 73°; of water, 73°. Winds: variable and calm; S. E. to S. W., W., S. W. First, light and variable; middle, heavy thunder, lightning, and rain. Ends light airs, and fine weather.

Feb. 23. Lat. 17° 27′ N.; long. 30° 17′ W. Barometer, 30.10; temperature of air, 76°; of water, 74°. Winds: W. S. W., calm, S. E. First and latter parts, light airs; middle calm.

Feb. 24. Lat. 15° 15′ N.; long. 30° 45′ W. Barometer, 30.10; temperature of air, 80°; of water, 74° Winds: S. E., S. E., S. S. E. Light breezes, and pleasant weather.

Feb. 25. Lat. 13° 25′ N.; long. 31° 11′ W. Barometer, 30.10; temperature of air, 81°; of water, 75°. Winds: S. E., S. E., by S., N. E. First and middle, light airs. Ends with moderate breezes.

Feb. 26. Lat. 11° 29′ N.; long. 31° 03′ W. Barometer, 30.10; temperature of air, 80°; of water, 75°. Winds: N. E., to E., S. E., S. E. by E., E. S. E. Light breezes, with calms.

Feb. 27. Lat. 9° 13′ N.; long. 30° 28′ W. Barometer, 30.10; temperature of air, 83°; of water, 78°. Winds: E. S. E., E. by S., E. by S. Light breezes, and pleasant weather.

Feb. 28. Lat. 6° 41′ N.; long. 29° 21′ W. Barometer, 30.10; temperature of air, 84°; of water, 78°. Winds: E. by S., E., E. Moderate breezes, and pleasant.

March 1. Lat. 4° 57′ N.; long. 28° 59′ W. Barometer, 30.00; temperature of air, 76°; of water, 77°. Winds: E., E. to S. W., S. W. to N. First, moderate breezes; middle, heavy rain squalls. Ends variable.

March 2. Lat. 3° 35′ N.; long. 29° 14′ W. Barometer, 30.00; temperature of air, 82°; of water, 81°. Winds: N. to S. E.; calm, W. Commences with fresh variable breezes; middle calm. Ends with light airs.

March 3. Lat. 2° 19′ N.; long. 29° 15′ W. Barometer, 30.10; temperature of air, 88°; of water, 82°. Winds: variable; light variable airs, with rain squalls.

March 4. Lat. 0° 01′ N.; long. 29° 55′ W. Barometer, 30.10; temperature of air, 77°; of water, 81°. Winds: E. S. E., S. E. by S., S. E. by S. Moderate breezes, with rain squalls.

March 5. Lat. 2° 37′ S.; long. 31° 15′ W. Barometer, 30.10; temperature of air, 63°; of water, 81°. Winds: S. E. by S., S. E. by S., S. E. by S. Moderate breezes, with light rain showers.

March 6. Lat. 5° 17′ S.; long. 32° 45′ W. Barometer, 30.20; temperature of air, 84°; of water, 81°. Winds: S. E. by S., S. S. E., S. E. by S. First and middle parts fresh breezes; latter moderate. Passed 8 miles west of Fernando de Noronha.

Ship Sea Serpent (Howland), New York for San Francisco, eleven days out.

Feb. 23, 1853. Lat. 22° 44′ N.; long. 41° 24′ W. Barometer, 29.70; temperature of air, 72; of water, 72°. Winds: S. W., S. W. by S., S. W. by S. Moderate and pleasant; brisk and squally; latter, steady breezes, with fine weather.

Feb. 24. Lat. 19° 25′ N.; long. 39° 26′ W. Barometer, 29.70; temperature of air, 72°; of water, 72°. Winds: S. W., N. W., N. N. W. Brisk and fine weather; middle, some rain; latter, moderate and fine weather.

Feb. 25. Lat. 18° 7′ N.; long. 38° 57′ W. Barometer, 29.80; temperature of air, 75°; of water, 76°. Winds: N. N. W., W. N. W., N. W. Light breezes, and fine weather.

Feb. 26. Lat. 16° 56′ N.; long. 37° 49′ W. Barometer, 29.80; temperature of air, 72°; of water, 74°. Winds: N. N. W., North, and N. N. E. Light breezes, and fine weather.

Feb. 27. Lat. 14° 29′ N.; long. 36° 30′ W. Barometer, 29.90; temperature of air, 73°; of water, 74°. Winds: North, N. E., E. N. E. Light breezes, and fine weather. At 6 P. M. took the N. E. trades. Lat. 15°. N.; long. 36° 13′ W.

Feb. 28. Lat. 11° 33′ N.; long. 34° 45′ W. Barometer, 29.80; temperature of air, 75°; of water, 75°. Wind: E. N. E. Moderate, unsteady breezes, with fine weather.

March 1. Lat. 8° 15′ N.; long. 32° 30′ W. Barometer, 29.80; temperature of air, 77°; of water, 80°. Winds: E. N. E., E. N. E., N. E. by E. Moderate, unsteady breezes, and squally; ends pleasant.

March 2. Lat. 5° 19′ N.; long. 30° 57′ W. Barometer, 29.75; temperature of air, 79°; of water, 80°. Winds: E. N. E., E. N. E., E. by N. Moderate, unsteady breezes, and fine weather.

March 3. Lat. 2° 52′ N.; long. 30° 04′ W. Barometer, 29.75; temperature of air, 82°; of water, 82°. Winds: E. by N., east, E. by N. Commences moderate and pleasant; middle, light and squally; latter, pleasant.

March 4. Lat. 0° 05′ S.; long. 30° 23′ W. Barometer, 29.75; temperature of air, 82°; of water, 82°. Winds: East, E. S. E., S. S. E. to E. by S. Moderate and unsteady; some rain; middle, variable and unsteady; ends pleasant. At 11 A. M. crossed the equator, in 19 days 16 hours.

March 5. Lat. 2° 57′ S.; long. 31° 21′ W. Barometer, 29.80; temperature of air, 83°; of water, 81°. Winds: S. E., S. E. by S., S. E. First, heavy clouds from S. E.; moderate breeze; middle, squally, with rain; ends pleasant, with a moderate breeze.

March. 6. Lat. 6° 14′ S.; long. 33° 12′ W. Barometer, 29.80; temperature of air, 82°; of water, 82°; Water (18 feet below surface) 81°. Winds: S. E. by S., S. E. by S., S. E. Moderate trade and fine weather. At 7 P. M., Fernando de Noronha bore west eight miles. Ends moderate, fine weather.

New York to Rio.—MARCH.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd or S'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From 40° 27′ N.	74° 00′ to										
39 11	70 00	E. S. E.	199	9.6	218	2.2	*w* 10.7	7.5	79.7	2.0	448
37 43	65 00	E. S. E.	256	7.0	274	1.4	7.8	7.0	83.9	2.0	353
36 03	60 00	E. S. E.	261	6.7	278	2.4	6.6	3.0	88.0	6.7	181
36 03	55 00 *d*	E.	243	6.5	259	2.1	6.3	4.9	86.7	4.7	142
35 00	53 43	S. E.	89	6.1	94	0.9	1.8	*w* 14.4	82.9	4.2	113
31 53	50 00	S. E.	265	12.6	298	6.0	4.5	3.0	86.5	0.0	65
30 05	45 00 *d*	E. S. E.	284	12.2	318	5.1	6.8	6.8	81.3	0.0	60
25 00	45 00	S.	305	8.8	331	0.0	*w* 15.5	12.4	72.1	8.6	32
20 23	40 00	S. E.	399	10.5	441	0.0	*w* 22.5	15.0	62.5	0.0	40
20 00	39 35	S. E.	33	4.5	34	0.0	6.0	*w* 12.0	82.0	2.0	45
15 36	35 00	S. E.	370	3.7	484	0.0	*w* 14.8	0.0	85.2	0.0	27
15 00	34 23 *d*	S. E.	51	10.1	56	3.6	7.2	7.2	82.0	0.0	56
10 00	32 16	S. S. E.	324	1.0	327	0.0	*w* 5.1	0.0	94.9	0.0	60
5 00	30 10 *d*	S. S. E.	324	9.8	355	3.9	*w* 11.7	1.3	83.1	3.7	78
Equator	30 10 *d*	S.	300	3.0	309	1.4	*w* 2.8	0.0	95.8	2.0	143
1 00 S.	30 35	S. S. W.	65	2.1	66	0.0	*w* 7.4	0.0	92.6	4.8	299
1 25	31 00	S. W.	35	4.0	37	0.0	*w* 13.4	0.0	86.6	0.0	15
3 00	31 40	S. S. W.	103	0.0	103	0.0	0.0	0.0	100.0	0.0	6
3 48	32 00	S. S. W.	52	8.8	56	0.0	*w* 22.2	0.0	77.8	0.0	9
5 00	32 30	S. S. W.	78	0.0	78	0.0	0.0	0.0	100.0	0.0	10
6 12	33 00	S. S. W.	78	0.0	78	0.0	0.0	0.0	100.0	0.0	15
7 00	33 20	S. S. W.	52	0.0	52	0.0	0.0	0.0	100.0	40.0	25
8 36	34 00	S. S. W.	104	4.5	109	0.0	*w* 14.0	0.0	86.0	0.0	49
9 00	34 10	S. S. W.	26	3.2	27	0.0	*w* 9.8	0.0	90.2	0.0	82

Shortest distance to the equator by this route, 3,703 miles. Average distance to be sailed on account, of adverse winds, 3,976 miles.

This and the February route are the most favorable. After crossing 5° N. if you can lay up S. S. E. to the line, do so.

Ship Golden State (L. F. Doty), New York to San Francisco, nineteen days out.

Feb. 27, 1853. Lat. 18° 1′ N.; long. 30° 54′ W. Temperature of air, 71°; of water, 71°. Winds: S. by W., North, N. E. Small breezes, and smooth sea; passing clouds.

Feb. 28. Lat. 15° 25′ N.; long. 29° 52′ W. Temperature of air, 71°; of water, 70°. Winds: N. E., N. N. E., N. E. Light breezes.

March 1. Lat. 12° 9′ N.; long. 29° 32′ W. Winds: N. E., E. N. E., E. N. E. Moderate trades, and hazy; all sail.

March 2. Lat. 9° 00′ N.; long. 28° 50′ W. Temperature of air, 71°; water, 70°. Winds: N. E., N. E. by E., N. E. by E. Fine trades, and hazy.

March 3. Lat. 5° 6′ N.; long. 27° 52′ W. Temperature of air, 71°; of water, 70°. Winds: N. E. Brisk trades, and fine weather.

March 4. Lat. 2° 56′ N.; long. 27 °3′ W. Temperature of air, 74°; of water, —. Winds: east, east, E. S. E. Moderate and hazy.

March 5. Lat. 1° 43′ N.; long. 28° 1′ W. Temperature of air, 76°; of water, 70°. Winds: S. E. by S. Light breezes and clear.

March 6. Lat. 0° 46′ S.; long. 28° 50′ W. Winds: S. E. by S., S. E., S. E. Light airs, and pleasant.

March 7. Lat. 2° 28′ S.; long. 29° 51′ W. Temperature of air, 77°; of water, 70°. Wind: S. E. Moderate breezes, and clear.

March 8. Lat. 3° 36′ S.; long. 30° 15′ W. Temperature of air, 79; of water, 70°. Wind: S. E. Small breezes and clear.

March 9. Lat. 5° 35′ S.; long. 31° 20′ W. Temperature of air, 79°; of water, 70°. Wind: S. E. Light trades, and clear weather.

Ship Paragon (Samuel Duncan), New York to San Francisco, twenty days out.

Feb. 28, 1853. Lat. 18° 20′ N.; long. 30° 18′ W. Barometer, 30; temperature of air, 72°; of water, 74°. Winds: N. N. E., N. E., N. E. Fresh breezes; trades, beyond a doubt.

March 1. Lat. 14° 54′ N.; long. 29° 13′ W. Barometer, 30; temperature of air, 73°; of water, 75°; Winds: N. E., E. N. E., N. E. by E. Fresh breezes; passed through strong tide rips, but experienced no currents.

March 2. Lat. 12° 11′ N.; long. 28° 27′ W. Temperature of air, 75°; of water, 77°. Winds: N. E. by E., E. N. E., E. N. E. Comes in fresh; ends good breeze, light showers.

March 3. Lat. 8° 30′ N.; long. 27° 33′ W. Barometer, 29.90; temperature of air, 78°; of water, 80°. Winds: N.E., E., E.N.E. Commences with good breezes and light showers of rain; ends fresh, with heavy appearances in the S.E.

March 4. Lat. 5° 7′ N.; long. 26° 49′ W. Var. obs. 12°. Barometer, 29.9; temperature of air, 80°; of water, 81°. Winds: E.N.E., E.N.E., E.N.E. Comes in fresh, thick and hazy weather; ends moderate and fine.

March 5. Lat. 3° N.; long. (D. R.) 26° 59′ W. Barometer, 29.90; temperature of air, 80°; water, 83°. Winds: E.N.E., S.E., E.S.E. Commences moderate; black and heavy in the S.E.; middle and latter light and unsteady with rain.

March 6. Lat. 1° 38′ N.; long. 27° 16′ W. Barometer, 29.9; temperature of air, 82°; of water, 84°. Winds: N.E., N.E., S.E. First and middle parts light and baffling, with rain.

March 7. Lat. 34′ N.; long. 27° 31′ W. Barometer, 29.90; temperature of air, 84°; of water, 85°. Winds: S.E., E., N.E. Light and baffling, and occasionally calm.

March 8. Long. 27° 50′ W. Current, ¾ of a mile per hour, S. W. Barometer, 29.60; temperature of air, 85°; of water, 85°. Winds: E.N.E., calm, E. Commences light; middle part, calm; latter, very light. At noon on the equator, in long. 27° 50′ W.

March 9. Lat. 1° 10′ S.; long. 27° 50′ W. Var. obs. 10°. Barometer, 29.90; temperature of air, 86°; of water, 85°. Winds: E.N.E., E., E. A light breeze; clouds have very little motion.

March 10. Lat. 2° 52′ S.; long. 29° 28′ W. Var. obs. 7°. Barometer, 29.80; temperature of air, 82°; of water, 84°. Winds: S. by E., S. by E., S. by E. Brisk breezes and fine weather.

March 11. Lat. 4° 55′ S.; long. 30° 26′ W. Barometer, 29.80; temperature of air, 83°; of water, 83°. Winds: S. by E., S.S.E., S.E. Brisk breezes; passed under the sun.

Ship Sword-Fish (C. Collins), New York for San Francisco, fifteen days out.

Feb. 27, 1853. Lat. 22° 54′ N.; long. 36° 30′ W. Barometer, 30.00; temperature of air, 72°; of water,* 71½°; of water, 70°. Winds: N., N.N.E., N.E.; light winds and clear weather. I think we now have what are called trade-winds.

Feb. 28. Lat. 19° 32′ N.; long. 35° 40′ W. Current, ¼ miles per hour, to the westward. Barometer, 30.00; temperature of air, 75°; of water, 74°; of water, 69°. Winds: E.N.E., E., E. to E.S.E.; light airs; middle part, good breeze; latter part, calm, with light puffs. Aneroid barometer, 29.56.

March 1. Lat. 16° 03′ N.; long. 34° 28′ W. Barometer, 29.80; temperature of air, 75°; of water, 73°; of water, 70½°. Winds: E.N.E., E. by S., E. by S.; good breezes throughout; latter part, wind comes in puffs; the barometer has been, during these 24 hours, as low as 29.62; wind inclined southerly; Aneroid barometer, 29.78.

March 2. Lat. 12° 21′ N.; long. 33° 12′ W. Current, 29 miles, W. by S. during the last two days.

* Surface.

Barometer, 29.76; temperature of air, 74°; of water, 74°; of water, 71°. Winds: E. S. E., E. S. E., S. E. by E. ½ E.; fine, clear weather; the ship has been close-hauled—log distance run 240 miles.

March 3. Lat. 8° 25′ N.; long. 31° 35′ W. Current, ⅛ mile per hour, to S. and W. Barometer, 29.75; temperature of air, 74°; of water, 78°; of water, 74°. Wind: E. S. E. throughout; throughout fine breezes—cannot say trades—I have been too often humbugged; ship by the wind; log dist. run 260 miles.

March 4. Lat. 4° 37′ N.; long. 29° 50′ W. Current, 1 mile per hour, W. by N. Barometer, 29.66; temperature of air, 80°; of water, 80°; of water, 77°. Winds: E. S. E., E. by S., E. by S.; good wind; clear weather.

March 5. Lat. 2° 55′ N.; long. 29° 23′ W. Current, 1½ miles per hour, W. Barometer, 29.70; temperature of air, 78°; of water, 80°; of water, 76°. Winds: calm; calm E. to S. W.; calms, and light airs throughout; very heavy looking squalls, all on the horizon; very little wind in them, but a great quantity of water.

March 6. Lat. 1° 48′ N.; long. 29° 06′ W. Current, 2 miles per hour, W. by N. Barometer, 29.80; temperature of air, 80°; of water, 80°; of water, 80. Winds: calm, E. S. E., calm, and E. S. E.; light airs and calms; very heavy showers of rain; weather, during the last four days, very warm and close; passed through a tide rip setting W. by N.

March 7. Lat. 0° 18′ N.; long. 29° 8′ W. Current, 1 mile per hour, W. S. W. Barometer, 29.76; temperature of air, 79°; of water, 79°; do. 79°. Winds: calm, baffling, calm, and east. Throughout, calms and light airs; very warm and sultry; several vessels in sight. At 10 P. M. passed Island St. Paul's, distant 4 miles.

March 8. Lat. 1° 06′ S.; long. 29° 6′ W. No current. Barometer, 29.75; temperature of air, 80°; of water, 80°; do. 79°. Winds: calm, calm, S. E. by E. Another day of light airs and calms. At 8 P. M., on the equator, log distance run to the line 4,135 miles in 22 *days*. You will see by this abstract that your route was followed to the letter, and has proved satisfactory after so many hard pulls and drawbacks as I have had while running to Rio de Janeiro. I should evidently have been on the line Sunday last, had the breezes held good, but my luck "calms," which, I am sorry to say, you will often see in this book.

[A model track. Compare it with the tracks of the Golden State and the Paragon (p. 457). They crossed the parallel of 18° W. in about 31°, the one 29, the other 27 days out. The Sword Fish crossed this parallel near the meridian of 35° W., 16 days out, and was south of the equator 6 days afterwards, beating the former several days again.

I would recommend vessels in coming out of New York and Boston, to stand off well to the eastward when the winds are fair, before attempting to make any southing. The degrees there are short, and by standing as far as 60° or 50° before crossing the parallel of 40°, you have a better chance for running south across the Horn latitudes.

This recommendation applies to all months, but only when the winds are fair for easting.]

March 9. Lat. 2° 57′ S.; long. 29° 23′ W. Current, three-fourths of a mile per hour, W. by S. Baro-

meter, 29.70; temperature of air, 81°; of water, 81°; do. 79°. Winds: calm and east, calm, S. E. by S. Fine clear weather, light airs and calm.

March 10. Lat. 5° 39′ S.; long. 30° 13′ W. Current, half mile per hour, W. Barometer, 29.72; temperature of air, 82°; of water, 82°; do. 82°. Winds: calm and S. E., S. E. and E., S. E. by S. Very light trades; fine weather; had main-topsail in three hours to fix the masthead.

Ship Sirocco (J. L. Sanford), New York to San Francisco, seventeen days out.

March 5, 1853. Lat. 22° 09′ N.; long. 34° 00′ W. Barometer, 30.60. Winds: E., E., and E. N E. Fresh breezes and squally weather.

March 6. Lat. 18° 26′ N.; long. 32° 30′ W. Barometer, 30.40. Winds: E. by S., E. by N., and E. Commence with fresh breezes and pleasant weather. Latter squally and hazy.

March 7. Lat. 14° 40′ N.; long. 31° 00′ W. Barometer, 30.20. Winds: E. N. E., E. by N., and E. N. E. Strong breezes and squally, with rain. Ends clear, with fine breezes.

March 8. Lat. 11° 03′ N.; long. 30° 00′ W. Barometer, 30.20. Winds: E. N. E., E. N. E., and N. E. Pleasant breezes, with clear pleasant weather.

March 9. Lat. 7° 49′ N.; long. 28° 54′ W. Barometer, 30.10. Winds: E. N. E., E. N. E., and N. E. Light breezes, with hazy weather and light rain.

March 10. Lat. 4° 26′ N.; long. 28° 00′ W. Barometer, 30.20. Winds: E. N. E., E., and N. E. Pleasant breezes and hazy weather.

March 11. Lat. 2° 00′ N.; long. 28° 00′ W. Barometer, 30.30. Winds: E. N. E., S. W., and N. W. Fine breezes and clear. At dark, much lightning. Middle part squally with rain; latter part, light airs and calms.

March 12. Lat. 0° 10′ N.; long. 28° 05′ W. Barometer, 30.30. Winds: E. N. E., variable, and N. Light breezes and occasionally calm. Twenty-five days from New York to the line.

March 13. Lat. 0° 32′ S.; long. 28° 10′ W. Barometer, 30.30. Winds: north, calm, and squally. Light airs and fine weather. Ends calm and squally.

March 14. Lat. 0° 56′ S.; long. 28° 20′ W. Barometer, 30.20; temperature of air, 80°; of water, 81°. Winds: calm, S. W., and calm. Light variable airs and calm. I find very little change in the barometer; weather clear and squally.

March 15. Lat. 0° 54′ S.; long. 28° 10′ W. Barometer, 30.20. Current, west, 12 miles. Temperature of air, 79°; of water, 80°. Light airs, and calm from the S. W.

March 16. Lat. 1° 10′ S.; long. 28° 20′ W. Barometer, 30.10. Current, W. S. W., 12 miles. Temperature of air, 79°; of water, 81°. Calm and squally; rain all around the compass.

March 17. Lat. 2° 20′ S.; long. 28° 45′ W. Barometer, 30.10; temperature of air, 80°; of water, 81°. Very light airs from the N. E. and N. W.

March 18. Lat. 3° 44′ S.; long. 29° 15′ W. Barometer, 30.00; temperature of air, 79°; of water, 81°. Winds: calm, E. S. E., and S. E. First part calm; middle and latter parts squally.

March 19. Lat. 5° 59′ S.; long. 30° 30′ W. Barometer, 30.10; temperature of air, 79°; of water, 81°. Winds: S. E., S. E., and S. S. E. Light breezes and clear weather; middle part squally.

Ship New York (David C. Baxter), New York to San Francisco, fifteen days out.

March 7, 1853. Lat. 20° 38′ N.; long. 40° 29′ W. Barometer, 29.09; temperature of air, 74°; of water, 73°. Winds: E. by N., E. by N., E. by N.; strong trades and squally, heading up S. E. and off S.

March. 8. Lat. 18° 29′ N.; long. 39° W. Barometer, 29.07; temperature of air, 74°; of water, 74°. Winds: E. by N., E. to E. by N., E. by N. ½ N.; strong trades, squally.

March 9. Lat. 16° 44′ N.; long. 37° W. Barometer, 29.07; temperature of air, 74°; of water, 74°. Winds: E. N. E., E. N. E., E. N. E.; strong trades, with some hard squalls.

March 10. Lat. 14° 19′ N.; long. 34° 56′ W. Barometer, 29.07; temperature of air, 76°; of water, 76°. Winds: E. N. E., E. N. E., E.; fine breezes without squalls; smooth sea.

March 11. Lat. 11° 36′ N.; long. 33° 25′ W. Barometer, 29.07; temperature of air, 78°; of water, 78°. Winds: E., E. by N., E. ½ N.; first part, moderate; middle squally; latter brisk.

March 12. Lat. 9° 41′ N.; long. 31° 30′ W. Barometer, 29.07; temperature of air, 80°; of water, 78°. Winds: E. by N., E. by N., E. by. N. ½ N.; same as yesterday.

March 13. Lat. 7° 17′ N.; long. 29° 12′ W. Barometer, 29.06; temperature of air, 82°; of water, 80°. Winds: E. N. E., E. N. E., E. N. E.; moderate trades.

March 14. Lat. 4° 50′ N.; long. 28° 30′ W. Barometer, 29.06; temperature of air, 82°; of water, 81°. Winds: E. N. E., E., N. by E.; commences moderate; middle part light; ends nearly calm.

March 15. Lat. 2° 30′ N.; long. 28° 30′ W. Barometer, 29.06; temperature of air, 82°; of water, 82°. Winds: N. by E., N. by E., N. E.; first part, very light airs; middle increasing; ends with a good breeze.

March 16. Lat. 0° 58′ N.; long. 28° 25′ W. Barometer, 29.06; temperature of air, 82°; of water, 82°. Winds: N. N. E., N. E., N. N. E.; commences a moderate N. E. wind; from 6 to 10 P. M., baffling from E. to W., and raining in torrents; middle part, light air from E. N. E.; ends with light breeze.

March 17. Lat. 0° 22′ S.; long. 28° 35′ W. Barometer, 29.06; temperature of air, 84°; of water, 83°. Winds: N. N. E., N. N. E., N.; first and middle parts, a light air; ends with gentle breezes; no rain.

March 18. Lat. 1° 48′ S.; long. 28° 45′ W. Barometer, 29.05; temperature of air, 84°; of water, 82°. Winds: N., E. N. E., S. E. by S.; light breezes; at times nearly calm; some rain.

March 19. Lat. 3° 57′ S.; long. 29° 45′ W. Barometer, 29.05; temperature of air, 82°; of water, 82°. Winds: S. E. by S., S. E. by S., S. E. by S.; commences a light breeze; latter part, squalls of wind, and rain.

March 20. Lat. 5° 37′ S.; long. 30° 40′ W. Barometer, 29.06; temperature of air, 83°; of water, 82°. Winds: S. E. by S., S. E. by S., S. E. by S.; squally; wind veering from S. S. E. and S., to S. E. by E.

Ship St. Lawrence (Robertson), New York to San Francisco, twenty-eight days out.

March 8, 1853. Lat. 19° 04′ N.; long. 27° 50′ W. Winds: N. E., N. E., E. N. E.; first part, fresh trades; middle, squally; latter, more steady.

[She goes the old route. The New York (p. 461), is going along the new route at the same time; the former crossing the parallel of 19° N. the sixteenth day; the latter, the twenty-eighth; and thence to the line, the passage is the same.]

March 9. Lat. 16° 00′ N.; long. 28° 15′ W. Winds: E. N. E., E. N. E., N. E.; fresh trades throughout.

March 10. Lat. 13° 21′ N.; long. 28° 35′ W. Wind: N. E.; fresh trades, with passing squalls.

March 11. Lat. 10° 40′ N.; long. 28° 15′ W. Wind: N. E.; passing squalls.

March 12. Lat. 7° 28′ N.; long. 28° 18′ W. Wind: E. N. E., and fine.

March 13. Lat. 4° 35′ N.; long. 28° 00′ W. Winds: N. E., N. E., E. N. E.; fine breezes.

March 14. Lat. 2° 45′ N.; long. 27° 52′ W. Wind: N. N. E. throughout, and fine.

March 15. Lat. 1° 20′ N.; long. 27° 55′ W. Winds: N. N. E., North, N. W. to S. W.; light winds, with squalls; baffling.

March 16. Lat. 00° 03′ N.; long. 28° 00′ W. Winds: N. N. E., N. N. E., North; squally, baffling and rainy.

March 17. Lat. 00° 42′ S.; long. 28° 05′ W. Winds: N. E., N. E., E. N. E.; light and pleasant.

March 18. Lat. 1° 49′ S.; long. 28° 12′ W. Winds: East, E. S. E., S. E.; light winds, have the S. E. trades.

March 19. Lat. 3° 10′ S.; long. 29° 00′ W. Winds: S. E., S. S. E., S. S. E.; light winds and pleasant.

March 20. Lat. 5° 20′ S.; long. 29° 00′ W. Wind: S. S. E.; light winds, with rain squalls.

March 21. Lat. 7° 47′ S.; long. 29° 40′ W. Wind: S. E.; throughout with squalls of rain.

Ship Stag-Hound (C. F. W. Behm), New York to San Francisco, sixteen days out.

March 13, 1853. Lat. 17° 15′ N.; long. 34° 2′ W. Barometer, 30.05; temperature of air, 72°; of water, 72°. Winds: E. S. E., S. E. by E., E. S. E. Light trades and fine weather.

March 14. Lat. 14° 30′ N.; long. 33° 23′ W. Barometer, 30.00; temperature of air, 72°; of water, 73°. Wind: E. S. E. Light trades, and fine.

March 15. Lat. 10° 48′ N.; long. 31° 58′ W. Barometer, 30.00; temperature of air, 74°; of water, 76°. Winds: E. S. E., E. by S., E. by S. Light trades and fine weather.

March 16. Lat. 7° 10′ N.; long. 30° 47′ W. Barometer, 29.96; temperature of air, 77°; of water, 78°. Winds: E. by S., E. S. E., east. Light trades. Ends with squally appearances in N. E.

March 17. Lat. 3° 41′ N.; long. 29° 45′ W. Barometer, 29.95; temperature of air, 79°; of water, 80°. Winds: N. E., E. N. E., E. N. E. Light trades and cloudy, with light showers during the night.

March 18. Lat. 0° 10′ N.; long. 29° 27′ W. Barometer, 29.90; temperature of air, 79°; of water, 80°. Winds: E. N. E., E. N. E., E. S. E. Ends with fine breeze from southward and eastward, and clearing up. Perhaps we shall have no doldrums.

March 19. Lat. 2° 24′ S.; long. 30° 41′ W. Current, west, 1¼ knots per hour. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: east, variable, S. E. Light airs, with occasional showers.

March 20. 4° 59′ S.; long. 32° 08′ W. Current, S. 80° W., 1 knot. Barometer, 29.95; temperature of air, 78°; of water, 82°. Winds: S. E. Thunder squalls.

March 21. Lat. 7° 17′ S.; long. 33° 15′ W. Current, N. by W., ⅓ knot. Barometer, 29.95; temperature of air, 78°; of water, 82°. Winds: S. E., S. E. by S., S. E. by S. Light breeze and squally, at times almost calm, but little rain.

Ship Hampton, New York to San Francisco, twenty-three days out.

March 14. Lat. 19° 46′ N.; long. 33° 47′ W. Barometer, 30.05; temperature of air, 74°; of water, 76°. Winds: E., E., E. Steady breezes and fine weather.

March 15. Lat. 17° 37′ N.; long. 32° 12′ W. Barometer, 30.05; temperature of air, 75°; of water, 76°. Winds: E., E., and E. by N. Steady breezes and fine weather.

March 16. Lat. 15° 24′ N.; long. 31° 06′ W. Barometer, 30.05; temperature of air, 75°; of water, 76°. Winds: E. by N., E., and E. by N. Steady breezes and fine weather.

March 17. Lat. 12° 44′ N.; long. 29° 56′ W. Barometer, 30.05; temperature of air, 74°; of water, 76°. Wind: E. by N. throughout. Steady breezes and fine weather.

March 18. Lat. 10° 09′ N.; long. 29° 30′ W. Barometer, 30.00; temperature of air, 75°; of water, 77°. Winds: E. N. E., E. by N., E. N. E. Pleasant weather; strong upper current from S. E.

March 19. Lat. 7° 36′ N.; long. 29° 05′ W. Barometer, 30.00; temperature of air, 76°; of water, 78°. Winds: E. N. E., E. by N., and N. E. Steady trades.

March 20. Lat. 4° 36′ N.; long. 29° 00′ W. Barometer, 30.00; temperature of air, 76; of water, 78°. Wind: N. E. throughout; fine steady breezes from the N. E.

March 21. Lat. 1° 39′ N.; long. 29° 15′ W. Barometer, 30.00; temperature of air, 80°; of water, 83°. Wind: N. E. throughout. Steady winds.

March 22. Lat. 0° 09′ S.; long. 29° 20′ W. Barometer, 30.00; temperature of air, 82°; of water, 82°. Winds: E., S. E., S. E. Light breezes and pleasant.

[Here, again, is an illustration of going farther east than is necessary. Compare the Hampton's track with that of the Stag-Hound (p. 462), about 2° to the west of her, upon the parallel of 20° N. No comment is required.

☞ Never, from the United States, care to cross the parallel of 20° N., east of 35°. If you are forced there by adverse winds, it is another thing. But attention to these tracks—and they are taken at random—will show that, in the winter and spring especially, vessels not only have quite as quick a run, 20° to the line, when they cross that parallel west of 35°, as they do when they cross it to the east of that meridian; but what is more, they have often a week or ten days less to that crossing from the United States. As an example, see Roscoe's track (p. 464; she had 27 days from New York to the parallel of 20° east of 35°.]

March 23. Lat. 00° 23′ S.; long. 29° 43′ W. Barometer, 30.00; temperature of air, 84°; of water, 83°. Winds: N. E., E. S. S., and E. Moderate breezes, inclining to the south.

March 24. Lat. 1° 12′ S.; long. 29° 46′ W. Barometer, 30.00; temperature of air, 85°; of water, 83°. Winds: S. S. E., S. S. E., and N. E. Light wind and fine weather.

March 25. Lat. 2° 34′ S.; long. 29° 53′ W. Barometer, 30.20; temperature of air, 85°; of water, 84°. Winds: S. E. by S., S. S. E., and S. S. E. Light baffling winds, and hazy swell from the southward.

March 26. Lat. 4° 39′ S.; long. 30° 30′ W. Barometer, 30.02; temperature of air, 85°; of water, 83°. Wind: S. S. E. throughout. Light breezes and clear weather.

March 27. Lat. 6° 25′ S.; long. 31° 37′ W. Barometer, 30.05; temperature of air, 87°; of water, 83°. Wind: S. S. E., S. E. by S., S. E. by S. Light steady breezes and cloudy.

March 28. Lat. 8° 14′ S.; long. 32° 15′ W. Barometer, 30.15; temperature of air, 88°; of water, 83°. Winds: S. E. by S., S. E., S. E. Cloudy with light showers.

English barque Emir, Gloucester (Eng.) to Calcutta, sailed February 26, 1849.

March 21, 1849. Lat. 6° 4′ N.; long. 22° 1′ W. Winds: east, E. S. E., east. Moderate winds and fine weather. All possible sail set.

March 22. Lat. 4° 29′ N.; long. 22° 1′ W. Wind: east. Steady winds and fine weather.

March 23. Lat. 3° 17′ N.; long. 20° 54′ W. Winds: east, E. N. E., east. Light winds and cloudy.

March 24. Lat. 2° 9′ N.; long. 20° 12′ W. Variable winds. Light airs, and at times calm.

March 25. Lat. 1° 58′ N.; long. 20° 39′ W. Variable winds. First part, light airs; latter part, squally, with heavy rain.

March 26. Lat. 1° 21′ N.; long. 20° 34′ W. Winds: S. to S. E., and S. W. Light, foul airs, and calm at times.

March 27. Lat. 1° 33′ N.; long. 20° 10′ W. Variable winds. Calms and light variable airs.

March 28. Lat. 1° 11° N.; long. 20° 38′ W. Wind: variable, and S. E. First part, light; latter, moderate breeze.

March 29. Lat. 1° 34′ N.; long. 20° 51′ W. Winds: calm, calm, S. E.

March 30. Lat. 38′ S.; long. 21° 11′ W. Wind: S. E. Got the S. E. trades moderate and fine.

March 31. Lat. 1° 47′ S.; long. 21° 11′ W. Wind: S. E. Light trade-wind and fine weather.

[I have quoted this very well kept English log, to illustrate the difficulties of crossing the doldrums far to the eastward.

When vessels do fall to leeward of St. Roque, as, by attempting to shave the new route too close, they now and then do, it is very seldom that they are a week in making 3½° of latitude, as the Emir was, in getting through these doldrums from 2° N. to 1° 47′ S.]

Ship Roscoe (Thomas Smith), New York to San Francisco, twenty-seven days out.

March 24, 1853. Lat. 21° 31′ N.; long. 32° 08′ W. Current, E. by S., one knot per hour. Variable,

16° W. Barometer, 30.11; temperature of air, 74°; of water, 73°. Winds: W. S. W., N. W., N. First part, light airs; middle and latter parts, good breezes.

March 25. Lat. 19° 17′ N.; long. 32° W. Barometer, 30.05; temperature of air, 75°; of water, 73°. Winds: N., N., N. N. E. Pleasant breezes throughout.

March 26. Lat. 16° 27′ N.; long. 31° 24′ W. Barometer, 30.06; temperature of air, 75°; of water, 74°. Winds: N. N. E., E. by N., E. by N. Fresh breezes throughout; squally during the middle part.

March 27. Lat. 13° 10′ N.; long. 30° 41′ W. Barometer, 30.5; temperature of air, 75°; of water, 74°. Winds: E. by N., E. by N., E. N. E. Fresh breezes; middle part, squally; latter part, blowing strong trade; saw a tide rip this day.

March 28. Lat. 9° 54′ N.; long. 30° 00′ W. Barometer, 30.5; temperature of air, 78°; of water, 77°. Winds: E. N. E., E. N. E., northward. First part, fresh breezes; middle, same; latter part, pleasant.

March 29. Lat. 6° 46′ N.; long. 29° 00′ W. Barometer, 29.98; temperature of air, 79°; of water, 79°. Winds: northward, E. N. E., E. N. E. Throughout the day, fresh breezes and pleasant.

March 30. Lat. 3° 40′ N.; long. 28° 20′ W. Barometer, 29.94; temperature of air, 83°; of water, 80°. Winds: E. N. E., E. N. E., E. N. E. Fresh breezes and squally; looks very much like rain, we have had none as yet; air very close.

March 31. Lat. 1° 00′ N.; long. 28° 00′ W. Barometer, 29.90; temperature of air, 85°; of water, 82°. Winds: E. N. E., E. N. E., baffling, east. First part, fresh breezes; middle, squally; at 8 h. 30 m. A. M., had a heavy squall of wind and rain from the S. S. E; latter part, light baffling airs from E. to N. E.; saw a great many porpoises this day.

April 1. Lat. 0° 44′ S.; long. 28° 00′ W. Current, half knot per hour, westerly. Barometer, 30.00; temperature of air, 85°; of water, 80°. Winds: E. to E. S. E., E., E. S. E. First part like breezes. At 10 A. M. a heavy squall, accompanied with rain from the south; latter part, light airs. We crossed the equator about midnight, in about 27° 38′ W. My intention was to have crossed it in 30° 00′ W. in the fore part of my voyage, had I not had to run so far to the eastward on the 28th and 29th, on account of winds. [I do not understand why the Roscoe had to run so far to the east there. She had the wind north of west the 28th, to make a course good to the line of about S. by E., not more.] When the wind let me come on the other tack, I could make little easting every day without taking off much of my latitude. We crossed the equator without any calm, and did not go less than four and a half to five miles per hour all the way through.

April 2. Lat. 3° 04′ S.; long. 29° 10′ W. Barometer, 30.00; temperature of air, 84°; of water, 80°. Winds: S. E. by S., S. E. by S., S. E. by S. Fresh breezes for the twenty-four hours.

April 3. Lat. 5° 41′ S.; long. 31° 30′ W. Seventeen miles current in twenty-four hours, setting S. W. ½ S. Barometer, 29.90; temperature of air, 83; of water, 81°. Winds: S. E. by S., S. S. E., S. S. E. First part, fresh breezes; middle and latter parts, baffling and fresh breezes at noon, barometer falling. I should think there was going to be a gale of wind; vessel leads off from S. S. W. to W.; almost calm and then gusts of wind.

Ship Surprise (Charles A. Raulett), New York to San Francisco, twelve days out.

March 25, 1853. Lat. 21° 49′ N.; long. 41° 59′ W. Barometer, 30.50; temperature of air, 76°; of water, 76°. Winds: calm, S. E., E. S. E. Middle and latter parts, light airs.

March 26. Lat. 18° 58′ N.; long. 41° 48′ W. Current, four-tenths of a knot per hour, westerly. Barometer, 30.00; temperature of air, 76°; of water, 76°. Winds: S. E., E. S. E., S. E. First part, a light breeze, some squalls; not very strong during the day.

March 27. Lat. 15° 34′ N.; long. 40° 27′ W. Westerly current, one knot per hour. Barometer, 30.00; temperature of air, 79°; of water, 77°. Winds: E. S. E., east, east. First part, good fresh breeze; stronger during the middle and latter parts; trades, I think. The barometer keeps up rather high for these latitudes.

March 28. Lat. 12° 35′ N.; long. 38° 48′ W. Current, S. W., one knot per hour. Barometer, 29.98; temperature of air, 79°; of water, 79°. Winds: east, E. by N., east. Fresh breezes and cloudy. I am afraid I shall be too far to the westward when I cross the line, but am determined to trust to Providence and Lieut. Maury's Charts.

March 29. Lat. 10° 00′ N.; long. 36° 22′ W. No current. Barometer, 29.08; temperature of air, 79°; of water, 79°. Winds: east, E. by. N., east. Good fresh breezes throughout.

March 30. Lat. 7° 23′ N.; long. 33° 59′ W. Slight easterly current. Barometer, 29.90; temperature of air, 82°; of water, 80°. Winds: E. by N. throughout. Cloudy and dusky weather. The ship lags along S. E. by S., and I am obliged to take all advantages; am fearful that I shall be jammed close by, if not to leeward of Cape St. Roque. Latter part, good fresh trades E. by N.

March 31. Lat. 4° 44′ N.; long. 31° 32′ W. Barometer, 29.88; temperature of air, 82°; of water, 80°. Winds: E. N. E., E. by N., E. by N. Clear weather and fresh breezes; am getting to the eastward finely.

April 1. Lat. 1° 57′ N.; long. 29° 46′ W. Barometer, 29.80; temperature of air, 83°; of water, 81°. Winds: east, E. N. E., E. N. E. Moderate breezes and fine weather. Set larboard studding sails, having now no fear of Cape St. Roque; light squalls during the night.

April 2. Lat. 0° 39′ S.; long. 30° 32′ W. Current, one knot per hour, westerly. Barometer, 29.80; temperature of air, 84°; of water, 81°. Winds: S. E., S. S. E., S. E. Barometer, 29.80; temperature of air, 84°; of water, 81°. Winds: S. E., S. S. E., S. E. The wind changed in a squall at noon, but continuing with as much force. Passage from Sandy Hook to the line, 19 days 18 hours. The barometer rises and falls regularly as the tides.

[I should be glad if all would observe the barometer as closely. This phenomenon shows the importance of accurate barometers; I mean barometers which we may make accurate by knowing their errors. This barometer has its errors—all have. What, therefore, can we learn about this highly interesting phenomenon from such an instrument, except that it occurs?]

April 3. Lat. 3° 51′ S.; long. 32° 50′ W. Current, two and a half miles per hour, westward. Baro-

meter, 29.88; temperature of air, 85°; of water, 83°. Winds: S. S. E., S. E., S. S. E. to S. E. At 9 A. M. the Island of Fernando de Noronha, bore S. by E., distance 25 miles, working the ship to the eastward.

April 4. Lat. 5° 34′ S.; long. 33° 48′ W. Barometer, 29.90; temperature of air, 85°; of water, 83°. Winds: S. E. by S., S. E., S. E. Light winds and variable. Tacked several times to gain a little more easting.

April 5. Lat. 7° 43′ S.; long. 33° 54′ W. Barometer, 29.90; temperature of air, 84°; of water, 83°. Winds: S. E., E. S. E., S. E. by S. Variable winds and squally. Tacked several times to keep to the eastward.

Barque Rosario (Caleb Sprague), New York to Valparaiso, twenty days out.

March 26, 1853. Lat. 20° 35′ N.; long. 27° 10′ W.; variation, 18° 20′ W. Barometer, 30.12; temperature of air, 73°; of water, 72°. Winds: N. N. E., N. by E., and N. E. by N.; light airs and pleasant weather; a swell from the N. W.

March 27. Lat. 17° 57′ N.; long. 27° 10′ W. Barometer, 30.14; temperature of air, 72°; of water, 72. Winds: N. E. by N., N. E., and E. N. E.; light airs throughout.

March 28. Lat. 14° 49′ N.; long. 27° 10′ W. Barometer, 30.10; temperature of air, 71°; of water, 72°. Winds: E. N. E., N. E., and E. N. E.; first part, light airs; middle and latter part, fresh breezes, and passing rain squalls.

March 29. Lat. 11° 25′ N.; long. 26° 41′ W. Current, W., 12 miles. Barometer, 30.08; temperature of air, 74°; of water, 75°. Winds: E. N. E., N. E., and N. E.; first part, moderate breeze. At 2 P. M. passed through a strong tide rip; temperature of the air at the same time, was 72°; of water, 74°; middle part, moderate; from 9 A. M. until noon, strong tide rips, but no change in the water.

March 30. Lat. 8° 23′ N.; long. 36° 14′ W. Current, N. 15° W., 18 miles; variation, 15° W. Barometer, 30.02; temperature of air, 74°; of water, 77°. Winds: N. E., E N. E., and E. N. E.; moderate breezes; occasional tide rips.

March 31. Lat. 5° 50′ N.; long. 26° 01′ W. Current, N. 30° W., 18 miles. Barometer, 30.01; temperature of air, 78°; of water, 79. Winds: E. N. E., and N. E.; light breezes, and strong tide rips.

April 1. Lat. 3° 22′ N.; long. 25° 49′ W. Current, W., 12 miles; variation 13° W. Barometer, 30.01; temperature of air, 79°; of water, 80°. Winds: E. N. E., and N. E.; light airs throughout. I remark here, that it was my intention, when I sailed from New York, to have followed the track projected on Lieut. Maury's Chart, and to cross the equator further to the westward, but the winds have been mostly from the south, which has forced me to go further to the eastward than I intended. From 27° 12′ N., this ship had N. E. winds to the equator, by her abstract.

April 2. Lat. 2° 01′ N.; long. 26° 24′. Current, N. 51° W., 20 miles. Barometer, 29.96; temperature of air, 79°; of water, 81°. Winds: E. N. E., S. E., and S. E. by E.; first part, light air; middle part,

squally, with rain, with sharp lightning; latter part, moderate. Passed through quantities of phosphoric substance; strong tide rips.

April 3. Lat. 11′ S.; long. 27° 16′ W. Current, N. 25° W., 15 miles. Variation, 10° W. Barometer, 29.95; temperature of air, 80°; of water, 81°. Winds: S. E., S. E., and S. E. by S. First part, moderate breeze and light rain squall all night; water very phosphorescent; latter part, pleasant.

April 4. Lat. 1° 32′ S.; long. 25° 31′ W. Current, west, 18 miles. Variation, 8° W. Barometer, 29.95; temperature of air, 82°; of water, 82. Winds: S. by E., S. by E., and S. S. E. Light airs and squalls throughout. At 6 P. M. a water-spout crossed the bows a quarter of a mile distant. No change in the barometer.

April 5. Lat. 3° 30′ S.; long. 29° 53′ W. Current, W., 22 miles. Barometer, 30.01; temperature of air, 82°; of water, 82°. Winds: S. S. E., S. E., and S. E. by S. First part, light breezes and squally. At 2 P. M. showed our flag to an American sloop of war bound south. I find that we can sail faster than she. Latter part, fresh breeze.

April 6. Lat. 6° 23′ S.; long. 31° 7′ W. Current, S. 45° W., 14 miles. Barometer, 30; temperature of air, 81°; of water, 82. Winds: S. E. by S., S. E., and S. E. by S. Moderate trades and fine weather.

Route to Rio, etc.—APRIL.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N. & E.	SLANTS FROM S. & W.	Fair.	Calms.	
From Sandy	Hook to										
39° 10′ N.	70° 00′	E. S. E.	200	10.7	221	3.6	*w* 11.1	5.3	80.0	4.0	523
39 10	65 00	E.	233	9.8	256	3.7	*w* 9.3	6.2	80.8	4.5	320
37 33	60 00	E. S. E.	254	6.2	274	2.0	*w* 6.6	4.0	87.4	3.2	151
35 54	55 00	E. S. E.	260	5.4	276	0.7	8.0	8.8	82.5	4.9	136
35 54	50 00	E.	243	6.1	258	0.0	*w* 12.2	7.2	81.6	8.1	125
35 54	45 00	E.	243	5.8	257	0.0	*w* 12.3	3.7	84.0	5.8	81
35 00	42 21	E. S. E.	141	7.7	152	1.5	6.2	*w* 10.8	81.5	0.0	65
30 00	40 00	E. S. E.	312	17.4	366	6.3	6.2	*w* 32.5	55.0	1.0	95
25 00	37 40	S. S. E.	325	13.8	369	3.0	17.0	*w* 19.0	61.0	3.0	97
20 00	35 26	S. S. E.	325	2.6	333	0.0	5.4	*w* 7.2	87.4	5.1	56
15 00	33 16	S. S. E.	325	2.0	331	2.0	0.0	0.0	98.0	0.0	49
10 00	31 09	S. S. E.	325	0.0	325	0.0	0.0	0.0	100.0	4.4	43
5 00	29 04	S. S. E.	325	0.6	327	0.0	1.7	0.0	98.3	0.0	59
Equator	29 04	S.	300	2.1	306	0.0	*w* 5.9	1.3	92.8	6.8	152
			3811		4051						
1 00 S.	29 29	S. S. W.	65	4.4	68	0.0	*w* 17.7	0.9	81.4	5.5	344
1 31	30 00	S. W.	44	3.3	45	0.0	*w* 16.7	0.0	83.3	0.0	12
2 31	31 00	S. W.	85	2.4	87	0.0	*w* 8.4	0.0	91.6	0.0	12
3 00	31 12	S. S. W.	31	2.4	32	0.0	*w* 12.0	0.0	88.0	15.0	17
5 00	32 02	S. S. W.	130	4.0	135	0.0	*w* 20.0	0.0	80.0	12.5	15
7 19	33 00	S. S. W.	150	2.7	154	0.0	*w* 13.3	0.0	86.7	0.0	15
9 00	33 42	S. S. W.	109	3.2	112	0.0	*w* 10.8	0.0	89.2	0.0	55

Observe that, between the meridians of 55° and 60°, the calms of the Horse Latitudes most prevail between the parallels of 21° and 27° N.; and between the parallels of 28° and 32°, between the meridians 40° and 45°.

Ship Seaman's Bride, New York to San Francisco, sixteen days out.

April 5, 1853. Lat. 20° 52′ N.; long. 36° 54′ W. Barometer, 29.95; temperature of air, 75°; of water, 73°. Winds: S. E. by E., E. S. E., E. by N. First and middle parts a light air; latter, a moderate breeze, with fine weather.

April 6. Lat. 17° 32′ N.; long. 35° 28′ W. Barometer, 29.95; temperature of air, 76°; of water, 75°. Winds: E. N. E., E. N. E., N. E. by E. First part, a moderate breeze; middle and latter parts, fresh breezes.

April 7. Lat. 13° 40′ N.; long. 33° 55′ W. Barometer, 29.80; temperature of air, 75°; of water, 75°. Winds: E. N. E., N. E. by E., East. First and middle parts, a fresh breeze, and clear; latter, a fresh breeze, and cloudy.

April 8. Lat. 10° 2′ N.; long. 32° 10′ W. Barometer, 29.75; temperature of air, 77°; of water, 77½°; of water 15 feet below surface 76°. Winds: E., E., E. by N. A fresh breeze and cloudy.

April 9. Lat. 6° 43′ N.; long. 30° 27′ W. Barometer, 29.65; temperature of air, 79°; of water, 79°. Winds: E., E. by N., E. N. E. A fresh breeze, and cloudy.

April 10. Lat. 3° 34′ N.; long. 28° 59′ W. Barometer, 29.60; temperature of air, 81°; of water, 81°. Winds: E. by N., E. by N., E. by N. A moderate breeze and cloudy. Lightning in the south during the night. Some tide rips.

April 11. Lat. 14′ N.; long. 28° 56′ W. Barometer, 29.70; temperature of air, 83°; of water, 82°. Winds: E., E., E. S. E. First part, moderate, with fresh squalls of wind and rain; middle and latter parts, moderate and clear.

April 12. Lat. 2° 42′ S.; long. 29° 50′ W. Current, E. S. E., 18 miles. Barometer, 29.65; temperature of air, 84°; of water, 82°; of water below surface, 81°. Winds, S. S. E., S. E. by S., S. E. by S. First part, a light breeze, with frequent and fresh squalls of wind and rain. At 3 P. M. crossed the equator, in about 29° 5′ W. Middle, a light breeze, and clear; latter, fresh trades, and pleasant.

April 13. Lat. 6° 3′ S.; long. 30° 44′ W. Current, E. S. E., 15 miles. Barometer, 29.65; temperature of air, 84°; of water, 83°. Winds: S. E., S. E., S. E. by S. A moderate breeze, and pleasant.

Ship Lantao (Geo. H. Bradbury), New York to San Francisco, sixteen days out.

April 6, 1853. Lat. 20° 5′ N.; long. 39° W. Barometer, 30.30; temperature of air, 74°; of water, 73°. Winds: N. by E., N. E., N. E. Fresh breezes, and squally, first part; ends fresh breezes and fine weather.

April 7. Lat. 16° 40′ N.; long. 37° 5′ W. Barometer, 30.20; temperature of air, 75°; of water, 74°. Winds: E. N. E., E. N. E., E. N. E. Strong breezes and flawy. Cloudy at times.

April 8. Lat. 13° 50′ N.; long. 35° 55′ W. Barometer, 30.20. Winds: E. by N. to N. E. by E., E. by N. to N. E. by E., E. by N. to N. E. by E. First part, moderate; latter, fresh and fine. Overcast at times.

April 9. Lat. 11° 5′ N.; long. 33° 50′ W. Barometer, 30.10. Winds: E. N. E. to N. E. by E., E. N. E. to N. E. by E., E. N. E. to N. E. by E. Fresh and fine. Wind unsteady, both in force and direction.

April 10. Lat. 8° 20 N.; long. 31° 50′ W. Barometer, 30.5; temperature of air, 78°. Winds: E. by N. to N. E. by E., E. by N. to N. E. by E., E. by N. to N. E. by E. Fresh and fine. Tide rips.

April 11. Lat. 5° 25′ N.; long. 30° 20′ W. Barometer, 29.98; temperature of air, 81°. Winds: E. to E. N. E., E. to E. N. E., E. to E. N. E. Fresh and cloudy. Swell from S. S. E. Upper strata of clouds from S. E. Tide rips.

April 12. Lat. 2° 5′ N.; long. 29° 40′ W. Barometer, 29.90; temperature of air, 82°. Winds: E. to N. N. E., E. to N. N. E., E. to N. N. E. Commences fresh and fine; middle, squally; ends calm, with squally appearances. Swell from south.

April 13. Lat. 1° N.; long. 29° 40′ W. Barometer, 29.85. Winds: S. S. E. to N. by E., S. S. E. to N. by E., S. S. E. to N. by E. Calms, squalls, wind flying from south to north (by east). Much thunder, lightning, and rain. Swell from southwest.

April 14. Lat. 0° 18′ N.; long. 29° 30′ W. Barometer, 29.95. Winds: N. E. to N., E., and calm; E. by S. to S. E. by E. First part squally, with rain; middle light airs, and calms; at midnight, a puff from S. E., and veered to E. N. E., and cleared. Latter part light and fine.

April 15. Lat. 0° 55′ S.; long. 30° 10′ W. Current, W., 8 miles. Barometer, 29.95; temperature of air, 84°; of water, 84°. Winds: E. S. E. to S. E., E. S. E. to S. E., E. S. E. to S. E. Light airs, and calm S. E. swell; indications of S. E. trades.

April 16. Lat. 2° 05′ S.; long. 31° 20′ W. Current, W., 36 miles. Barometer, 30.00; temperature of air, 84°; of water, 84°. Winds: S. E., calm, calm, and S. E. by S.; squalls, calms, clear, rainy, &c. Fresh breezes from 8 P. M. to midnight; then calm until 10 A. M. After which fresh breezes.

April 17. Lat. 4° 20′ S.; long. 32° 20′ W. Current, W. N. W., 24 miles. Barometer, 30.05; temperature of air, 83°; of water, 83°. Winds: S. E., S. E., S. E. Moderate and fine; swell from south. Passed about 20 miles to windward of Fernando de Noronha.

April 18. Lat. 6° 00′ S.; long. 32° 35′ W. Current, N. W., 24 miles. Barometer, 30.10; temperature of air, 83°; of water, 83°. Winds: S. to S. E., S. to S. E., S. to S. E. First part, moderate and fine; middle, calm and squalls. Latter do. S. E. swell. One squall from N. E.

Bark Parthian (Smith), Richmond, Virginia, to San Francisco, 15 days out.

April 7, 1853. Lat. 18° 55′ N.; long. 34° 25′ W. Barometer, 29.8; temperature of air, 72°; of water, 73°. Winds: N. E., N. E., E. N. E. Fresh trades.

April 8. Lat. 15° 55′ N.; long. 33° 12′ W. Barometer, 29.8; temperature of air, 72°; of water, 73.° Winds: N. E., E. N. E., E. N. E. Fresh trades.

April 9. Lat. 12° 52′ N.; long. 32° 3′ W. Barometer, 29.7; temperature of air, 73°; of water, 73°. Winds: E. N. E., E., E. N. E. Fresh trades.

April 10. Lat. 9° 35′ N.; long. 30° 58′ W. Barometer, 29.7; temperature of air, 76°; of water, 75°. Winds: E. N. E., E., E. N. E. Fresh trades.

April 11. Lat. 6° 09′ N.; long. 29° 50′ W. Barometer, 29.5; temperature of air, 78°; of water, 78°. Wind: E. Squally, and extremely sultry.

April 12. Lat. 2° 45′ N.; long. 29° 1′ W. Barometer, 29.5; temperature of air, 81°; of water, 81°. Wind: E. N. E. Latter part, squally.

April 13. Lat. 1° 20′ N.; long. 28° 57′ W. Barometer, 29.5; temperature of air, 80°; of water, 80°. Winds: N. E., E. S. E., S. S. E. Throughout light winds, with much rain. During the night, thunder, and lightning.

April 14. Lat. 0° 37′ N.; long. 29° 32′ W. Barometer, 29.6; temperature of air, 82°; of water, 80°. Winds: E., S. S. E., E. S. E. First part, variable with rain. Rest of the day fine weather. At 8 A. M. St. Paul's, E. N. E., 15 miles distant.

April 15. Lat. 0° 38′ S.; long. 29° 58′ W. Barometer, 29.7; temperature of air, 82°; of water, 80°. Winds: S. E., S. S. E., S. S. E. At 8 P. M. crossed the equator, in 29° 40′ W. Fine weather.

April 16. Lat. 2° 19′ S.; long. 30° 40′ W. Barometer, 29.7; temperature of air, 82°; of water, 82°. Winds: S. E., S. E., S. E.

April 17. Lat. 3° 58′ S.; long. 31° 48′ W. Barometer, 29.6; temperature of air, 82°; of water, 82°. Current, W. N. W., $\frac{3}{4}$ knots per hour. Winds: S. S. E., S. E. by S. At noon, Fernando de Noronha, W. N. W., 35 miles distant.

April 18. Lat. 5° 30′ S.; long. 32° 50′ W. Current, W. N. W., $2\frac{1}{8}$ knots per hour. Barometer, 29.6; temperature of air, 82°; of water, 82°. Winds: S. E. by E., S. S. E., calm. Strong lee current.

Ship Climax (Fred. Howes), New York to San Francisco, eleven days out.

April 8, 1853. Lat. 18° 22′ N.; long. 37° 35′ W. Barometer, 28.00. Winds: E. N. E., E. N. E., E. N. E.; moderate trades with fine weather.

April 9. Lat. 15° 29′ N.; long. 35° 52′ W. Barometer, 28.00. Winds: E. N. E., E., E.; commences strong breezes; middle, squally; latter, light.

April 10. Lat. 12° 48′ N.; long. 33° 43′ W. Barometer, 28.00. Winds: E., E. N. E., E. N. E.; pleasant trades and fine weather.

April 11. Lat. 9° 40′ N.; long. 31° 35′ W. Barometer, $27\frac{10}{12}$. Winds: E., E., E. to N. E.; fine trade-winds; all kinds of cross-running seas.

April 12. Lat. 6° 16′ N.; long. 29° 30′ W. Barometer, $27\frac{9}{12}$. Winds: E., E. N. E., E.; commences fresh trades and fine weather; middle and latter parts, the same.

April 13. Lat. 3° 00′ N.; long. 28° 20′ W. Barometer, $27\frac{7}{12}$. Winds: E., E. N. E., N. E.; first

part, fine weather and fresh trades; middle, squally appearances all around; heavy clouds to the south; barometer low; indications of a change of wind.

April 14. Lat. 2° 40′ N.; long. 28° 40′ W. Barometer, $27\frac{7}{12}$. Winds: calm, calm, N. E. light; first and middle parts, rainy, with thunder and lightning; latter part, light airs and fine weather. This is the first time the ship has made less than *six knots* the hour since sailing. I hope we shall not be long getting through the doldrums.

April 15. Lat. 1° 37′ N.; long. 28° 50′ W. Barometer, $27\frac{9}{12}$. Winds: N. E., S. E., S. E.; light airs and clear; very warm.

April 16. Lat. 0° 59′ N.; long. 29° 10′ W. Barometer, $27\frac{10}{12}$. Winds: S. E., S. E., S. S. E.; light airs and fine weather; St. Paul's in sight, bearing W. S. W., distant about fifteen miles.

April 17. Lat. 0° 06′ S.; long. 29° 20′ W. Barometer, —. Winds: E. N. E., S. E. by S., S. E. by S.; fine weather, with passing clouds and baffling flaws from E. N. E. to S. E. We have at last crossed the equator, in nineteen days and seventeen hours, from Boston light-house. Distance to the line, 3,600 miles.

April 18. Lat. 0° 37′ S.; long. 29° 35′ W. Ten miles westerly current. Winds: S. E., calm, S. E.; light airs and calm during the day.

April 19. Lat. 1° 22′ S.; long. 29° 50′ W. Winds: calm, E. N. E., calm; fine weather with baffling airs. When shall I get out of the doldrums? Current, W. N. W., eighteen miles.

April 20. Lat. 3° 02′ S.; long. 30° 00′ W. Winds: S. E., E. N. E., calm; first part, light airs; middle, fresh breezes; latter, calm, with heavy southerly swell.

April 21. Lat. 3° 52′ S.; long. 30° 10′ W. Winds: calm, E. S. E., E. S. E.; commences calm; middle and latter parts, light airs; fine weather.

April 22. Lat. 5° 27′ S.; long. 30° 35′ W. Winds: E. S. E., E. S. E., E. S. E.; first part, light airs; middle, squally with torrents of rain; ends with a steady breeze.

Ship Competitor (Moses Hows), Boston to San Francisco, twelve days out.

April 8, 1853. Lat. 20° 15′ N.; long. 32° 14′ W. Barometer, 29.95; temperature of air, 74°; of water, 74°.5. Winds: N., N., N. Light breezes and pleasant weather.

April 9. Lat. 18° 16′ N.; long. 32° 07′ W. Barometer, 29.95; temperature of air, 74°; of water, $73\frac{1}{2}$°. Wind: N. throughout. Light airs and hot weather.

April 10. Lat. 16° 13′ N.; long. 31° 47′ W. Barometer, 29.95; temperature of air, 81°; of water, $74\frac{1}{2}$°. Winds: N. N. E., N. E., and E. by S. Light airs and warm weather.

April 11. Lat. 13° 24′ N.; long. 31° 40′ W. Barometer, 29.85; temperature of air, 78°; of water, 73°. Wind: E. S. E. throughout.

April 12. Lat. 10° 00′ N.; long. 30° 00′ W. Barometer, 29.85; temperature of air, 82°; of water, 77°. Winds: E. by S., E., and E. by N. Light winds and cloudy; under studding-sails.

April 13. Lat. 6° 31′ N.; long. 28° 20′ W. Barometer, 29.80; temperature of air, 83°; of water, 79°. Wind: E. throughout. Light winds and cloudy.

April 14. Lat. 4° 09′ N.; long. 28° 20′ W. Barometer, 29.80; temperature of air, 91°; of water, 81°. Winds: E., E. N. E., E. N. E. Light winds and cloudy weather.

April 15. Lat. 3° 03′ N.; long. 28° 12′ W. Barometer, 29.85; temperature of air, 91°; of water, 81°. Winds: E. S. E., E. S. E., and S. E. Light and baffling airs, with squally appearance.

April 16. Lat. 2° 17′ N.; long. 28° 11′ W. Barometer, 29.85; temperature of air, 98°; of water, 81°. Winds: calm, E., and calm. Baffling airs from the eastward, and cloudy weather.

April 17. Lat. 1° 35′ N.; long. 28° 10′ W. Barometer, 29.85; temperature of air, 88°; of water, 83°. Winds: calm, calm, and E. S. E. Calms, and light squalls from the eastward.

April 18. Lat. 1° 20′ N.; long. 28° 45′ W. Barometer, 29.90. Current, S. 30° W., 16 miles. Temperature of air, 88°; of water, 81°. Winds: S. by W., S. S. W., and S. S. W. Light airs.

April 19. Lat. 0° 57′ N.; long. 28° 50′ W. Barometer, 29.90; temperature of air, 85°; of water, 81°. Winds: calm throughout.

April 20. Lat. 0° 10′ N.; long. 28° 45′ W. Barometer, 29.93; temperature of air, 85°; of water, 80°. Winds: calm, calm, and E. S. E. Light airs and calm, and cloudy weather.

[I have quoted from the Competitor's abstract, merely to illustrate the track of the Climax (p. 471), and to impress navigators with the fact that nothing is to be gained by crossing 20° N. to the east of 35° W.; but, on the contrary, there is generally a loss.

These two vessels crossed that parallel within a day of each other; the Climax, which crossed to the west of that meridian, gaining on her competitor two days to that parallel, and making another gain of another two days thence to the line.]

April 21. Lat. 0° 35′ S.; long. 29° 04′ W. Barometer, 29.90. Current, S. 24°, W. 10 miles. Temperature of air, 88°; of water, 80°. Winds: calm throughout. Crossed the line at 3 o'clock P. M.; during the last week I have not taken in royals, and have made but 218 miles.

April 22. Lat. 1° 43′ S.; long. 29° 32′ W. Barometer, 29.85; temperature of air, 84°; of water, 81°. Winds: calm, calm, S. S. E.; first and middle part calm; latter part, light breezes and cloudy.

April 23. Lat. 4° 47′ S.; long. 30° 30′ W. Barometer, 29.90; temperature of air, 86°; of water, 82°. Winds: S. E. by S., S. E., and S. E. First part, light breezes and passing clouds; middle and latter part, fresh breezes.

April 24. Lat. 7° 48′ S.; long. 32° 34′ W. Barometer, 29.90; temperature of air, 90°; of water, 82. Winds: S. E. throughout, fresh breezes and fine weather.

Bark Tremont (Joseph Taylor), Boston to Cape Town, eighteen days out.

April 16, 1853. Lat. 19° 50′ N.; long. 35° 22′ W. Current, ½ knot per hour, S. S. W. Barometer, 30.00; temperature of air, 72°; of water, 72°. Winds: E. by N., E. by N., E. by N. Moderate breezes, and clear.

April 17. Lat. 17° 31′ N.; long. 33° 12′ W. Current, ½ knot per hour, S. S. W. Barometer, 30.00;

temperature of air, 72°; of water, 72°. Winds: E. by N., E. by N., E. by N. Fair weather, and moderate.

April 18. Lat. 15° 03′ N.; long. 31° 44′ W. Current, 1 knot per hour, W. Barometer, 29.16; temperature of air, 73°; of water, 74°. Winds: E. N. E., E. by N., E. by N. Fair and moderate; some tide rips.

April 19. Lat. 12° 15′ N.; long. 30° 22′ W. Current, ¾ knot per hour, W. Barometer, 29.15; temperature of air, 74°; of water, 74°. Winds: E. by N., E. by N., E. by N. Squally, with some rain and tide rips.

April 20. Lat. 9° 35′ N.; long. 28° 50′ W. Barometer, 29.18; temperature of air, 78°; of water, 76°. Winds: E. N. E., E. N. E., E. N. E. Squally, with some rain and tide rips.

April 21. Lat. 6° 45′ N.; long. 27° 40′ W. Barometer, 29.18; temperature of air, 80°; of water, 78°. Winds: E. N. E., N. E., N. E. Squally, with some rain and tide rips.

April 22. Lat. 4° 03′ N.; long. 27° 15′ W. Barometer, 29.15; temperature of air, 80°; of water, 79°. Winds: N. E., E. N. E., E. N. E. Many tide rips. First part, almost cloudless sky.

April 23. Lat. 2° 00′ N.; long. 26° 45′ W. Barometer, 29.15; temperature of air, 81°; of water, 79°. Winds: N. E., E. N. E., E. N. E. Moderate, and sky overcast; a little rain.

April 24. No observations. Barometer, 29.15; temperature of air, 80°; of water, 79°. Winds: N., E. N. E., E. N. E. Light airs; thunder, and some rain.

April 25. Lat. 1° 21′ S.; long. 26° 20′ W. Barometer, 29.18; temperature of air, 80°; of water, 80°. Winds: E., E. S. E., S. E. Fine weather, and clear sky.

April 26. Lat. 3° 25′ S.; long. 27° 46′ W. Barometer, 29.15; temperature of air, 82°; of water, 81°. Winds: E. S. E., S. E., S. E. by S. Fair and moderate.

April 27. Lat. 5° 22′ S.; long. 28° 41′ W. Barometer, 29.15; temperature of air, 81°; of water, 80°. Winds: S. S. E., S. E., S. E. Fair and moderate.

Bark Golden Era (E. P. Sleeper), New York to Panama, twenty-five days out.

April 19, 1852. Lat. 20° 06′ N.; long. 38° 22′ W. Winds: S., and variable, S. E., S., and variable. Very light variable airs, and calms. A heavy sea from the N. W.

April 20. Lat. 19° 49′ N.; long. 38° 07′ W. Temperature of air, 76°; of water, 76°. Winds: calm, N. N. W., N. N. W. Very light airs and calms.

April 21. Lat. 19° 08′ N.; long. 37° 38′ W. Temperature of air, 77°. Winds: N. N. W., N. N. E., E. N. E., variable. Light airs and calms.

April 22. Lat. 17° 58′ N.; long. 36° 51′ W. Temperature of air, 75°. Winds: E. N. E., E., variable, E. S. E., variable. Light breezes; middle part, light squalls and rain.

April 23. Lat. 16° 8′ N.; long. 35° 37′ W. Temperature of air, 76°; of water, 78. Winds: E., variable; E. by N. E., variable. Moderate breezes, light squalls, and rain.

April 24. Lat. 13° 40′ N.; long. 33° 56′ W. Barometer, 29.08; temperature of air, 76°; of water, 76°. Winds: E., E. by N., E. N. E.; fresh breezes throughout.

April 25. Lat. 11° 16′ N.; long. 32° 20′ W. Temperature of air, 77°; of water, 77°. Winds; E. N. E., E. by E. N. E., N. E.; good breezes.

April 26. Lat. 8° 58′ N.; long. 30° 39′ W. Temperature of air, 78°; of water, 79. Wind: E. N. E.; first part good breezes; middle and latter part moderate breezes.

April 27. Lat. 6° 42′ N.; long. 29° 07′ W. Temperature of air, 79°; of water, 80°. Winds: E. N. E.; moderate breezes.

April 28. Lat. 4° 23′ N.; long. 27° 55′ W. Temperature of air, 81°; of water, 82°. Winds: E. N. E., N. E. by E., N. E. by E.; moderate breezes.

April 29. Lat. 3° 04′ N.; long. 27° 14′ W. Temperature of air, 82°; water, 82°. Winds: N. E. by E., N. E. by E., N. E. by N.; light breezes.

April 30. Lat. D. R. 1° 48′ N.; long. D. R. 27° 15′ W. Temperature of air, 81°; of water, 82°. Winds: N., N., variable, N. W. to E.; first part very light breezes; middle and latter, showers of rain.

May 1. Lat. 00° 34′ N.; long. 26° 40′ W. Current, E., 24 miles, during the last two days; temperature of air, 84°; water, 83°. Winds: N., N., N. E.; very light breezes, and pleasant.

May 2. Lat. 0° 09′ S.; long. 26° 18′ W. Current, 30 miles, E. S. E., during the day. Winds: N. N. E., calm, S. E.; very light airs, and pleasant.

May 3. Lat. 0° 37′ S.; long. 26° 55′ W. Current, 30 miles E.; temperature of air, 83°. Winds: S. S. E., variable, S., variable, S. by W., variable; first part, very light airs; middle and latter, light breezes.

Ship White Squall (Samuel Kennedy), New York to San Francisco, fourteen days out.

April 23, 1852. Lat. 21° 29′ N.; long. 33° 7′ W. Current south, 12 knots per day. Barometer (Aneroid*), 30.55; temperature of air, 78°; of water, 73°. Moderate trades all day. First part, N. E.; middle part, E. N. E.; latter part, east.

April 24. Lat. 17° 32′ N.; long. 31° 47′ W. Current S. E., 7 knots per day. Barometer, 30.55; temperature of air, 80°; of water, 76°. Fresh trades all day. Winds: E. S. E., E., E. by N.

April 25. Lat. 13° 30′ N.; long. 30° 27′ W. Current S. S. E., 23 knots per day. Barometer, 30.45; temperature of air, 80°; of water, 77°. Wind: E., E. N. E., E. N. E. Fresh trades all day.

April 26. Lat. 9° 50′ N.; long. 29° 23′ W. Barometer, 30.40; temperature of air, 81°; of water, 78°. Moderate trades all day; E. N. E. throughout.

April 27. Lat. 6° 58′ N.; long. 28° 36′ W. Barometer, 30.45; temperature of air, 83°; of water, 80°. Winds: E. N. E., N. E., N. E. Light trades all day; tide rips.

April 28. Lat. 3° 53′ N.; long. 28° 22′ W. Current, S. S. W., 27 knots per day. Barometer, 30.40. temperature of air, 84°; of water, 80°. Winds: E. N. E., N. E., N. N. E. Light trades all day; tide rips.

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* Four-tenths to be deducted from the Aneroid, for each day up to the 21st of May, for want of adjustment.

April 29. Lat. 2° 22′ N.; long. 28° 20′ W. Current, E. S. E., 13 knots per day. Barometer, 30.40; temperature of air, 86°; of water, 82° Winds: N. N. E., N., N. Light breeze all day.

April 30. Lat. 48′ N.; long. 27° 10′ W. Current east, 32 knots per day. Barometer, 30.35; temperature of air, 87°; of water, 84°. Winds: N., S. S. W., N. Light breeze all day; middle part, rain.

May 1. Lat. 39′ S.; long. 26° 47′ W. Current E. S. E., 33 knots per day. Barometer, 30.35; temperature of air, 89°; of water, 87°. Winds: N., E. N. E., N. E. Light airs; tide rips.

May 2. Lat. 1° 22′ S.; long. 26° 37′ W. Current S. E., 27 knots per day. Barometer, 30.30; temperature of air, 91°; of water, 85°. Winds: N., N. E., S. Light airs; tide rips.

May 3. Lat. 1° 50′ S.; long. 27° 36′ W. Current E. by S., 29 knots per day. Barometer, 30.45; temperature of air, 88°; of water, 86°. Wind: S. S. W. throughout. First part, nearly calm; ends, light breezes; rain squalls.

May 4. Lat. 4° 52′ S.; long. 29° 24′ W. Current, S. S. W., 11 knots per day. Barometer, 30.40; temperature of air, 91°; of water, 89°. Winds: S. S. W., and S. E., S. S. E., S. E. Rainy until 1 P. M.; wind hauls to S. E., and clears.

Route to Rio, etc.—MAY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N. & E.	SLANTS FROM S. & W.	Fair.	Calms.	
From port	to										
39° 11′ N.	70° 00′	E. S. E.	199	9.8	218	2.5	10.8	8.3	78.4	2.1	599
39 11	65 00	E.	238	11.5	464	6.4	12.8	11.2	69.6	2.8	315
37 34	60 00	E. S. E.	254	9.1	277	2.8	6.6	8.8	81.8	1.6	181
35 55	55 00	E. S. E.	259	10.2	285	1.8	9.1	*w* 15.2	73.9	3.6	163
35 55	50 00	E.	243	9.9	267	0.7	15.2	12.4	17.9	2.7	145
35 00	47 17	E. S. E.	144	5.5	152	0.9	0.0	*w* 16.9	82.2	1.7	112
33 06	45 00	S. E.	194	9.1	211	3.3	0.0	*w* 11.5	85.2	1.6	61
30 00	41 23	S. E.	263	14.7	301	3.3	13.9	*w* 19.1	63.7	5.6	151
27 00	40 00	S. S. E.	194	6.5	206	2.6	*w* 10.4	0.0	87.0	2.5	39
25 00	40 00	S.	120	9.4	131	3.4	5.1	5.1	86.4	0.0	60
20 00	37 46	S. S. E.	325	0.3	326	0.0	1.8	0.0	98.2	0.0	54
15 00	35 36	S. S. E.	325	0.8	327	0.0	*w* 4.4	0.0	95.6	0.0	23
10 00	33 29	S. S. E.	325	0.0	325	0.0	0.0	0.0	100.0	0.0	54
5 50	31 24	S. S. E.	325	0.5	325	0.0	*w* 4.8	0.0	95.2	0.0	42
Equator	31 24	S. S. E.	300	0.6	302	0.0	*w* 5.2	1.7	93.1	3.4	115
			3708		3917						
1 00 S.	31 49	S. S. W.	65	2.1	66	0.0	*w* 9.9	0.4	89.7	0.0	264
1 27	22 00	S. S. W.	29	0.0	29	0.0	0.0	0.0	100.0	6.2	15
3 00	32 39	S. S. W.	101	3.3	104	0.0	*w* 16.7	0.0	83.3	0.0	12
3 51	33 00	S. S. W.	55	0.0	55	0.0	0.0	0.0	100.0	0.0	21
5 00	33 28	S. S. W.	75	0.0	75	0.0	0.0	0.0	100.0	0.0	6
6 24	34 00	S. S. W.	84	0.0	84	0.0	0.0	0.0	100.0	0.0	9
7 00	34 15	S. S. W.	39	14.2	45	0.0	*w* 48.9	2.4	48.7	0.0	41
7 00	33 30	E.	44	3.2	45	0.0	0.0	*w* 11.8	88.2	0.0	23
8 13	34 00	S. S. W.	79	32.0	104	13.0	*w* 52.2	0.0	34.8	0.0	23

In this month, and near this route, the calms of the Horse Latitudes are most prevalent between the meridians of 40° and 45°, and the parallels of 32° and 33° N. Between the meridians 25° and 30°, the equatorial calms are most prevalent from 5° north to the line, the greatest prevalence of calms being between 3° and 4° north. Between the meridians of 30° and 35°, the equatorial calms prevail most between 3° and 5° N. Here they extend also a little to the south of the line. In the main, the equatorial calms prevail as you go to the east. When you cross the line to the west of 29°, draw a line from the point of crossing to St. Augustine, and aim to keep to the eastward of it, and for this purpose take advantage of all slants.* This direction applies to every month. You should aim generally to make easting, when easting becomes necessary after crossing the line, before crossing 7° south.

If you can cross 7° S. to the east of 34°, there will probably be no necessity of steering the east course, as by the table. Observe that calms are seldom or never found along this route, in this month, south of 1° S.

The equatorial calms in April, between 25° and 30° W., prevail from 5° S. to 3° N., being most prevalent between 1° S. and 1° N. Between 30° and 35° W., they prevail from 3° N. to 3° S., being most prevalent between 2° N. and the line.

Observe, also, how the winds in this month hang from the southward, in latitude 35° to 30° N., and between the meridians of 40° and 45° W.

Schooner Tennessee (A. B. Lamkin), from Richmond to Pernambuco, twenty-one days out.

April 30, 1853. Lat. 19° 57′ N.; long. 35° 36′ W. Wind: E. throughout; fresh breeze, with occasional showers of rain.

May 1. Lat. 16° 29′ N.; long. 34° 28′ W. Winds: E., E., E. by S.; brisk breezes, with showers of rain.

May 2. Lat. 13° N.; long. 32° 41′ W. Wind: E. throughout; fresh breezes, with passing squalls.

May 3. Lat. 09° 30 N.; long. 31° 44′ W. Wind: E. throughout; pleasant breezes, and fine weather.

May 4. Lat. 06° 06′ N.; long. 31° 12′ W. Winds: E., E. N. E., and E.; light winds, and cloudy weather.

May 5. No observation. Winds: variable from E. N. E.; light breezes, and showery weather.

May 6. Wind and weather the same. No observation.

May 7. Lat. 3° N.; long. 31° 17′ W. Winds: variable and heavy showers of rain.

May 8. Lat. 1° 30′ N.; long. 31° 41′ W. Winds: calm, calm, S. E. by E.; light baffling winds and calms.

May 9. Lat. 00° 36′ S; long. 32° 14′ W. Winds: S. E. by S., S. E., and S. E by S.; light winds, with fine pleasant weather.

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* *Vide* p. 417.

May 10. Lat. 3° 58′ S.; long. 32° 02′ W. Wind: S. E. by S. throughout; light winds with fine weather.

May 11. Lat. 5° 46′ S.; long. 32° 22′ W. Winds: S. E. by S. and S. E.; light air with clear weather.

Ship Victory (O. G. Lane), New York to San Francisco, nineteen days out.

May 10, 1853. Lat. 20° 40′ N.; long. 33° 23′ W. Winds: E., E. S. E., and S. E.; variable breezes and squally.

May 11. Lat. 17° 51′ N.; long. 32° 25′ W. Winds: S. E. by S., E. by S., and E. by S.; fresh breeze and cloudy.

May 12. Lat. 14° 24′ N.; long. 31° 19′ W. Winds: E., E., and E. by N.; fresh breezes and cloudy weather.

May 13. Lat. 10° 06′ N.; long. 30° 15′ W. Wind: E. by N. throughout; fresh breezes and passing clouds.

May 14. Lat. 7° 49′ N.; long. 29° 21′ W. Winds: E. by N., E., and E. by N.; gentle breezes.

May 15. Lat. 4° 38′ N.; long. 28° 19′ W. Winds: E. by N., E. N. E., and E. N. E.; fine breezes and cloudy weather.

May 16. Lat. 3° 30′ N.; long. 28° 25′ W. Wind: E. N. E., variable and calm; variable breezes and light showers of rain.

May 17. Lat. 1° 44′ N.; long. 29° 37′ W. Winds: S., S. E. by S., and S. E.; moderate breezes and squally weather.

May 18. Lat. 00° 49′ S.; long. 30° 18′ W. Wind: S. E. throughout; fine breezes and pleasant weather. At 4 A. M. passed the equator, twenty-six and a half days out; distance sailed, 3,890 miles.

May 19. Lat. 3° 18′ S.; long. 31° 04′ W. Winds: S. E. throughout; fine breezes and pleasant weather.

May 20. Lat. 6° 07′ S.; long. 31° 50′ W. Winds: S. E. throughout; fresh breezes and pleasant weather.

Ship Uncle Toby (E. C. Soule), Boston to San Francisco, 1853, twenty-one days out.

May 10. Lat. 20° 49′ N.; long. 31° 57′ W. Winds: E. N. E., E., and E. S. E.; moderate breezes and clear weather.

May 11. Lat. 17° 15′ N.; long. 30° 01′ W. Winds: E. S. E., E. S. E., and E.; strong breezes and clear.

May 12. Lat. 13° 13′ N.; long. 31° 44′ W. Winds: E., E., and E. N. E.; strong breezes throughout.

May 13. Lat. 9° 27′ N.; long. 30° 41′ W. Winds: E. N. E., E. N. E., and E.; strong breezes throughout.

May 14. Lat. 6° 03′ N.; long. 29° 39′ W. Winds: E., E., and E. S. E.; moderate breezes and cloudy weather.

May 15. Lat. 3° 04′ N.; long. 29° 28′ W. Winds: E., N. E., and E. N. E.; fresh breezes and squally.

May 16. Lat. 1° 53′ N.; long. 30° 25′ W. Winds: S. S. E., S. E., and S. S. E.; light variable breezes, and squally.

May 17. Lat. 00° 50′ S.; long. 31° 44′ W. Winds: S. S. E., S. E., and S. S. E.; fresh breezes throughout.

May 18. Lat. 3° 44′ S.; long. no observation. Winds: S. E., E. S. E., and E. S. E. Fresh breezes throughout. At 10 A. M. made Fernando de Noronha.

May 19. Lat. 6° 53′ S.; long. 33° 10′ W. Winds: E. S. E., S. E., and S. E. Light breezes and pleasant; passed close to leeward of Fernando de Noronha.

Flying Cloud (J. P. Creesy), New York to San Francisco, eleven days out.

May 10, 1853. Lat. 20° 50′ N.; long. 38° 47′ W. Winds: S. E. by E., S. E. by E., E. S. E. First part, moderate; middle, rain; latter, squally.

May 11. Lat. 16° 47′ N.; long. 37° 48′ W. Winds: S. E. by E., S. E. by E., S. E. by E. First part, light; middle, squally; latter, fresh and squally.

May 12. Lat. 12° 11′ N.; long. 36° 26′ W. Wind: E. by S. throughout. Fresh and squally.

May 13. Lat. 8° 00′ N.; long. 34° 46′ W. Wind: E. by S. Fresh and squally.

May 14. Lat. 3° 37′ N.; long. 34° 08′ W. Wind: E. S. E. Fresh and squally.

May 15. Lat. 1° 00′ N.; long. 34° 03′ W. Wind: S. E. by E. Light and squally. Civil time, 15′. At 7 P. M. crossed the equator, in long. 34° 20 W. Seventeen days from Sandy Hook, or 408 hours, averaging nine knots; when determined in short lines, from noon to noon of each day, 3,672 miles. [Distance, as calculated in the tables, 3,708.]

May 16. Lat. 0° 27′ S.; long. 34° 07′ W. Winds: baffling throughout.

May 17. Lat. 3° 11′ S.; long. 34° 42′ W. Wind: S. E. Light breezes and fine weather.

May 18. Lat. 4° 46′ S; long. 34° 57′ W. Winds: baffling throughout. Beating to the eastward, with light winds and fine weather. Current, W. by N., 46 miles.

May 19. Lat. 2° 31′ S.; long. 33° 41′ W. Winds: S. E., S. E., S. E. by E. Light breezes and fine weather. At 1 hour 15 min., tacked S. by W. ½ W. At 4 hours 20 min., tacked N. E. by E. Stood on this tack 21 hours; lost 135 miles in latitude, and gained 76 miles easting, after having been currented at 82° W., 55 miles.

May 20. Lat. 5° 47′ S.; long. 34° 19′ W. Wind: S. E. by E. Light winds and fine weather. Currented west, 20½ miles. I would here remark, the current sets much stronger to the westward and northward and westward, when close in with the land and shoals about Cape St. Roque, than it does in the offing, say 40 or 50 miles. Should recommend all ships to work to the eastward on the northern limit of the S. E.

trades, say between 1° N. lat. and 2° S. lat., when they are so unfortunate as to cross the equator too far west.

[This recommendation should be very cautiously adopted. Captain Creesy falls to leeward, crosses the line in 34°, stands boldly on, tacks when he must, and in 22 days out is clear of St. Roque; and yet, notwithstanding this extraordinarily good passage, all navigators are cautioned against following so good an example as he himself set, after having the misfortune to be forced to cross the line so far to leeward as 34°. It is true, no vessel should willingly cross so far, but cases are not unfrequent of vessels, after crossing in 34°, and even in 37°, having no difficulty in clearing St. Roque. They do this by following the *Sailing Directions*, which advise them in such cases to stand or trust to chance for a change of wind, and to luck for favorable slants.

I think that Captain Creesy would have done very unwisely had he, on the 15th, when he found himself to leeward, and on "the northern limits of the southeast trades," attempted, instead of standing on south, as he did, to beat to windward there in the doldrums. If there be any one point upon which I feel myself clear, touching the best course of procedure in such cases, it is in the caution which I have so often given and here repeat, viz: that navigators should not attempt to beat to windward in the doldrums. If a vessel find herself to leeward in them, and the wind will allow her to lay a course well to windward, as it did the Eagle, let her lay it, but do not attempt to beat in a part of the ocean where you know you are not to have wind enough for beating.]

May 21. Lat. 7° 52′ S.; long. 34° 30′ W. Wind: S. E. by E. First part, light breezes and fine weather; middle and latter, faint airs and calms. Currented N., 49° W., 11 miles.

I find the strength of the current about here depends much, if not altogether, upon the direction and velocity of the wind; in crossing with the wind, and *vice versâ*.

Barque Southerner (E. Hooper), New York to San Francisco, nineteen days out.

May 11, 1852. Lat. 14° 24′ N.; long. 39° 05′ W. Strong easterly wind with a head sea.

May 12. Lat. 11° 53′ N.; long. 37° 21′ W. Strong easterly winds, and clear.

May 13. Lat. 9° 19′ N.; long. 35° 53′ W. Fine easterly breezes, and clear.

May 14. Lat. 6° 49′ N.; long. 33° 58′ W. Fresh breezes at E. by N., and clear.

May 15. Lat. 5° 11′ N.; long. 31° 47′ W. Wind: E. N. E. Fine breezes, and clear.

May 16. Lat. 4° 10′ N.; long. 31° 15′ W. First part, wind all round the compass with rain; middle part, wind S. E. and squally; latter part, east, with rain squalls.

May 17. Lat. 2° 28′ N.; long. 29° 40′ W. First part, squally with rain; middle and latter parts, fresh breezes from E. to E. S. E., and clear weather.

May 18. Lat. 0° 25′ N.; long. 29° 30′ W. Fine breezes with rain squalls. At 6 A. M. made St. Paul's Island. At 8 A. M. it bore N. E. true, distant about 12 miles. Found (by observation) that Blunt places the island too far east. English books agree with my chronometer.

May 19. Lat. D. R. 00° 15′ S.; long. D. R. 29° 55′ W.; first part, light breezes from E. S. E; middle and latter parts, wind all round the compass, accompanied with heavy showers.

May 20. Lat. D. R. 1° 00′ S.; long. D. R. 30° 29′ W.; light airs, and rain squalls from all points of the compass.

May 21. Lat. D. R. 1° 10′ S.; long. D. R. 31° 05′ W.; light airs, calms, with rain from all points, but principally N. W.

May 22. Lat. D. R. 1° 23′ S.; long. D. R. 30° 36′ W.; light baffling airs from S. E. to S., with continual rain squalls.

May 23. Lat. 2° 38′ S.; long. 30° 59′ W.; first part, light, baffling airs, and rain squalls; at midnight, took the trades at S. E. by E. Ends with fresh trades, and clear.

May 24. Lat. 4° 05′ S.; long. 32° 56′ W.; fine fresh breezes from S. E. by E., and clear, with a heavy sea from S.

May 25. Lat. 6° 44′ S.; long. 33° 09′ W.; strong gales and a high, irregular sea. Wind: S. E.

May 26. Lat. 7° 10′ S.; long. 33° 18′ W.; strong S. S. E. gales. At 5, made a tack off shore, and at 4 A. M. on again. Current, N. W., 1 mile per hour.

Bark Ottowa (S. G. Brooks), New York to Rio Grande, Brazil, twenty days out.

May 26, 1853. Lat. 20° 50′ N.; long. 43° 30′ W. Barometer, 30.05; temperature of air, 79°. Winds: E. S. E., E. by S., E.; first part, moderate breezes; middle and latter, light.

May 27. Lat. 18° 55′ N.; long. 42° 18′ W. Barometer, 30.00; temperature of air, 78°. Winds: E., E. N. E., E.; fresh breezes, and squally throughout.

May 28. Lat. 16° 42′ N.; long. 41° 15′ W. Barometer, 29.90; temperature of air, 79°. Winds: E. by S., E., E. by N. to E. by S.; fresh squalls throughout; tumbling sea.

May 29. Lat. 14° 40′ N.; long. 40° 02′ W. Barometer, 29.90; temperature of air, 79°. Winds: E. by S., E. by S., E. by N. to E. by S.; fresh breezes and squally.

May 30. Lat. 12° 44′ N.; long. 38° 31′ W. Barometer, 29.90; temperature of air, 78°. Winds: E. by S., E. by S., E. N. E.; fresh breezes with squalls.

May 31. Lat. 11° 03′ N.; long. 36° 39′ W. Barometer, 29.89; temperature of air, 80°. Winds: E. by N., E. N. E., N. E. by E.; light breezes, and flawy.

June 1. Lat. 9° 18′ N.; long. 34° 44′ W. Barometer, 29.82; temperature of air, 82°. Winds: N. E. by E., E. N. E., E. by N.; moderate breezes; clouds rising from the southward.

June 2. Lat. 7° 34′ N.; long. 33° 08′ W. Barometer, 29.85; temperature of air, 81°. Winds: E. by N., E. by N., W. S. W.; first and middle parts, moderate breezes; latter, light.

June 3. Lat. 6° 00′ N.; long. 32° 37′ W. Barometer, 29.89; temperature of air, 83°. Winds, calm; S. E., E. to E. N. E.; first part, calm; middle, light breezes; latter, fresh.

June 4. Lat. 4° 33′ N.; long. 32° 07′ W. Barometer, 29.90; temperature of air, 82°. Winds: E. to E. N. E., E. to E. S. E., and S. E. Moderate breezes and squally.

June 5. Lat. 2° 33′ N.; long. 33° 20′ W. Current, W. S. W., $\frac{3}{4}$ of a knot per hour. Barometer, 29.89; temperature of air, 83°. Winds: S. to S. S. E., S. S. E., S. E. Throughout, light breezes; looks like trades.

June 6. Lat. 00° 50′ N.; long. 34° 13′ W. Current, W. by S., 1 knot per hour. Barometer, 29.87; temperature of air, 84°. Winds: S. E. by E., E. S. E., S. E. by E. Light breezes and fine weather; quite smooth.

June 7. Lat. 1° 05′ N.; long. 33° 38′ W. Current, W. by S., $1\frac{2}{10}$ knots per hour. Barometer, 29.85; temperature of air, 83°. Winds: E. S. E., S. E., and S. E. by S. to S. by E. Moderate, and fine weather.

June 8. Lat. 1° 43′ N.; long. 31° 56′ W. Current, W. by N., $1\frac{1}{2}$ knots per hour. Barometer, 29.85; temperature of air, 83°. Winds: S. by E., S., S. by E. First and middle parts, light breezes. Latter, fresh.

June 9. Lat. 1° 24′ N.; long. 32° 21′ W. Barometer, 29.89; temperature of air, 83°. Winds: S. S. E. $\frac{1}{2}$ E., S. E. by S. S., E. Throughout, moderate breezes. *You don't catch me here again.*

June 10. Lat. 00° 24′ S.; long. 33° 06′ W. Current, $1\frac{2}{10}$ knots per hour, W. Barometer, 29.89; temperature of air, 83°. Winds: S. E. by E., S. E., S. E. Throughout, moderate breezes, and squally. Strong currents.

June 11. Lat. 2° 40′ S.; long. 32° 30′ W. Not much current. Barometer, 29.85; temperature of air, 83°. Winds: S. E. by S., S. E. by E., E. Moderate breezes.

June 12. Lat. 4° 54′ S.; long. 32° 04′ W. Barometer, 29.90; temperature of air, 84°. Winds: east, E. N. E., E. by S. Throughout, moderate breezes; stronger in the night.

June 13. Lat. 7° 07′ S.; long. 32° 40′ W. Barometer, 29.89; temperature of air, 82°. Winds: S. E. by S., S. E., S. E. by S. First part, light breezes; middle, and latter, fresh and squally.

Route to Rio, etc.—JUNE.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.	
From New	York to										
39° 11′ N.	70° 00′	E. S. E.	199	10.1	219	2.6	7.8	*w* 11.4	78.2	3.1	349
37 34	65 00	E. S. E.	254	13.4	287	5.3	*w* 10.7	4.0	80.0	1.3	300
35 55	60 00	E. S. E.	259	5.9	272	2.0	2.8	*w* 6.2	89.0	1.2	245
35 00	57 17	E. S. E.	144	8.8	157	2.2	6.3	*w* 10.9	80.6	0.9	233
34 13	55 00	E. S. E.	123	2.0	125	0.0	*w* 10.0	0.0	90.0	20.0	20
32 30	50 00	E. S. E.	271	6.1	287	0.0	10.0	10.0	80.0	0.0	30
30 45	45 00	E. S. E.	276	5.8	292	1.1	2.1	*w* 17.0	79.7	19.7	94
30 00	42 54	E. S. E.	118	19.3	140	6.7	17.4	16.0	59.9	9.7	149
27 28	40 00	S. E.	215	15.0	247	3.3	*w* 22.9	6.6	67.2	4.2	67
25 00	37 15	S. E.	209	16.2	242	6.0	*w* 13.0	9.0	72.0	4.8	100
20 00	35 00	S. S. E.	325	2.6	333	0.0	*w* 9.0	0.0	91.0	1.8	56
15 00	32 50	S. S. E.	325	0.3	326	0.0	0.7	0.9	99.1	0.8	116
10 00	30 43	S. S. E.	325	2.0	331	0.0	*w* 7.5	1.5	91.0	0.0	66
5 00	28 37	S. S. E.	325	17.6	381	5.3	13.2	13.8	67.7	16.0	152
Equator	30 41	S. S. W.	325	8.8	353	2.8	*w* 16.1	2.8	78.3	0.0	106
			3693		3992						
1 00 S.	31 06	S. S. W.	65	3.0	67	0.0	*w* 12.0	0.0	88.0	0.0	171
3 00	31 06	S. S. W.	330	5.8	138	0.0	28.5	0.0	71.5	0.0	21
5 00	32 46	S. S. W.	130	10.0	143	0.0	50.0	0.0	50.0	0.0	12
5 34	33 00	S. S. W.	37	10.0	41	0.0	50.0	0.0	50.0	0.0	12
7 00	33 36	S. S. W.	93	7.7	100	0.0	33.4	0.0	66.6	0.0	21
7 58	34 00	S. S. W.	63	6.6	67	0.0	27.0	0.0	73.0	0.0	37
9 00	34 26	S. S. W.	67	6.4	71	0.0	24.0	2.0	74.0	0.0	50

If the wind should, as it probably will, head you off, after crossing the line to the west of 30°, so as to force you to leeward of 33° before crossing 5° 30′ S., stand E. for a few leagues, or until the wind hauls so as to let you lay up.

Aim to cross the equator near 29°; and do not, if it can be avoided, go to the east of 28° 30′ after crossing 10° N. The farther you go east there, the more prevalent are the calms. Endeavor to cross 30° N. in about 40° W., so you may get to 25° N. by a south course. It is difficult to get to the S. E. between those two parallels. Southwest winds are not uncommon here. Between 10° and the equator, calms are much more frequent E. of 30° than to the W. of 30°, and they become more prevalent as you go east. Between 25° and 30° W., from 3° to 5° N., are the calm latitudes in this month. See the Charts, Pilot and Track.

Vessels should aim never to get to leeward of the track here laid down after crossing the line. The winds hang obstinately to the southward in June. Therefore, take advantage of all slants for making easting in south latitude, until you get to 9° S. Don't consider yourself too far eastward, if in this month you cross this parallel in 31° W. No calms obtain in June, south of the line, and between 29° W. and the

coast. Among 1,000 observations examined in this part of the ocean, for this month, not one calm is recorded.

Between 65° and 70° W., 30° and 33° N., is a great place for calms; also from 25° to 28° N., between 60° and 65°. On the average, you will carry the N. E. trades to 8° or 9° N. Equatorial calms are most prevalent between 6° and 10° N., and 25° and 30° W. But between 30° and 35° W., the calms are most prevalent between 5° and 7° N.

Between 30° and 35° W., you sometimes get the S. W. monsoons, and you are liable to them from 9° to 1° N.

Ship Audubon (C. Whiting), Boston to Canton, seventeen days out.

May 26, 1852. Lat. 21° 01′ N.; long. 38° 34′ W. Winds: light, S. E., E. S. E., E. S. E.; weather pleasant.

May 27. Lat. 18° 38′ N.; long. 37° 46′ W. Wind: fresh, E. by S.; weather pleasant.

May 28. Lat. 15° 39′ N.; long. 36° 26′ W. Winds: fresh and flawy, E. by S., E.; weather pleasant.

May 29. Lat. 12° 51′ N.; long. 35° 15′ W. Winds: fresh with squalls, E., E. by N.; weather variable.

May 30. Lat. 10° 00′ N.; long. 33° 43′ W. Winds: fresh and flawy, E. N. E., E. by N.; weather cloudy.

May 31. Lat. 7° 36′ N.; long. 32° 23′ W. Wind: fresh, with squalls, E. by N. E.; weather hazy.

June 1. Lat. 6° 03′ N.; long. 32° 25′ W. Winds: fresh, squally, E., E. S. E., S. E.; weather cloudy, with rain.

June 2. Lat. 4° 49′ N.; long. 32° 00′ W. Winds: S. E., E., moderate, S. S. E. to E. Light and baffling; cloudy weather.

June 3. Lat. 4° 31′ N.; long. 31° 27′ W. Winds: light and baffling; N. E. to E., N. E., E. N. E. to N.; weather pleasant.

June 4. Lat. 3° 49′ N.; long. 31° 07′ W. Winds: light; N., N. E., N. E.; weather clear and pleasant.

June 5. Lat. 3° 28′ N.; long. 31° 12′ W. Winds: light and baffling; W. S. W., S. S. E., S.; weather pleasant, passing squalls.

June 6. Lat. 1° 46′ N.; long. 31° 52′ W. Winds: moderate; S. S. E., S. S. E., S. E.; weather pleasant.

June 7. Lat. 0° 02′ S.; long. 31° 53′ W. Winds: moderate; S. E., E. S. E., E. S. E.; weather pleasant.

June 8. Lat. 2° 14′ S.; long. 32° 12′ W. Winds: moderate; E. S. E. to S. E. by E.; weather pleasant.

June 9. Lat. 3° 25′ S.; long. 32° 20′ W. Winds: moderate; S. E., E. by S., E. S. E.; weather fine; made Fernando de Noronha.

June 10. Lat. 3° 16′ S.; long. 31° 30′ W. Winds: moderate; S. E., S. E. by S., S. E.; weather pleasant.

June 11. Lat. 5° 20′ S.; long. 31° 27′ W. Winds: fresh; S. E., S. S. E., S. E.; weather pleasant.

Ship Milton (Freeman), Boston to Madras, twenty-three days out.

June 7, 1851. Lat. 20° 31′ N.; long. 35° 50′ W. Fresh winds with occasional squalls; E. S. E., S. E.

June 8. Lat. 18° 55′ N.; long. 34° 40′ W. Fresh winds and clear weather; E. to E. S. E.

June 9. Lat. 16° 53′ N.; long. 33° 31′ W. Fresh breezes and passing clouds; E. by N.

June 10. Lat. 14° 48′ N.; long. 31° 33′ W. Fresh breezes and hazy weather; E. by N.

June 11. Lat. 12° 48′ N.; long. 30° 12′ W. Fine breezes and pleasant; E., E. by N.

June 12. Lat. 11° 05′ N.; long. 28° 23′ W. Fine wind and pleasant; E. by N.

June 13. Lat. 9° 16′ N.; long. 27° 01′ W. Fine breezes and squally; E., E. by N.

June 14. Lat. 7° 47′ N.; long. 25° 48′ W. Moderate; breezes with occasional squalls; E., E. N. E., N. E.

June 15. Lat. 6° 45′ N.; long. 25° 10′ W. Light airs and pleasant; N. E., E.

June 16. Lat. 5° 57′ N.; long. 25° 18′ W. Light baffling airs; calms, thunder and lightning; N. E. baffling.

June 17. Lat. 5° 17′ N.; long. 26° 02′ W. Light airs first part; latter, heavy squalls with rain. South; variable.

June 18. Lat. 4° 47′ N.; long. 25° 11′ W. Calms and squalls, first and middle part; latter part, fine weather; calm, S. by E.

June 19. Lat. 3° 18′ N.; long. 26° 02′ W. Gentle breezes and pleasant; S. by E.

June 20. Lat. 1° 36′ N.; long. 27° 21′ W. Fine weather; S. S. E.

June 21. Lat. 0° 24′ S.; long. 28° 26′ W. Fine weather; S. E.

June 22. Lat. 2° 52′ S.; long. 28° 44′ W. Fine weather; moderate breezes; S. E. by E., S. E. by S., S. E.

June 23. Lat. 5° 17′ S.; long. 28° 54′ W. Fine weather; S. E.

Ship Messenger (Frank Smith), New York to California, eleven days out.

June 13, 1852. Lat. 19° 37′ N.; long. 38° 46′ W. Winds: east throughout. First part, fine winds and weather; middle and latter parts, light and squally.

June 14. Lat. 16° 18′ N.; long. 38° 44′. Moderate breeze, E. S. E., S. E. by E., E. S. E. Occasional squalls.

June 15. Lat. 13° 30′ N.; long. 36° 44′ W. First part, light breezes and squally; latter, moderate and fair, E., E. to E. by N., E. N. E.

June 16. Lat. 11° 00′ N.; long. 34° 39′ W. First part, fine breezes; middle and latter, light, at E. by N. throughout.

June 17. Lat. 9° 00′ N.; long. 31° 49′ W. Light winds and fair weather, E. by N. to E. N. E.

June 18. Lat. 7° 18′ N.; long. 30° 24′ W. First part, moderate breezes; latter, baffling airs and calms; E. N. E.; northerly, baffling.

June 19. Lat. 7° 08′ N.; long. 29° 50′ W. First part, calm and cloudy; latter part, light breeze from southward.

June 20. Lat. 6° 28′ N.; long. 29° 10′ W. First part, light airs, S. by W., and clear; middle and latter part, calm with heavy rain.

June 21. Lat. 5° 51′ N.; long. 25° 43′ W. First part, calm with showers; middle and latter, light breeze, S. by W., S. S. W.

June 22. Lat. 4° 27′ N.; long. 27° 53′ W. Moderate breezes and clear; S. by W., S., S. by E.

June 23. Lat. 3° 26′ N.; long. 29° 20′ W. Very light airs and calms; S. by E., calm, S.

June 24. Lat. 2° 25′ N.; long. 31° 05′ W. Light airs; S. by E., calm, S. S. E.

June 25. Lat. 0° 30′ N.; long. 31° 54′ W. Light breezes; S. S. E., S. E. by S., S. E. to S. E. by E.

June 26. Lat. 2° 12′ S.; long. 31° 56′ W. Moderate breezes and squally, S. E. by E., E. S. E.

June 27. Lat. 5° 04′ S.; long. 32° 40′ W. Light winds in first and middle parts, S. E. by E.; latter part, fine breezes, S. E. by E.

Ship Eliza Mallory (John E. Williams), New York to San Francisco, sixteen days out.

June 4, 1852. Lat. 21° 24′ N.; long. 35° 14′ W. Barometer, 30.05; temperature of air, 78. Winds: E., E. N. E., E. N. E. Light and baffling.

June 5. Lat. 18° 33′ N.; long. 34° 00′ W. Barometer, 30.00; temperature of air, 78°. Winds: E. N. E., E., E. First part, light breezes; middle and latter, strong. Came through a tide rip.

June 6. Lat. 15° 47′ N.; long. 32° 39′ W. Barometer, 29.95; temperature of air, 78°. Winds: E. N. E., E., E. by S. First part, strong breezes; middle and latter, squally.

June 7. Lat. 12° 50′ N.; long. 31° 16′ W. Barometer, 29.95; temperature of air, 78°. Winds: E. S. E., E., E. N. E. Strong breezes.

June 8. Lat. 10° 27′ N.; long. 30° 08′ W. Barometer, 29.9; temperature of air, 78°. Wind: east. Strong breezes and rain squalls. Came through tide rips. Current setting to the eastward.

June 9. Lat. 7° 54′ N.; long. 29° 8′ W. Current, eastwardly. Barometer, 29.9; temperature of air, 82°. Winds: E. by N. Strong breezes.

June 10. Lat. 7° 8′ N.; long. 28° 40′ W. Current, to the eastward. Barometer, 29.9; temperature of air, 82°. Winds: E. N. E., and calm. First part, strong, with rain squalls; middle and latter, calm and rainy.

June 11. No observation. Current, to the eastward. Barometer, 29.9; temperature of air, 78°.

Winds: S. S. W., and baffling. First part, squalls from S. W.; middle and latter, rain squalls from all quarters.

June 12. Lat. 6° 40′ N.; long. 27° 23′ W. Easterly current. Barometer, 29.9; temperature of air, 78°. Winds: S. W. Wind baffling from west to S. W., with rain squalls. Heavy sea from S. W.

June 13. Lat. 6° N.; long. 27° 22′ W. Easterly current. Barometer, 29.95; temperature of air, 82°. Wind: S. W.; calm, S. E. First part, rain squalls; middle, calm; latter, light.

June 14. Lat. 5° 18′ N.; long. 27° 21′ W. Barometer, 29.90. Temperature of air, 80°. Wind: S. E. First part, light; middle and latter, light and squally.

June 15. Lat. 3° 45′ N.; long. 28° 30′ W. Barometer, 29.9; temperature of air, 82°. Winds: S. S. E., S. S. E., S. by E. First part, light and rainy; middle, squally; latter, strong.

June 16. Lat. 2° N.; long. 30° 30′ W. Barometer, 29.9; temperature of air, 80°. Winds: S. by E., S. E. by S., S. S. E. First part, strong; middle and latter, moderate.

June 17. Lat. 1° 40′ N.; long. 31° 37′ W. Westerly current. Barometer, 29.9; temperature of air, 81°. Wind: S. S. E. Light winds. At 8 A. M. came through a tide rip.

June 18. Lat. 2° N.; long. 30° 54′ W. Westerly current. Barometer, 30; temperature of air, 80°. Winds: baffling, S. S. E., S. S. E. Strong current going to the westward. Tacked to the eastward.

June 19. Lat. 15′ S.; long. 31° 13′ W. Westerly current. Barometer, 30; temperature of air, 80°. Winds: S. E. by S., S. E., S. E. by E.; light. Tacked ship; came through tide rips.

Ship N. B. Palmer (C. P. Low), New York to San Francisco, thirteen days out.

June 4, 1852. Lat. 22° 3′ N.; long. 32° 29′ W. Barometer, 30.30. Winds: north, N. E., and E. S. E. Moderate breeze and pleasant.

June 5. Lat. 18° 14′ N.; long. 31° 24′ W. Barometer, 30.30. Wind: E. S. E.

June 6. Lat. 14° 21′ N.; long. 29° 48′ W. Barometer, 30.30. Wind: E. S. E. Pleasant trades.

June 7. Lat. 11° 16′ N.; long. 28° 28′ W. Barometer, 30.20. Wind: E. by S. Pleasant trades.

June 8. Lat. 8° 44′ N.; long. 26° 54′ W. Barometer, 30.20. Wind: E. by S. Pleasant trades. At 2 A. M. came up with and passed the clipper ship Gazelle, which sailed 6 days before us.

June 9. Lat. 7° 32′ N.; long. 26° 30′ W. Barometer, 30.20. Winds: E. by S. Light airs and calms. Gazelle twelve miles astern.

June 10. Lat. 7° 20′ N.; long. 25° 52′ W. Barometer, 30.30. Winds: E., S., N. Light airs and calms.

June 11. Lat. 6° 30′ N.; long. 24° 55′ W. Barometer, 30.30. Winds: S., S. S. W., S. S. E. Light airs and calms.

June 12. Lat. 5° 49′ N.; long. 25° 14′ W. Barometer, 30.1. Winds: S. S. E. Light airs and calms.

June 13. Lat. 3° 45′ N.; long. 26° 40′ W. Barometer, 30.1. Winds: S. by E., S. S. E., S. E. by S. Moderate breezes from S. to S. E. by S. Gazelle out of sight astern.

June 14. Lat. 1° 16′ N.; long. 28° 10′ W. Barometer, 30.20. Wind: S. S. E. Moderate breezes.

June 15. Lat. 1° 28′ S.; long. 29° 32′ W. Barometer, 30.30. Wind: S. E. by S. Moderate breezes, and cloudy.

June 16. Lat. 4° 24′ S.; long. 30° 38′ W. Barometer, 30.30. Wind: E. S. E.

Ship Oneida (William A. Creesy), New York to China, nineteen days out.

June 6, 1852. Lat. 15° 53′ N.; long. 31° 25′ W. Barometer, 30.00; temperature of air, 75°; of water, 75°. Winds: E. by S., E. by S., E. by S. Fresh breezes and hazy weather; sun obscured.

June 7. Lat. 12° 49′ N.; long. 30° 37′ W. Barometer, 30; temperature of air, 76°; of water, 75°. Winds: E., E., E. Moderate breezes, and squally, with showers of rain; heavy dew.

June 8. Lat. 10° 31′ N.; long. 29° 20′ W. Barometer, 29.95; temperature of air, 76°; of water, 75°. Winds: E., E., E., gentle. Night-showers; latter pleasant. S. E. sea.

June 9. Lat. 8° 3′ N.; long. 27° 50′ W. Barometer, 29.95; temperature of air, 82°; of water, 79°. Winds: E., E. by N., E. by N. Overcast; heavy clouds hanging at the S. E. and S. Ends rainy.

June 10. Lat. 7° 16′ N.; long. 27° 40′ W. Barometer, 29.95; temperature of air, 77°; of water, 80°. Winds: E., calm, calm. Heavy rains; frequent airs from all points, but generally calm. Saw a ship, apparently a clipper, bound same way.

June 11. Lat. 6° 58′ N.; long. 27° 30′ W. Barometer, 29.95; temperature of air, 81°; of water, 81°. Winds: calm, S., S. E., light airs from S. to S. E., and S. W., and calm, with heavy rains. Ends pleasant. Signalized ship Tartar, from New York, May 12, for Canton.

June 12. Lat. 6° 18′ N.; long. 27° 5′ W. Barometer, 29.95; temperature of air, 79°; of water, 81°. Winds: calm N. N. W., calm N. N. W., calm, calm, most of the time. Cats-paws from all points; frequent rains.

June 13. Lat. 5° 34′ N.; long. 26° 41′ W. Barometer, 29.95; temperature of air, 82°; of water, 81°. Winds: calm, calm, S. E.; first and second calm, baffling, and rainy; latter, light airs from S. E.

June 14. Lat. 4° 44′ N.; long. 26° 50′ W. Barometer, 29.95; temperature of air, 82°; of water, 81°. Winds: S. E., calm, S. E.; first and second, pleasant; latter, hanging squalls and rains.

June 15. Lat. 3° 10′ N.; long. 27° 49′ W. Barometer, 29.95; temperature of air, 79°; of water, 81°. Winds: S. S. E., S. S. E., S. S. E.; first part, rainy and squally; night and morning, steady trades.

June 16. Lat. 57′ N.; long. 29° 28 W. Barometer, 29.95; temperature of air, 80°; of water, 80°. Winds: S. S. E., S. E., S. S. E.; pleasant, with gentle breezes. Made Saint Paul's Rocks E. by S., four or five miles.

June 17. Lat. 1° S.; long. 30° 11′ W. Barometer, 29.95; temperature of air, 79°; of water, 77°. Winds: S. E. by S., S. E., S. E. Pleasant, with gentle breezes at times, approximating to a calm.

June 18. Lat. 2° 46′ S.; long. 30° 25′ W. Current, E. N. E., half knot per hour. Barometer, 29.95; temperature of air, 79°; of water, 79°. Winds: S. E., E. S. E., E. S. E.; first and second very light; latter, brisk breezes, squally appearances.

June 19. Lat. 4° 26′ S.; long. 30° 45′ W. Barometer, 29.95; temperature of air, 79; of water, 79°. Winds: S. E. by S., S. S. E., S. E. Squally, with showers of rain. Stood east twenty miles.

June 20. Lat. 7° S.; long. 32° 11′ W. Barometer, 30; temperature of air, 80°; of water, 79°. Winds: S. S. E., E. by S., S. S. E. Brisk breezes, and fine. Flying fish.

June 21. Lat. 9° 2′ S.; long. 33° 55′ W. Current, half knot per hour. Barometer, 30; temperature of air, 80°; of water, 79. Winds: S. S. E., S. S. E., S. S. E. Brisk breezes, and cloudy throughout.

Route No. 1, *to Rio, &c.*—JULY. (FOR FAST VESSELS.)

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From Sandy	Hook to										
39° 11′ N.	70° 00′	E. S. E.	199	11.4	222	2.2	11.8	10.8	75.2	4.0	310
37 33	65 00	E. S. E.	256	5.4	269	0.2	8.2	6.5	85.1	10.7	411
35 54	60 00	E. S. E.	259	7.7	278	2.6	4.7	6.9	85.8	7.5	234
35 00	57 21	E. S. E.	141	5.3	148	0.4	4.7	*w* 7.9	87.9	3.4	256
34 12	55 00	E. S. E.	126	19.2	150	6.2	*w* 18.5	10.8	64.5	12.2	65
32 28	50 00	E. S. E.	272	20.6	297	7.2	9.6	*w* 22.8	60.2	0.0	84
30 00	50 00	S.	148	14.4	173	1.7	*w* 19.9	17.4	61.0	1.7	116
25 00	50 00	S.	300	10.6	352	5.3	*w* 10.5	0.0	84.2	5.0	19
20 24	45 00	S. E.	390	3.5	402	0.0	*w* 0.0	17.4	82.6	0.0	23
20 00	44 34	S. E.	34	5.1	36	0.0	*w* 18.0	0.0	82.0	0.0	28
15 40	40 00	S. E.	368	5.8	389	0.0	*w* 28.7	0.0	71.3	0.0	28
15 00	39 10	S. E.	57	11.5	57	0.0	*w* 1.4	0.0	98.6	0.0	72
10 48	35 00	S. E.	356	5.9	377	0.0	*w* 25.0	0.0	75.0	7.2	64
10 00	34 40	S. S. E.	52	6.4	55	1.0	*w* 8.2	1.0	89.8	5.8	98
8 06	30 00	E. S. E.	299	11.7	334	1.0	*w* 18.6	15.5	61.9	13.4	97
6 03	25 00	E. S. E.	322	14.2	367	2.4	15.6	*w* 18.0	64.0	10.7	167
5 00	25 26	S. S. W.	68	29.8	88	8.4	*w* 35.4	12.6	44.6		
Equator	27 30	S. S. W.	325	7.4	348	1.3	*w* 21.9	0.0	76.8	0.0	78
			3972		4322						
3 36 S.	29 00	S. S. W.	234	6.9	348	2.0	*w* 21.0	2.0	75.0	0.0	401
4 36	30 00	S. W.	85	0.0	85	0.0	*w* 39.8	0.0	69.2	0.0	35
5 00	30 10	S. S. W.	26	2.9	27	0.0	14.2	0.0	85.8	0.0	21
5 50	31 00	S. W.	70	0.0	70	0.0	0.0	0.0	100.0	0.0	33
7 00	31 30	S. S. W.	76	5.0	80	0.0	24.9	0.0	75.1	0.0	12
7 30	32 00	S. W.	42	0.6	42	0.0	3.4	0.0	96.6	0.0	29
8 29	33 00	S. W.	84	2.9	86	0.0	14.4	0.0	85.6	0.0	21
9 00	33 51	S. W.	44	1.9	45	0.0	9.6	0.0	90.4	0.0	42
10 14	34 00	S. S. W.	80	7.2	86	0.0	26.0	0.0	74.0	5.0	39
11 00	34 19	S. S. W.	50	4.2	52	0.0	23.4	0.0	76.6	0.0	39

The difficulties for this month consist in calms and baffling winds, in certain regions, which it is necessary to avoid. I have therefore given two tracks for this month, viz: One for bold navigators and fast-sailing vessels, that can lay up within six points of the wind; and the other for dull sailers, that cannot do well close-hauled. Both tracks avoid the calms of the Horse Latitudes.

There is not much difference between them as they are here given, in point of average sailing distance. The difference consists in better working breezes by route No. 1, than the other, and I now confine myself to this route, viz: No. 1.

In taking this route, if you keep much to the east of the track, say between the parallels of 35° and 30° N., you will get into the calms of the Horse Latitudes. See, by the *Trade-Wind-Charts*, where these calms most prevail along this route, and at this season.

After reaching the meridian of 50° W., south is given as the course which a vessel will make on the *average* thence to the parallel of 25°.

But it should be recollected that the tracks given in these Directions, and which every navigator who intends to be guided by them is recommended to project on his chart, are in no case the track which the vessel herself is expected actually to make. Suppose a large number of vessels at different times should take this route as their guide, the mean of all their tracks would be represented by the route which I recommend; though perhaps it would not represent the track of a single vessel taken separately. Some would be on one side, some on another; some would cross it in one place and some in another.

It is difficult to get navigators to comprehend this. Many of them think that, to go the routes recommended by me, they must actually run on the lines which I have drawn to serve merely as guides for them, and for the purpose of my own convenience in illustration.

Vessels that attempt to follow these routes will sometimes find themselves hundreds of miles on one side or the other of the track, as projected; and when they find themselves so driven off from the track as laid down in the books, they should not attempt to get back upon the line itself, as though it were a channel-way, but taking the direction in which it lies as a guide, and consulting the Charts with which they are supplied, they should shape their course and be governed accordingly.

Every track that I have drawn shows that head winds may be expected along it; and when these head winds are encountered, the vessel so encountering must expect to be turned aside; and whether she should beat or not, or stand off altogether upon this or that track, the master must decide; and he should be governed in his decision by the *Sailing Directions* and the Charts themselves.

With this general explanation for *all* the routes, navigators who try this July route will perceive that I do not recommend that they should, after reaching the meridian of 50° W., actually stretch away due south for 500 miles until they reach the parallel of 25° N., where the wind will allow them to lay up to the southward and eastward.

Suppose that a vessel on this route should, on reaching the meridian of 50°, near lat. 32° 28′, have the wind to come out from S. E.—as she will find it to do, on the average, 12 times in 100—she should not in this case stand to the northward and eastward, because she would then run up into a part of the ocean where the calms and light airs of the Horse Latitudes are most vexatious. If she cannot lie south, she should stand down to the southward and westward until the wind hauls, or until she can reach the parallel of 31°, and then go about, taking care not to recross the parallel of 32° to the west of 45°.

After crossing 30° N., strive not to fall to the westward of the projected track. Consider yourself in

the best possible position if you can cross the parallel of 25° N. between 40° and 45°, or the parallel of 20° between 35° and 40°. From either of these positions, you will have no difficulty in reaching the meridian of 30° or 31° between the parallels of 9° and 12° N., where you will lose the N. E. trades; you will then take the equatorial calms, and they may hang on you obstinately, *if you go much farther to the east;* but you will seldom or never carry them with you below 6° N. Cross 6° N. by the shortest possible course. Losing these calms, you will generally get the S. E. trades; for to the west of 30°, the S. W. monsoons seldom blow—though they do sometimes; to the east of 30° they blow quite constantly in July. To the east of 30°, the equatorial calms prevail from 15° N. to 80° N.; and you will be liable to the S. W. monsoons from 11° to 2° N. Hence, you will observe that it is important you should, if the winds will allow you, cross the equatorial doldrums about 30° W., and not go farther east than 27 if you can possibly avoid it.

After crossing the line and getting the S. E. trades, if you should find yourself unable to clear the land, stand on boldly to the southward, unless the wind should slant so as to allow you to lay well up to the eastward on the other tack, until you cross 5° S. to the west of 33°. Between this parallel and 9° S. you can make either a south or an east course good on the average twice out of three, and in some regions three times in four; or even when you get near the land, four times in five. It is better to take the chances of these slants, than it is to attempt to make your easting in the doldrums north of the line. If a vessel strike these calms to the east of 27° west, she may consider herself lucky if she gets clear of them in less than a week or ten days. Don't fear to pass west of Fernando de Noronha.

July is an unfavorable month for quick passages, let a vessel take what route she will.

Route No. 2, to Rio, &c.—JULY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			Direct.	Per cent.	True.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From Sandy Hook to											
39° 11′ N.	70° 00′	E. S. E.	199	11.4	222	2.2	11.8	10.8	75.2	4.0	310
37 33	65 00	E. S. E.	256	5.4	269	0.2	8.2	6.5	85.1	10.7	411
37 33	60 00	E.	238	9.0	259	3.4	*w* 8.6	5.2	82.8	7.5	234
37 33	55 00	E.	238	9.0	259	4.3	3.5	*w* 6.3	85.0	3.4	256
37 33	50 00	E.	238	6.7	254	1.1	4.9	*w* 9.0	84.1	5.8	262
37 33	45 00	E.	238	8.2	257	2.9	1.2	*w* 10.2	85.7	2.8	243
35 54	40 00	E. S. E.	259	5.9	274	1.6	2.0	*w* 11.1	85.3	3.3	244
35 00	38 54	S. E.	77	14.9	88	3.6	9.0	*w* 19.5	67.9	5.5	329
31 41	35 00	S. E.	274	9.6	300	1.0	*w* 16.0	10.0	73.0	3.8	100
30 00	34 09	S. S. E.	115	6.2	122	0.0	*w* 17.6	11.0	71.4	8.3	46
25 00	31 49	S. S. E.	325	8.5	352	3.0	7.0	8.0	82.0	3.0	98
21 00	30 00	S. S. E.	260	0.3	261	0.0	1.5	0.0	98.5	0.0	130
20 00	29 34	S. S. E.	65	0.3	65	0.0	0.0	2.1	97.9	1.4	142
15 00	27 24	S. S. E.	325	0.5	327	0.0	2.5	0.0	97.5	1.8	163
10 00	25 17	S. S. E.	325	4.3	339	0.6	*w* 8.2	5.2	86.0	9.2	158
	Thence	S. or S. S. E.	to intersection of track No. 1.								

This route is intended for dull sailers and timid navigators. Do not cross 35° N., to the west of 45°; nor 33° N., to the west of 40°. After crossing 30° N. in about 33°, you have, as the track shows, all the chances nearly of fair winds in your favor, until you get between 13° and 8° N.; between which parallels, if you be between the meridians of 25° and 30°, you may expect to lose the N. E. trades, and then to contend with southerly winds, light airs, and calms (if between these two meridians), till you get between 5° and 2° N., where the S. E. trades will be found. The getting from the N. E. into the S. E. trades is the difficult part of the passage, and the farther you go east, the more difficult this is. In July, you can carry the N. E. trades two or three degrees farther down, by keeping between the meridians of 30° and 35°, than you are liable to do between the meridians of 25° and 30°. In like manner, you will get the S. E. trades farther to the north between the two former, than you will between the two latter meridians. And in this fact is the great secret of the advantage to be gained by keeping to the west.

Ship Albany (L. B. Gorham), from New York to San Francisco, twenty-one days out.

June 24, 1852. Lat. 20° 04′ N.; long. 40° 29′ W. Winds: E. by N., E. by N., E. by N. Fine breezes and weather.

June 25. Lat. 19° 14′ N.; long. 39° 30′ W. Winds: E., and E. by N. Moderate breezes and passing clouds.

June 26. No observation. Wind: E. by N. Fresh breezes, with fresh squalls of rain.

June 27. Lat. 15° 43′ N.; long. 36° 45′ W. Wind: E. by N. Fresh breezes and squally.

June 28. Lat. 14° 08′; long. 35° 00′ W. Wind: E. N. E. Moderate breezes with fresh squalls.

June 29. Lat. 12° 53′ N.; long. 33° 25′ W. Wind: E. by N. Squally with rain.

June 30. Lat. 11° 27′ N.; long. 31° 36′ W. Wind: E. N. E. Moderate breezes and pleasant.

July 1. Lat. 9° 57′ N.; long. 27° 32′ W. Wind: E. N. E. Fine breezes and clear weather.

July 2. Lat. 9° 07′ N.; long. 29° 13′ W. Winds: N. E. to S. E. Light, variable winds, and calm with rain.

[This ship is now entering the doldrums, and the region of southwardly monsoons. That tack is the best, which, under these circumstances, would enable her to make most southing. She was baffled in this region until the 19th, seventeen days; for it was not until the 19th that she cleared the rains which mark this region.]

July 3. Lat. 8° 59′ N.; long. 28° 16′ W. Winds: variable, S., and S. by W. Light air and squally, with rain.

July 4. Lat. 8° 38′ N., long. 27° 00′ W. Wind: S. S. W. Light breezes and fine weather.

July 5. Lat. 7° 40′ N.; long. 26° 00′ W. Winds: S. W., calm, and S. W.; light airs and calm.

July 6. Lat. 6° 53′ N.; long. 29° 39′ W. Winds: S. W. by S., S. S. W., and S.; moderate and passing clouds.

July 7. Lat. 6° 07′ N.; long. 26° 10′ W. Winds: S. S. E., S. E. by S.; light and hazy.

July 8. Lat. 5° 07′ N.; long. 26° 12′ W. Winds: S. S. E., S. S. E., S. E. by S.; moderate and clear.

July 9. Lat. 4° 04′ N.; long. 26° 57′ W. Wind: S. E. by S.; moderate and clear.

July 10. Lat. 3° 24′ N.; long. 28° 25′ W. Wind: S. E. by S.; gentle breezes and fine weather.

July 11. Lat. 3° 42′ N.; long. 28° 00′ W. Wind: S. S. W.; moderate and cloudy.

July 12. Lat. 4° 04′ N.; long. 27° 00′ W. Wind: S. by W. to S.; moderate and cloudy.

July 13. Lat. 3° 21′ N.; long. 27° 28′ W. Winds: S., S. S. E., S. E. by S.; moderate and pleasant weather.

July 14. Lat. 2° 01′ N.; long. 28° 40′ W. Winds: S. E. by S., S. E., S. E. by E.; gentle breezes and pleasant.

July 15. Lat. 1° 38′ N.; long. 29° 45′ W. Winds: S. E., S. E. and S. by E.; gentle and light airs, and fine weather.

July 16. Lat. 2° 04′ N.; long. 29° 30′ W. Winds: S. S. E., S. by E., and S.; light breeze and clear.

July 17. Lat. 2° 24′ N.; long. 29° 25′ W. Winds: S., S. S. E., S. E. by S.; light winds and clear.

July 18. Lat. 2° 42′ N.; long. 29° 20′ W. Winds: S. S. E., S. E. by S., S. E. by E.; light breeze and squally with rain; latter part, fine breezes and clear.

July 19. Lat. 1° 03′ N.; long. 30° 26′ W. Winds: E. S. E., S. E., S. E. by E.; moderate breezes and clear.

July 20. Lat. 0° 57′ S.; long. 31° 05′ W. Winds: S. E., and E. S. E.; moderate and clear.

July 21. Lat. 2° 55′ S.; long. 31° 03′ W. Wind: E. S. E.; moderate and pleasant.

July 22. Lat. 4° 57′ S.; long. 31° 24′ W. Winds: S. E. by E., E. S. E.; moderate and rain.

July 23. Lat. 7° 08′ S.; long. 31° 43′ W. Winds: S. E. to E. S. E.; moderate and pleasant; latter part, fresh breezes and squally.

Ship Helena (F. H. Cave), New York to Port Philip, fifteen days out.

June 25, 1852. Lat. 21° 18′ N.; long. 33° 18′ W. Strong trades with passing clouds; E. by S., E.

June 26. Lat. 17° 14′ N.; long. 32° 37′ W. Strong trades with passing clouds, east.

June 27. Lat. 13° 25′ N.; long. 31° 65′ W. Moderate winds, smoky weather, east.

June 28. Lat. 10° 12′ N.; long. 31° 28′ W. Moderate breezes, east.

June 29. Sun obscure; lost the trades; middle part, baffling winds and calms, with storms of rain; ends thick and rainy.

June 30. Lat. 7° 13′ N.; long. 30° 29′ W. Begins squally with rain, wind baffling; at midnight heavy rains; 9 A. M. weather more clear with passing clouds, W. S. W.

July 1. Lat. 6° 24′ N.; long. 29° 39′ W. Baffling winds with rain, W. S. W., S. W., S. S. W.

July 2. Lat. 5° 31′ N.; long. 29° 00′ W. Baffling winds, with heavy rains, S. S. W.

July 3. Lat. 3° 41′ N.; long. 29° 40′ W. First part, baffling winds. Ends with fine breezes; S. S. W., S., S. S. E.

July 4. Lat. 0° 36′ N.; long. 31° 32′ W. Strong trades: S. E. by S., S. E.

[Compare the track of the Helena and Sabine (pp. 493, 494), with the track of the Alboni (p. 424). They all came along about the same time. The two former did not go east of 29°, and were detained by the baffling winds of the doldrums, only two or three days each, against the Alboni's two or three weeks.]

July 5. Lat. 1° 45′ S.; long. 32° 15′ W. Moderate trades: S. E. to E., E. S. E., S. E.

July 6. Lat. 2° 28′ S.; long. 31° 36′ W. Moderate winds: S. E., S. S. E., S. E.

July 7. Lat. 3° 47′ S.; long. 32° 22′ W. Fresh breezes, with squalls and rain; made the Island of Fernando de Noronha. Winds: S. E., S. S. E., E. S. E.

July 8. Lat. 6° 45′ S.; long. 32° 32′ W. Strong breezes: E. S. E., S. E. by E.

Ship Sabine (H. Libbey), Boston to Calcutta, 20 days out.

June 25, 1852. Lat. 21° 54′ N.; long. 35° 00′ W. Moderate breezes and cloudy weather. E. ½ S. throughout.

June 26. Lat. 18° 26′ N.; long. 34° 20′ W. Strong trades with squalls, east.

June 27. Lat. 15° 13′ N.; long. 33° 24′ W. Strong trades with squalls, east.

June 28. Lat. 12° 13′ N.; long. 32° 04′ W. Strong trades with squalls, E. N. E.

June 29. Lat. 10° 06′ N.; long. 30° 57′ W. Heavy squalls from eastward, between them moderate breezes, cloudy. E. N. E., E. by N.

June 30. Lat. 8° 52′ N.; long. 30° 25′ W. First part pleasant; very light breeze; middle part, very light, with squalls from S. E. Latter part, squalls from northward to eastward, and S. S. E.

July 1. Lat. 7° 54′ N.; long. 29° 48′ W. First part, moderate breeze, N. E. by E. with heavy rain. Middle part, squally from S. E. Latter part, moderate from southward, with squalls.

July 2. Lat. 6° 43′ N.; long. 28° 30′ W. First and middle parts, light breezes, with frequent rain squalls, W. S. W; latter part, cloudy, S. W. by S.

July 3. Lat. 6° 11′ N.; long. 28° 45′ W. Squally, with rain. South throughout.

July 4. Lat. 5° 09′ N.; long. 39° 15′ W. Moderate breeze and pleasant. South, S. E. by S., S. by E.

July 5. Lat. 4° 28′ N.; long. 29° 00′ W. Moderate breeze and pleasant; S. S. E., and S. by E.

July 6. Lat. 2° 14′ N.; long. 30° 15′ W. Strong breezes; S. E. by S., S. E. ½ S.

July 7. Lat. 0° 01′ S.; long. 31° 15′ W. Fresh trades, S. E., E. S. E., E. by S.

July 8. Lat. 2° 30′ S.; long. 31° 06′ W. Fresh breezes and pleasant, E. by S.

July 9. Lat. 5° 06′ S.; long. 32° 05′ W. Fresh breezes and pleasant, E. S. E.

Ship Probus (David Branscum), New York to Panama, thirty-eight days out.

July 2, 1853. Lat. 19° 44′ N.; long. 30° 05′ W. Winds: E. N. E., E. N. E., and east. Fresh breezes and cloudy weather.

July 3. Lat. 17° 22′ N.; long. 29° 25′ W. Winds: east, E. N. E., and east. Fine breezes and clear weather.

July 4. Lat. 15° 12′ N.; long. 29° 03′ W. Winds: east, east, E. N. E. Pleasant breeze and clear weather.

July 5. Lat. 12° 52′ N.; long. 28° 45′ W. Winds: E. N. E., N. E., and N. E. Pleasant breezes and cloudy weather.

July 6. Lat. 11° 54′ N.; long. 28° 29′ W. Winds: N. N. E., E. N. E., and east. Moderate breeze.

July 7. Lat. 10° 30′ N.; long. 28° 11′ W. Wind: east. Moderate breezes and cloudy.

July 8. Lat. 9° 01′ N.; long. 27° 42′ W. Winds: E. N. E., N. E., and east. Light breezes and clear weather.

July 9. Lat. 8° 08′ N.; long. 28° 18′ W. Wind: S. S. E. Baffling winds and cloudy, with thunder, lightning, and rain.

July 10. No observation. Winds: S. S. E., S. by E., and south. Light breezes and cloudy weather; showers.

July 11. Lat. 7° 18′ N.; long. 27° 50′ W. Winds: variable. Weather squally.

July 12. No observation. Winds: S. W., S. W., S. W. Moderate breezes and thick weather.

July 13. Lat. 5° 17′ N.; long. 27° 22′ W. Winds: south, south, and S. by W. Pleasant breezes and cloudy weather, with rain.

July 14. Lat. 5° 06′ N.; long. 25° 48′ W. Wind: S. by W. throughout. Fresh breezes from the southward, and clear.

July 15. No observation. Wind: S. by W. throughout. Moderate breezes, with thick rainy weather.

July 16. Lat. 3° 58′ N.; long. 26° 44′ W. Winds: S. W., south, and south. Moderate breezes and rainy weather.

July 17. Lat. 2° 43′ N.; long. 28° 37′ W. Winds: south, S. by W., and S. by E. Pleasant breeze and clear.

July 18. Lat. 0° 32′ N.; long. 30° 00′ W. Winds: S. S. E., S. E. by S., and S. E. Fresh breezes and clear weather.

July 19. Lat. 1° 35′ S.; long. 31° 08′ W. Wind: S. E. Moderate breezes and pleasant.

July 20. Lat. 3° 43′ S.; long. 31° 10′ W. Winds: S. E. by E., and E. S. E. Moderate breezes and squally; cloudy weather.

July 21. Lat. 5° 47′ S.; long. 32° 21′ W. Winds: S. E. by E., S. E., and S. E. by S. Pleasant breezes and cloudy, with light rain squalls.

Barque Reindeer (Wm. Weard), Baltimore to San Francisco, seventeen days out.

July 7, 1853. Lat. 20° 57′ N.; long. 45° 03′ W. Winds: E., E. by N., E. by N. Moderate breezes and squally weather.

July 8. Lat. 19° 06′ N.; long. 43° 41′ W. Winds: E. by N., throughout; fresh breezes and showers of rain.

July 9. Lat. 16° 52′ N.; long. 42° 04′ W. Winds: E. by N., E. N. E., and E. by N. Strong breezes with cloudy weather.

July 10. Lat. 14° 41′ N.; long. 40° 27′ W. Winds: E. by N. throughout, strong breezes and cloudy with rain.

July 11. Lat. 12° 45′ N.; long. 38° 38′ W. Winds: E. by N., E. N. E., E. N. E. Strong trades with fresh squalls.

July 12. Lat. 10° 56′ N.; long. 36° 36′ W. Winds: E. N. E., N. E. by E., and E. N. E. Brisk breezes and hazy weather.

July 13. Lat. 9° 30′ N.; long. 34° 24′ W. Winds: E. N. E., N. E. by E., E. by N. Brisk breezes with squally hazy weather.

July 14. Lat. 8° 58′ N.; long. 33° 03′ W. Winds: variable from the southward. Variable breezes and squally weather.

July 15. Lat. 7° 19′ N.; long. 31° 05′ W. Winds: S. S. W. throughout, fresh breezes and heavy squalls.

July 16. Lat. 5° 44′ N.; long. 28° 29′ W. Winds: S. W., S. S. W., and S. by W. Brisk breezes and passing squalls.

July 17. Lat. 5° 24′ N.; long. 26° 10′ W. Winds: S. by W., S., and S. Moderate breezes and squally.

July 18. Lat. 4° 00′ N.; long. 27° 34′ W. Winds: S., S. by E., and S. S. E. Moderate breezes and passing squalls.

July 19. Lat. 1° 35′ N.; long. 28° 52′ W. Winds: S. S. E., S. E., and S. E. by S. Moderate breezes, with passing squalls of rain and wind.

July 20. Lat. 1° 34′ S.; long. 30° 22′ W. Winds: S. E. by S., S. E., and S. E. Brisk breezes and fine weather.

July 21. Lat. 4° 30′ S.; long. 31° 26′ W. Winds: S. E., S. E. by E., and S. E. by E. Brisk breezes, with squalls of wind and rain.

July 22. Lat. 7° 12′ S.; long. 32° 17′ W. Winds: S. E. by E., S. E., and S. E. by S. Strong breezes, with heavy squalls of wind and rain.

Ship Robert Burton (John W. Dicks), New York to Columbia River, thirty days out.

July 19, 1852. Lat. 21° 20′ N.; long. 37° 48′ W. Winds: E. S. E., E. by S., E. by S. Fresh winds and squally.

July 20. Lat. 18° 49′ N.; long. 36° 53′ W. Winds: E. by S. Squally throughout.

July 21. No observations. Winds: E. by S. Squally.

July 22. Lat. 14° 08′; long. 35° 14′ W. Winds: E. by S., E. by S., E. N. E. First part, squally; latter part, pleasant.

July 23. Lat. 12° 25′ N.; long. 33° 00′ W. Winds: E. N. E., E. N. E., N. W. First part, moderate with rain; latter, light wind from N. W.

July 24. Lat. 11° 28′ N.; long. 31° 43′. W. Winds: N. W., N. W., S. W. Showery all day.

July 25. Lat. 10° 47′ N.; long. 30° 31′ W. Wind: S. W. Rainy and squally all through this day.

July 26. Lat. 10° 06′ N.; long. 30° 20′ W. Winds: S. W., S. W., N. Rainy, squally, and variable weather through this day.

July 27. Lat. 8° 48′ S.; long. 29° 25′ W. Current, 1.7 knots per hour. Winds, first part, north; middle and latter, all around the compass. Rainy, squally, and variable weather.

July 28. Lat. 8° 02′ N.; long. 28° 50′ W. Winds: N., S. S. W., S. W. First part, light airs; wind hauled to S. S. W. in a heavy squall.

July 29. No observations. Winds: S. S. W., S. W. by S., S. W. by S. Rainy, cloudy, disagreeable weather.

July 30. Lat. 7° 41′ N.; long. 24° 55′ W. Wind: S. W. by S. Cloudy, rainy weather.

July 31. Lat. 6° 58′ N.; long. 23° 19′ W. Winds: S. W. by S., S. S. W., S. S. W. Clouds moving with great rapidity, N. E. by E.; the upper clouds moving slowly S. by W.

Aug. 1. Lat. 5° 59′ N.; long. 21° 50′ W. Wind: S. W. Feel I am steering too far east, but have had the neuralgia for the past twenty days, so as to be hardly able to move, and the ship is so crank, we do not get along very well by the wind.

Aug. 2. Lat. 4° 31′ N.; long. 20° 05′ W. Wind: S. S. W. Shall tack if no change occurs.

Aug. 3. Lat. 4° 58′ N.; long. 20° 28′ W. Wind: S. S. W. Tacked—lay up W. half S. Saw many Carey Chickens. Beautiful weather.

Aug. 4. Lat. 4° 01′ N.; long. 22° 26′ W. Winds: S. S. W., S. S. W., S. Fine weather, and the wind hauling more favorable.

Aug. 5. Lat. 2° 13′ N.; long. 24° 27′ W. Wind: S. S. E. Have now the S. E. trades, I hope.

Aug. 6. Lat. 0° 19′ S.; long. 26° 47′ W. Wind: S. S. E. Crossed the equator at 8 hours 15 min. A. M., in long. 26° 25′ W.

Aug. 7. Lat. 3° 02′ S.; long. 28° 33′ W. Winds: S. S. E., S. E., S. E. Very beautiful weather, and fine breeze.

Aug. 8. Lat. 5° 46′ S.; long. 30° 19′ W. Winds: S. E. by S., S. E. by S., S. E. Fine weather and winds.

Aug. 9. Lat. 7° 40′ S.; long. 32° 15′ W. Winds: S. E., S. E., S. S. E. Squally; heavy banks of cumulus in the south; the wind inclined that way.

Aug. 10. Lat. 7° 58′ S.; long. 33° 12′ W. Winds: S. S. E., S. S. W., S. E. by S. Squally.

Route to Rio, &c.—AUGUST.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			Direct.	Per cent.	True.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From Sandy	Hook to										
39° 11′ N.	70° 00′	E.S.E.	199	12.3	223	3.0	13.2	11.4	72.4	5.4	366
37 33	65 00	E.S.E.	256	9.8	281	3.2	5.0	*w* 10.3	81.5	3.5	221
35 54	60 00	E.S.E.	259	8.0	280	2.2	5.4	*w* 9.7	82.7	4.1	185
35 00	57 20	E.S.E.	141	10.9	156	4.6	3.9	*w* 7.8	83.7	7.2	154
33 04	55 00	S.E.	165	8.5	178	1.9	*w* 11.4	3.8	82.9	3.6	53
31 19	50 00	E.S.E.	275	9.6	302	2.6	10.4	*w* 13.0	74.0	0.0	76
30 00	46 17	E.S.E.	207	15.2	238	4.6	9.2	*w* 25.3	60.9	6.5	43
29 32	45 00	E.S.E.	72	39.2	100	8.0	*w* 48.0	28.0	16.0	7.4	25
25 00	42 54	S.S.E.	294	6.4	312	1.5	*w* 19.1	0.0	79.4	2.9	68
22 21	40 09	S.E.	225	7.7	242	0.0	*w* 16.8	7.2	77.0	6.7	42
20 00	38 57	S.S.E.	153	4.8	160	2.0	*w* 8.0	0.0	90.0	0.0	49
15 00	36 47	S.S.E.	325	7.0	347	3.7	*w* 5.5	0.0	90.8	0.0	54
10 50	35 00	S.S.E.	271	8.5	294	2.8	*w* 8.6	4.7	83.9	7.1	105
10 00	34 38	S.S.E.	54	11.5	60	3.4	*w* 11.1	6.6	78.9	9.0	90
8 06	30 00	E.S.E.	297	8.0	320	0.0	8.8	*w* 15.8	75.4	8.1	57
5 00	26 53	S.E.	263	4.6	275	0.0	4.4	*w* 15.9	79.7	7.4	114
Equator	28 57	S.S.W.	325	10.1	358	1.3	*w* 35.1	0.0	63.6	1.2	78
			3781		4126						
1 00 S.	29 22	S.S.W.	65	1.4	66	0.2	4.5	0.3	95.0	0.0	402
2 32	30 00	S.S.W.	99	5.7	105	0.0	28.5	0.0	71.5	0.0	21
3 00	30 12	S.S.W.	30	13.3	34	0.0	66.6	0.0	33.4	0.0	9
5 00	31 00	S.S.W.	130	6.7	139	0.0	33.3	0.0	66.7	0.0	18
7 00	31 50	S.S.W.	130	0.0	130	0.0	0.0	0.0	0.0	0.0	18
Thence	*ad lib.*										

The only precaution to give with regard to this route—for in August the passage is liable to be tedious by any route—is not to cross the meridian of 50° W. to the north of 31°, or to the south of 29° N.

After reaching the meridian of 35° between the parallels of 11° and 10° N., stand straight as the winds will allow for the equator in about 29° or 30°, not caring if you fall upon the line as far as 30° W. After getting the S. E. trades in this month, there is no difficulty in making stretches to the E.; for the S. E. trades, frequently, at this season of the year, blow from S. S. E.; and if navigators will bear this fact in mind, they should not be discouraged if the wind should force them to cross the equator as far west as 35°; some have even crossed in 41°, and made good passages by taking advantage of slants south of the line to make easting with. But, of course, no navigator would willingly cross so far to the westward as longitude 40°.

Vessels from ports south of the Capes of Virginia, that intend to try this route, should run up to 34°, and continue between the parallels of 34° and 35°, until they fall in with the route as projected, which they will do somewhere between the meridians of 55° and 60°. This they are recommended to do on account of the calms of the Horse Latitudes, with which, by keeping south of 34° in this season, and part of the ocean, they are liable to be bothered.

In August, if between the meridians of 30° and 35°, expect to lose the N. E. trades from 14° to 10° N.; to have the equatorial calms from 13° to 9° N.; and the S. W. monsoons occasionally *only* from 12° to 5° N.

Between the meridians of 25° and 30° W., the N. E. trades are sometimes lost in 17° N., generally in 12°, though they are occasionally carried to 9°; seldom below. The calms prevail from 15° to 8° N., and the S. W. monsoons with considerable regularity from 14° N. to the equator. That is, you are liable to get them somewhere between 14° N. and the equator, as you are liable to encounter the calms and to lose the N. E. trades between the parallels above stated.

Ship Leaman (W. B. Daniels), New York to San Francisco, fifteen days out.

Aug. 18, 1852. Lat. 26° 03′ N.; long. 39° 29′ W. Winds: calm, S. E., S. First part calm; middle part, light and baffling airs; thick banks of fog and very dark; latter part, fresh and pleasant.

Aug. 19. Lat. 22° 09′ N.; long. 38° 57′ W. Barometer, 30.20; temperature of air, 81°. Wind: E.; fresh trades, with passing squalls.

Aug. 20. Lat. 18° 24′ N.; long. 38° 02′ W. Current, N. W., ½ knot per hour. Barometer, 30.10. Wind: E. by N.; fresh trades, and squally.

Aug. 21. Lat. 15° 12′ N.; long. 36° 50′ W. Current, N. N. W., ¾ of a knot per hour. Wind: E. by N.; brisk trade-winds, and squally gloomy weather.

Aug. 22. Lat. 11° 52′ N.; long. 35° 25′ W. Temperature of air, 82°; of water, 81°. Wind: E. by N.; fresh trades; and squally.

Aug. 23. Lat. 11° 07′ N.; long. 35° 06′ W. Barometer, 30.00. Winds: E. calm, calm; first part light winds; middle and latter part calm. Observed tide rips.

Aug. 24. Lat. 9° 20′ N.; long. 34° 20′ W. Winds: calm, S. S. E., S. W. by S.; first part calm; middle, moderate and rainy; latter, fresh and squally. A large swell from S. E.

Aug. 25. Lat. 7° 50′ N.; long. 31° W. Current, N., ¾ knot per hour. Barometer, 30.00; temperature of air, 82°; of water, 81°. Winds: S. S. W.; fresh breezes, with passing squalls.

Aug. 26. Lat. 6° 46′ N.; long. 28° 28′ W. Current, N., ¾ knot per hour; temperature of air, 81°. Wind: S. S. W.; first and middle parts, moderate; latter fresh.

Aug. 27. Lat. 5° 46′ N.; long. 27° 28′ W. Current, N., ½ knot per hour. Wind: S. by W.; fresh breezes and squally.

Aug. 28. Lat. 4° 46′ N.; long. 28° 54′ W. Temperature of air, 82°. Wind: S. ½ W.; moderate breezes and pleasant weather.

Aug. 29. Lat. 3° 31′ N.; long. 30° 26′ W. Temperature of air, 81°. Wind: S. by E.; light winds and pleasant.

Aug. 30. Lat. 1° 53′ N.; long. 30° 52′ W. Winds: S. by E., S. S. E., S. E by S.; moderate breezes and pleasant.

Aug. 31. Lat. 0° 15′ N.; long. 31° 45′ W. Current, W. N. W., ½ knot per hour. Barometer, 30.10; temperature of air, 80°; of water, 80°. Wind: S. E. by S.; moderate breezes and pleasant.

Sept. 1. Lat. 2° 08′ S.; long. 32° 30′ W. Barometer, 30.00; temperature of water, 79°. Winds: S. E. by S., S. E. by S., S. E.; moderate breezes and pleasant.

Sept. 2. Lat. 3° 45′ S.; long. 32° 15′ W. Temperature of water, 78°. Wind: S. E.; first and middle parts, light and pleasant; ends with strong breezes. At noon, saw Fernando de Noronha, bearing W. S. W. ten miles distant.

Sept. 3. Lat. 7° S.; long. 33° 06′ W. Barometer, 30.10. Wind: S. E. by E.; fresh trade-winds and pleasant weather.

Ship Eagle (John S. Farrou), New York to San Francisco, fifteen days out.

July 25. Lat. 19° 5′ N.; long. 46° 30′ W. Winds: E. by S., E. S. E., E. S. E. Fair weather.

July 26. Lat. 15° 20′ N.; long. 44° 55′ W. Wind: E. by S., east, and east. Fresh breezes and squally, with rain.

July 27. Lat. 12° 48′ N.; long. 44° 30′ W. Winds: E. by S., E. by S., E. S. E. Pleasant weather.

July 28. Lat. 10° 58′ N.; long. 44° 10′ W. Winds: E. S. E., E. S. E., and east. Pleasant weather.

July 29. Lat. 8° 57′ N.; long. 43° 47′ W. Wind: E. by S. Occasional squalls with rain.

July 30. Lat. 7° 49′ N.; long. 43° 39′ W. Winds: E. by S., E., and S. S. E. Calms, squalls, and rain.

July 31. Lat. 7° 12′ N.; long. 42° 10′ W. Wind from S. to N. W. Baffling, with squalls.

Aug. 1. Lat. 7° 44′ N.; long. 39° 16′ W. Winds: S. W., W., and S. W. Squally, with hard rain.

Aug. 2. Lat. 7° 56′ N.; long. 36° 41′ W. Winds: S., S. S. E., and S. E. by S. Squally, rainy weather.

Aug. 3. Lat. 7° 42′ N; long. 35° 53′ W. Wind: S. by E., and calm; constant rain.

Aug. 4. Lat. 7° 50′ N.; long. 35° 01′ W. Variable winds, and squally, with rain.

Aug. 5. Lat. 7° 40′ N.; long. 35° 21′ W. Winds: S. S. W., S. W., and S. W., squally, with rain.

Aug. 6. Lat. 7° 29′ N.; long. 33° 47′ W. Winds: S. S. W., S. S. W., and S. E. Moderate breezes and squally.

Aug. 7. Lat. 7° 3′ N.; long. 33° 16′ W. Winds: calm, S. W. by S., S. W. by S. Squally, with rain.

Aug. 8. Lat. 6° 56′ N.; long. 29° 52′ W. Winds: S. S. W., calm, and S. by E. Squally with rain.

Aug. 9. Lat. 6° 34′ N.; long. 26° 48′ W. Winds: S., S. S. W., and S. S. W. Squally, with rain.

Aug. 10. Lat. 5° 45′ N.; long. 22° 53′ W. Winds: S. by W., S. S. W., and S. by W. Squally with rain.

[The Eagle had bad luck certainly, inasmuch as she found the N. E. trades with southing in them. She met the doldrums just south of the parallel of 9° N. and near the meridian of 44° W. Here, Captain

Farrou availed himself of the monsoons to go east; and at the end of 9 days finds himself to *leeward* on the *other side* of his route. On August 8, being in 29° 50′, he finds the monsoon S. by E., right in his teeth. He stands on, and the next day is so far to the east that his course now is S. S. W.; at that point, he gets the wind; and thus he is forced to go as far as 22° W. before he can cross the parallel of 5° N. I do not think that the facts exhibited on the Charts would justify any one in pronouncing an opinion against the propriety of the course pursued to get to the eastward. Compare the Eagle's track with that of the Candace (p. 502). The C. crossed the parallel of 20° N. nearly 500 miles east of where the Eagle crossed it; yet, notwithstanding the Eagle's misfortunes, she beat the Candace a week to Cape St Roque.]

Aug. 11. Lat. 4° 7′ N.; long. 24° 41′ W. Winds: S., S. by E., and S. S. E. Pleasant.

Aug. 12. Lat. 2° N.; long. 26° 36′ W. Winds: S., S. by E., and S. S. E. Fair weather.

Aug. 13. Lat. 24′ S.; long. 28° 29′ W. Winds: S. by E., S. S. E., and S. by E. Fair weather.

Aug. 14. Lat. 2° 24′ S.; long. 30° 4′ W. Winds: S. S. E. and S. by E. Fair weather.

Aug. 15. Lat. 4° 59′ S.; long. 32° 30′ W. Winds: S. S. E. and S. by E. Fair weather.

Aug. 16. Lat. 6° 1′ S.; long. 34° 16′ W. Winds: S. S. E., S. by E., and S. Strong gales and heavy squalls, rain.

Barque Panchita (Peterson), New York to Buenos Ayres, twenty days out.

Aug. 5, 1850. Lat. 21° 12′ N.; long. 40° 46′ W. Fresh and cloudy. Wind: E. N. E.

Aug. 6. Lat. 19° 25′ N.; long. 39° 48′ W. Fresh and cloudy. Winds: E., E. by N.

Aug. 7. Lat. 17° 41′ N.; long. 38° 37′ W. Variable, with squalls. Wind: E.

Aug. 8. Lat. 15° 32′ N.; long. 37° 10′ W. Fresh and cloudy. Wind: eastward.

Aug. 9. Lat. 13° 21′ N.; long. 35° 43′ W. Moderate and clear. Wind: E.

Aug. 10. Lat. 10° 42′ N.; long. 34° 28′ W. Moderate breezes; variable, rain squalls. Wind: N. E.

Aug. 11. Lat. 9° 56′ N.; long. 33° 18′ W. Moderate and cloudy. Winds: E. S. E., S., S. W. by S.

Aug. 12. Lat. 8° 34′ N.; long. (no obs.). Strong breezes and heavy rain squalls. Wind: S. W. by S.

Aug. 13. Lat. 8° 2′ N.; long. 29° 45′ W. Moderate breezes and hazy. Winds: S. W., S.

Aug. 14. 7° 48′ N.; long. 28° 27′ W. Light airs and foggy. Wind: S. by W.

Aug. 15. Lat. 7° 42′ N.; long. 28° 00′ W. Light breeze, S. by W.

Aug. 16. Lat. 7° 28′ N.; long. 28° 30′ W. Strong breeze, S. E., S., S. W.

Aug. 17. Lat. 6° 43′ N.; long. 26° 42′ W. Fresh breeze and cloudy, W. S. W., S. W., S. by W.

Aug. 18. Lat. 6° 10′ N.; long. 25° 04′ W. Moderate and clear, S. S. W.

Aug. 19. Lat. 5° 00′ N.; long. 23° 20′ W. Light breeze and hazy, S. S. W., S. W.

Aug. 20. Lat. 4° 21′ N.; long. 24° 12′ W. Moderate and pleasant, S. W. by S.

Aug. 21. Lat. 3° 31′ N.; long. 25° 55′ W. Moderate and pleasant, S. W. by S.

Aug. 22. Lat. 2° 03′ N.; long. (——— ?) W. Moderate and pleasant, S. S. E.

Aug. 23. Lat. 0° 15′ N.; long. 28° 47′ W. Fresh breeze, S. S. E.

Aug. 24. Lat. 1° 23′ S.; long. 29° 30′ W. Strong breezes and cloudy, S. S. E.

Aug. 25. Lat. 3° 35′ S; long. 30° 34′ W. Moderate, S. E.

Aug. 26. Lat. 6° 23′ S.; long. 31° 35′ W. Moderate, S. E.

Barque Candace (Joseph Arguit), New York to Shanghai, 23 days out.

Aug. 9, 1849. Lat. 19° 30′ N.; long. 39° 23′ W. Winds: E., E. by S., E. by S. Fresh breeze and pleasant; a heavy sea.

Aug. 10. Lat. 16° 57′ N.; long. 37° 48′ W. Wind: east. Brisk breeze and pleasant.

Aug. 11. Lat. 14° 20′ N.; long. 36° 17′ W. Winds: E., E., and E. S. E. Brisk winds, and clear weather.

Aug. 12. Lat. 12° 48′ N.; long. 35° 48′ W. Winds: E., E. N. E., and E. N. E. Moderate breezes and passing squalls.

Aug. 13. Lat. 11° 25′ N.; long. 35° 53′ W. Wind: E. N. E. Moderate breezes and clear.

Aug. 14. Lat. 10° 41′ N.; long. 32° 59′ W. Winds: E. N. E., E. S. E., and S. W. Baffling winds and weather.

Aug. 15. Lat. 9° 31′ N.; long. 31° 17′ W. Winds: S. W., S. W. by W., W. S. W. Baffling winds.

Aug. 16. Lat. 8° 00′ N.; long. 29° 45′ W. Winds: S. W. to N. W. Brisk baffling winds, and rain squalls.

Aug. 17. Lat. 7° 32′ N.; long. 27° 00′ W. Winds: S. S. W., S. S. W., and S. W. Strong winds; much rain.

Aug. 18. Lat. 6° 42′ N.; long. 24° 50′ W. Wind: S. S. W. Strong winds and pleasant weather.

Aug. 19. Lat. 6° 40′ N.; long. 23° 02′ W. Winds: S. S. W., S., and S. S. W. Light winds and clear pleasant weather.

Aug. 20. Lat. 6° 16′ N.; long. 23° 08′ W. Winds: S. S. W., and S. S. W.; light winds, and clear.

Aug. 21. Lat. 5° 52′ N.; long. 23° 29′ W. Winds: S. S. W., S., and S. S. W.; variable winds and weather.

Aug. 22. Lat. 5° 26′ N.; long. 21° 44′ W. Wind: S. S. W.; strong wind, passing squalls.

Aug. 23. Lat. 4° 50′ N.; long. 22° 29′ W. Wind: S.; light winds and calms.

Aug. 24. Lat. 3° 51′ N.; long. 21° 50′ W. Winds: S. S. W., S. W., S. W.; moderate breezes and squally.

Aug. 25. Lat. 2° 56′ N.; long. 20° 23′ W. Wind: S. W.; brisk winds, and cloudy.

Aug. 26. Lat. 1° 38′ N.; long. 22° 27′ W. Winds: S., S., and S. S. E.; light winds.

Aug. 27. Lat. 0° 16′ S.; long. 24° 08′ W. Winds: S. S. E., S. E. by S., and S. E. by S.; moderate trades and pleasant.

Aug. 28. Lat. 2° 24′ S.; long. 25° 23′ W. Wind: S. S. E.; light winds and pleasant.

Aug. 29. Lat. 5° 05′ S.; long. 27° 01′ W. Winds: S. S. E., S. E. by S., and S. E. by S.; moderate trades and pleasant.

Ship Louis Philippe (R. Benthall), Baltimore to Valparaiso, twenty-two days out.

Aug. 10, 1849. Lat. 18° 22′ N.; long. 35° 15′ W. Winds: E. by N., E. by S., and S. E.; cloudy and hazy.

Aug. 11. Lat. 15° 55′ N.; long. 36° 48′ W. Wind: E.; damp, cloudy weather.

Aug. 12. Lat. 13° 05′ N.; long. 35° 10′ W. Winds: E., and E. by N.; cloudy and damp.

Aug. 13. Lat. 11° 17′ N.; long. 34° 10′ W. Winds: E. by N., and E. N. E.; cloudy.

Aug. 14. Lat. 10° 51′ N.; long. 33° 24′ W. Wind: variable. Cloudy, with light showers.

Aug. 15. Lat. 10° 07′ N.; long. 32° 33′ W. Winds: S. W. and W. N. W. Cloudy, with light rain.

Aug. 16. Lat. 1° 13′ N.; long. 31° 26′ W. Wind: N. W. Cloudy and rainy.

Aug. 17. Lat. 7° 55′ N.; long. 30° 01′ W. Wind: S. W. Rainy weather.

Aug. 18. Lat. 7° 52′ N.; long. 26° 46′ W. Wind: S. S. W. Squally and rainy.

Aug. 19. Lat. 7° 19′ N.; long. 24° 52′ W. Wind: southerly. Clear and pleasant.

Aug. 20. Lat. 7° 05′ N.; long. 24° 30′ W. Wind: southerly. Cloudy; a large sea.

Aug. 21. Lat. 6° 09′ N.; long. 23° 33′ W. Winds: S. W., W. S. W., and S. S. W. Cloudy, with squalls.

Aug. 22. Lat. 5° 45′ N.; long. 21° 30′ W. Winds: S. S. W., S. S. W., and south. Weather pleasant.

Aug. 23. Lat. 5° 23′ N.; long. 20° 55′ W. Wind: S. S. W. Clear weather.

Aug. 24. Lat. 3° 57′ N.; long. 19° 23′ W. Winds: S. W., S. W., and S. S. W. Cloudy, with light rain.

Aug. 25. Lat. 3° 04′ N.; long. 18° 24′ W. Winds: S. W., S. W., and S. S. W. Cloudy weather.

Aug. 26. Lat. 1° 51′ N., long. 20° 46′ W. Winds: S. S. W., S. by W., and S. by E. Pleasant.

Aug. 27. Lat. 0° 14′ N.; long. 22° 59′ W. Winds: south, S. by E., and S. E. by S. Pleasant.

Aug. 28. Lat. 1° 26′ S.; long. 24° 27′ W. Wind: S. E. by S. Pleasant weather.

Aug. 29. Lat. 3° 41′ S.; long. 26° 27′ W. Wind: S. E. by S. Clear weather.

Aug. 30. Lat. 6° 22′ S.; long. 28° 28′ W. Wind: S. E. Weather pleasant.

Ship Sea Witch (G. W. Fraser), New York to San Francisco, sixteen days out.

Aug. 17, 1851. Lat. 21° 37′ N.; long. 42° 39′ W. Winds: E. by S., E. by S., and E. S. E.; fresh single reef gale, heavy sea.

Aug. 18. Lat. 18° 42′ N.; long. 40° 26′ W. Wind: E. by N.; fresh breeze and pleasant.

Aug. 19. Lat. 15° 49′ N.; long. 39° 14′ W. Winds: E. by S., E. S. E., and E. by S.; fresh breezes with cloudy weather.

Aug. 20. Lat. 13° 06′ N.; long. 36° 44′ W. Winds: E., E. by S., and E. N. E.; fresh breezes and squally.

Aug. 21. Lat. 11° 25′ N.; long. 35° 31′ W. Winds: E. N. E., calm, southerly; moderate and light breezes and pleasant.

Aug. 22. Lat. 10° 38′ N.; long. 34° 11′ W. Winds: southerly, S. S. W., and S. S. W.; variable breezes and squally.

Aug. 23. Lat. 10° 09′ N.; long. 34° 17′ W. Winds: calm, calm, and N. E.; calms and light airs.

Aug. 24. Lat. 8° 24′ N.; long. 33° 10′ W. Winds: N. N. E., N. E., and N.; light breezes and squally.

Aug. 25. Lat. 7° 08′ N.; long. 31° 35′ W. Winds: N. W., S. W., and S. W. by S.; light breezes and squally.

Aug. 26. Lat. 5° 58′ N.; long. 29° 26′ W. Winds: S. W., S. S. W., and S. W. by S.; light airs and squally.

Aug. 27. Lat. 5° 09′ N.; long. 29° 26′ W. Winds: S. S. W., S., S.; moderate breezes and cloudy.

Aug. 28. Lat. 3° 50′ N.; long. 24° 44′ W. Wind: S. S. W.; moderate breezes and pleasant.

[This is another case of falling to leeward on the other side. When the navigator gets as far east in the doldrums as he wants to go, he finds the monsoons so changed that they are directly in his teeth. As an illustration, see the track of the Panchita (p. 501), Aug. 19. I should advise navigators on such occasions, when they have got as far to the east as 30° west, to beat down on that parallel; for there is reason to believe that, by remaining stationary, these doldrums will leave you quite as soon as you can get clear of them by running along with them to the east.]

Aug. 29. Lat. 2° 13′ N.; long. 25° 19′ W. Winds: S. S. W., S. by W., and S.; moderate breezes and pleasant; at 9, tacked ship.

Aug. 30. Lat. 0° 20′ S.; long. 27° 11′ W. Wind: S. S. E.; moderate trades and pleasant.

Aug. 31. Lat. 3° 40′ S.; long. 26° 11′ W. Wind: S. S. E.; weather pleasant.

Sept. 1. Lat. 6° 46′ S.; long. 32° 08′ W. Winds: S. S. E., S. E. by S., and S. by E.; moderate breezes with passing showers of rain.

Route to Rio, &c.—SEPTEMBER.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			Direct.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
40° 27′ N.	70° 00′	E.	186	13.0	210	2.5	*w* 17.0	*w* 14.0	66.5	3.4	200
38 52	65 00	E. S. E.	249	9.9	274	2.2	*w* 12.4	7.5	77.9	5.1	184
37 14	60 00	E. S. E.	256	7.4	275	0.7	*w* 12.6	7.7	79.0	3.3	447
35 35	55 00	E. S. E.	260	7.4	279	1.6	8.8	7.2	82.4	4.0	123
35 00	54 18	S. E.	48	25.3	60	9.4	13.7	*w* 16.6	60.3	3.5	139
33 31	50 00	E. S. E.	232	15.0	267	3.0	3.0	*w* 42.0	52.0	0.0	34
31 47	45 00	E. S. E.	272	15.4	313	6.0	4.0	*w* 22.0	68.0	5.7	50
30 00	42 55	S. E.	151	15.0	174	2.9	11.5	*w* 21.7	63.9	4.2	69
27 27	40 00	S. E.	217	17.9	255	2.8	11.2	*w* 25.2	60.8	2.7	36
25 00	37 16	S. E.	208	16.8	243	3.4	17.9	16.8	61.9	1.1	89
20 00	37 16	S.	300	4.2	313	4.2	*w* 10.5	0.0	85.3	2.6	38
15 00	35 06	S. S. E.	325	0.0	325	0.0	0.0	0.0	100.0	0.0	23
10 00	32 58	S. S. E.	325	7.8	349	1.6	*w* 11.3	9.8	77.1	6.1	61
8 47	30 00	E. S. E.	191	16.8	223	2.8	3.6	*w* 30.8	60.8	4.0	73
5 00	27 11	S. E.	321	18.4	380	5.8	9.6	*w* 23.0	61.6	7.1	104
Equator*	29 15	S. S. W.	325	14.1	370	6.2	*w* 34.3	1.4	58.1	0.0	70
			3866		4310						
1 58	30 00	S. S. W.	118	17.4	138	4.4	*w* 13.3	5.7	58.6	0.0	297
3 00	31 02	S. W.	88	9.6	96	0.0	*w* 48.2	0.0	51.8	0.0	27
5 00	31 52	S. S. W.	130	12.5	145	0.0	*w* 62.5	0.0	37.5	0.0	24
5 19	32 00	S. S. W.	21	3.4	22	0.0	*w* 16.7	0.0	83.3	0.0	12
7 00	32 42	S. S. W.	108	7.2	115	0.0	*w* 35.7	0.0	64.3	0.0	14
7 43	33 00	S. S. W.	47	1.3	48	0.0	*w* 6.0	0.0	94.0	0.0	17
9 00	33 32	S. S. W.	83	8.0	91	0.0	*w* 36.6	0.0	63.4	0.0	30

It may be said that the N. E. trade-winds prevail in September and October only to the east of longitude 50°, and then only between the parallels of 15° and 25° N. They sometimes blow in other parts of the ocean, but it cannot be said that they *prevail.*

Endeavor to cross the meridian of 50°, in September and October, before you do the parallel of 30° N., and do not consider yourself hopelessly to leeward, if you be *forced* to cross the parallel of 20° N., as far west as longitude 45°, or the parallel of 10 N., as far as 36° or 37° W.; for in September and October, as the Pilot Charts show, you may frequently meet, between 10° N. and the equator, the S. E. trade-winds.

The S. E. trades may be calculated on with certainty between 7° N. and 13° N., between 35° and 40° W. Occasionally, the S. W. monsoons are found between the same parallels. The S. E. trades, when taken in the northern hemisphere in this month, are frequently at S. S. E.; and therefore it is not difficult for vessels that find themselves as far west as longitude 37°, in latitude 10° N., to get to the eastward before crossing the line.

Between long. 30° and 35°, the equatorial calms are found from 4° to 12° N., and between long. 25°

* The best routes for October and November do not differ materially from those for September and December. See Pilot Charts.

and 30°, they, and the S. W. monsoons, are found from 12° to the equator; and as a general rule they are found more and more vexatious as you go east.

Captain Sinclair, when in command of the U. S. frigate Congress, on her way to South America, with that close observation of all the phenomena about him which gives a particular value to his remarks, observed the difficulties of crossing this belt far to the eastward. He crossed it in January, 1818, and inferred that there was a belt of monsoons between the two trades. He was mistaken as to the time of the year. He crossed this belt in January; and though, in January, the winds are sometimes from the S. W., yet, at that time of the year, they have nothing of the character of monsoons about them.

I quote a passage from his Journal:—

"We made a great run from their latitude (the Cape de Verdes), to about 7° 30′, when the N. E. trade began gradually to leave us, which it did effectually before we reached the latitude of 6° 30′ N., having run from 19° 30′, a distance of near nine hundred miles, between the 31st December and the 5th January; and from this time to the 17th there was little else than a continued calm, except when occasionally disturbed by a thunder-squall and violent rains. Though, considering we were at one time as far east as long. 19° W., we had very little rain and very few squalls of wind; those we had were principally from S. S. W. to W. S. W.; indeed, there appears to be, between the N. E. and S. E. trade-winds, which we found to be from 6° 30′ N. to the equator, a light monsoon from the S. W."

Had this remark been made in the summer instead of the winter it would have been perfectly correct.

If, after getting within these latitudes, *i. e.* those in which the calms are mentioned as prevailing, and the wind should come out at S. E., prefer the port tack; for, before you make the land, you are almost sure to have the wind out from the S. S. E., when you can make your easting within the regions of the perpetual S. E. trades.

After getting the S. E. trades, and finding himself a little pinched for easting to clear the land, the skilful navigator will see that, by standing on with the wind at S. E., all the chances are in his favor. If the wind haul to S. S. E., he can go about and make easting. If it veer to E. S. E., or farther, he can lay up and clear the land; for whether you go this or that side of Fernando de Noronha, in this or any other month, is a matter of no sort of consequence, excepting only so far as the difference of longitude is concerned. If you can weather it, do so, but do not waste time simply that you may pass to the eastward of it.

Good passages are sometimes made in September, but, as a general rule, the most tedious seasons of the year are the summer and fall months for passages.

After losing the N. E. trades, the navigator may consider himself fortunate in this month if he is not baffled about for more than a week before he gets the S. E. trades.

Schooner David C. Foster (N. H. Canput), New York to Para, twenty days out.

Aug. 30, 1850. Lat. 19° 33′ N.; long. 43° 40′ W. Winds: E. by S., E. by S., and E. Fresh breeze and clear weather.

Aug. 31. Lat. 16° 13′ N.; long. 43° 38′ W. Wind: East. Fresh breeze and clear.

Sept. 1. Lat. 13° 13′ N.; long. 43° 20′ W. Winds: E., N. N. E. Trade-winds, and heavy tide rips.

Sept. 2. Lat. 10° 27′ N.; long. 43° 6′ W. Winds: N. E., E. N. E., N. E. Fine weather.

Sept. 3. Lat. 8° 36′ N.; long. 43° 7′ W. Wind: variable, from N. E. to S. Baffling and squally.

Sept. 4. Lat. 8° 24′ N.; long. 42° W. Wind: southerly. Variable breezes, and heavy tide rips.

Sept. 5. Lat. 7° 52′ N.; long. 41° W. Light southerly winds, and squally.

Sept. 6. Lat. 6° 37′ N.; long. 40° W. Winds: southerly, light, and squally.

Sept. 7. Lat. 5° 15′ N.; long. 39° 30′ W. Winds: light, S. E. trades.

Sept. 8. Lat. 3° N.; long. 41° 22′ W. Winds: S., S. E., S. E. by E. Pleasant weather.

Sept. 9. Lat. 1° 19′ N.; long. 43° W. Winds: S. E., E., S. E. by E. Squally, and heavy rain.

Sept. 10. Lat. 00° 38′ S.; long. 46° 43′ W. Winds: S. E. by E. Fresh breeze, and clear weather.

Sept. 11. Lat. 00° 40′ S.; long. 45° 00′ W. Winds: S. E. by E. Fresh breeze, and clear weather.

Sept. 12. Arrived at Para, Brazil.

Steamer Chesapeake (C. H. Baldwin), New York to Rio Janeiro, twenty-one days out.

August 31, 1849. Lat. 19° 36′ N.; long. 39° 22′ W. Winds: W. N. W., S. S. W., and S. E. Moderate breeze, and rain squalls.

Sept. 1. Lat. 17° 44′ N.; long. 38° 28′ W. Winds: E., E. by N., and E. Moderate and strong breeze, and pleasant.

Sept. 2. Lat. 15° 46′ N.; long. 37° 30′ W. Winds: E. and E. by N. Squally, with fresh breeze.

Sept. 3. Lat. 13° 42′ N.; long. 36° 25′ W. Winds: E. by N., E. N. E., and E. Fresh breeze, and squally.

Sept. 4. Lat. 12° 46′ N.; long. 36° 48′ W. Winds: variable from the southward. Squally, with light rain.

Sept. 5. Lat. 11° 30′ N.; long. 34° 40′ W. Winds: N. W., W. N. W., and S. W. Squally, with rain.

Sept 6. Lat. 9° 42′ N.; long. 32° 20′ W. Winds: N. W., W., and S. W. Squally, with rain.

Sept. 7. Lat. 8° 00′ N.; long. 30° 50′ W. Winds: S. W., S. S. W., and S. W. Light breeze and squally, with rain.

Sept. 8. Lat. 7° 04′ N.; long. 29° 34′ W. Winds: S. W., variable, S. W., rain squalls and calms.

Sept. 9. Lat. 6° 37′ N.; long. 27° 30′ W. Winds: S. S. W., S. by W., and S. Squally, with heavy rain.

Sept. 10. Lat. 5° 27′ N.; long. 26° 46′ W. Wind: S. Light breeze, and pleasant.

Sept. 11. Lat. 4° 10′ N.; long. 26° 36′ W. Wind: S. S. W. Moderate and pleasant.

Sept. 12. Lat. 3° 00′ N.; long. 26° 10′ W. Wind: S. by W. Light and pleasant.

Sept. 13. Lat. 1° 30′ N.; long. 26° 30′ W. Wind: S. Pleasant weather.

Sept. 14. Lat. 0° 26′ N.; long. 27° 00′ W. Winds: S. S. E., S. E. by S., and S. E. by S. Light breeze, and pleasant.

Sept. 15. Lat. 0° 11′ N.; long. 27° 37′ W. Winds: S. S. E., S. E. by E., S. E. by E. Moderate and pleasant.

Sept. 16. Lat. 1° 22′ S.; long. 28° 06′ W. Winds: S. by E., S., and S. S. E. Light airs.

Sept. 17. Lat. 2° 38′ S.; long. 29° 10′ W. Winds: S. E., S. E. by S., and S. S. E. Pleasant weather.

Sept. 18. Lat. 3° 46′ S.; long. 30° 34′ W. Winds: S. S. E., S., and S. S. E. Moderate breeze, and pleasant.

Sept. 19. Lat. 5° 34′ S.; long. 32° 16′ W. Wind: S. S. E. Fresh breeze, and pleasant.

Bark Antelope (R. D. White), Baltimore to San Francisco, twenty days out.

Sept. 4, 1853. Lat. 19° 53′ N.; long. 42° 15′ W. Winds: E., E. S. E., and E. S. E. Squally with rain.

Sept. 5. Lat. 18° 00′ N.; long. 41° 54′ W. Winds: E., and E. S. E. Squally with rain.

Sept. 6. Lat. 15° 23′ N.; long. 41° 38′ W. Winds: S. E. by E., S. E., and E. S. E. Occasional rain squalls.

Sept. 7. Lat. 13° 44′ N.; long. 39° 45′ W. Winds: E. N. E., N. E. by E., and N. E. by E. Light winds and occasional rain squalls.

Sept. 8. Lat. 12° 47′ N.; long. 37° 50′ W. Winds: N. E. by E., N. E., and E. N. E. Strong variable winds and rain.

Sept. 9. Lat. 11° 37′ N.; long. 36° 34′ W. Winds: calm, squally, and south. Much rain.

Sept. 10. Lat. 11° 35′ N.; long. 35° 28′ W. Winds: calm, S. E., and N. E. Squally with rain.

Sept. 11. Lat. 9° 27′ N.; long. 34° 18′ W. Winds: N. E., E. N. E., and E. Occasional light squalls of rain.

Sept. 12. Lat. 8° 18′ N.; long. 33° 24′ W. Winds: E., E., W. N. W. Squally with much rain.

Sept. 13. Lat. 6° 50′ N.; long. 30° 57′ W. Winds: W., W. S. W., and W. S. W. Squally and much rain.

Sept. 14. Lat. 6° 28′ N.; long. 29° 02′ W. Winds: S., S. S. W., S. by W. Much rain, with variable winds.

Sept. 15. Lat. 6° 25′ N.; long. 26° 30′ W. Wind: S. Pleasant.

Sept. 16. Lat. 5° 53′ N.; long. 26° 49′ W. Winds: S., S., and S. S. E. Moderate breezes and pleasant.

Sept. 17. Lat. 5° 38′ N.; long. 26° 40′ W. Winds: S. by E., S., and S. Light breezes and pleasant.

Sept. 18. Lat. 5° 08′ N.; long. 26° 34′ W. Winds: S. by E., S. by W., and S. Light breezes.

Sept. 19. Lat. 4° 37′ N.; long. 27° 00′ W. Winds: S. by W., S., and S. Light breezes and pleasant.

Sept. 20. Lat. 4° 25′ N.; long. 25° 20′ W. Winds: S. by W., S. by E., and S. S. W. Fresh breezes and flying clouds.

Sept. 21. Lat. 2° 31′ N.; long. 26° 47′ W. Winds: S. by E., S. S. E., and S. by E. Fresh breezes.

Sept. 22. Lat. 00° 02′ S.; long. 28° 26′ W. Wind: S. S. E. Strong breezes and pleasant.

Sept. 23. Lat. 2° 54′ S.; long. 29° 11′ W. Winds: S. S. E., S. E., and E. by S. Good breezes and clear weather.

Sept. 24. Lat. 4° 26′ S.; long. 29° 32′ W. Wind: E. by S. Steady breezes.

Sept. 25. Lat. 6° 05′ S.; long. 30° 05′ W. Winds: E. by S., E. S. E., and E. Moderate breezes.

Ship Monsoon (L. Winsor), Boston to San Francisco, twenty days out.

Sept. 18, 1852. Lat. 19° 58′ N.; long. 41° 44′ W. Winds: E. S. E., E. S. E., and N. E. Light breezes and squally.

Sept. 19. Lat. 17° 20′ N.; long. 40° 19′ W. Winds: E., E.S. E., E. S. E. Fresh breezes and passing squalls.

Sept. 20. Lat. 14° 57′ N.; long. 38° 58′ W. Winds: E., E. S. E., and E. S. E. Fresh trades, and thick cloudy weather.

Sept. 21. Lat. 12° 18′ N.; long. 37° 08′ W. Wind: E. Fresh trades and cloudy.

Sept. 22. Lat. 11° 09′ N.; long. 30° 21′ W. Winds: E. S. E., S. S. W., and W. N. W. Fresh breezes and fresh squalls, with heavy tide rips; latter part, light breezes.

Sept. 23. Lat. 10° 12′ N.; long. 34° 24′ W. Winds: variable and calm. Frequent squalls and heavy tide rips.

Sept. 24. Lat. 9° 12′ N.; long. 34° 12′ W. Light variable breezes and frequent squalls.

Sept. 25. Lat. 9° 17′ N.; long. 33° 30′ W. Winds: E. N. E., variable, and calm. Light breezes and pleasant; much lightning during the night.

Sept. 26. Lat. 8° 21′ N.; long. 31° 55′ W. Winds: W. N W., W. N. W., and W. Light breezes and pleasant weather.

Sept. 27. Lat. 6° 33′ N.; long. 29° 30′ W. Winds: W., W., and S. W. Fresh breezes and squally.

Sept. 28. Lat. 6° 39′ N.; long. 26° 39′ W. Winds: S. S. W., S. W., and S. Fresh gales, and heavy squalls with rain.

Sept. 29. No observation. Winds: S. W., S. S. W., and S. W. Calms and squalls.

Sept. 30. Lat. 5° 55′ N.; long. 25° 13′ W. Calm, with constant rain.

Oct. 1. Lat. 4° 25′ N.; long. 27° 10′ W. Wind: S. Squally and variable; pleasant weather.

Oct. 2. Lat. 2° 33′ N.; long. 29° 30′ W. Wind: S. Firm breezes and pleasant weather.

Oct. 3. Lat. 00° 01′ S.; long. 32° 25′ W. Wind: S. S. E. Light breezes and fine weather. Current, 28′ S. W.

Oct. 4. Lat. 2° 55′ S.; long. 34° 37′ W. Wind: S. S. E. Fine breezes and pleasant weather. Current, 30′ S. W.

Oct. 5. Lat. 4° 55′ S.; long. 35° 23′ W. Wind: S. E. Fine breezes and pleasant weather. Current, 12 miles, S. W.

Oct. 6. Lat. 5° 11′ S.; long. 34° 30′ W. Wind: S. E. Fine breezes and pleasant weather.

Ship Thomas W. Sears (Joseph Osgood), New York to California, thirty days out.

Sept. 18, 1852. Lat. 19° 41′ N.; long. 35° 42′ W. Current, 1.1 knot per hour, N. 53° W. Barometer, 30.00; temperature of air, 79°; of water, 80°. Winds: S. S. E., S. E. by E., E. First part, light airs; middle part, moderate breezes; latter, fine trades.

Sept. 19. Lat. 16° 53′ N.; long. 34° 54′ W. Current, west, 0.4 knot per hour. Barometer, 30.00;

temperature of air, 81°; of water, 80°. Winds: E. by N., E., E. S. E. Strong trades and pleasant. A cross sea on.

Sept. 20. Lat. 14° 21′ N.; long. 33° 54′ W. Current, N. 63°, W., 0.4 knot per hour. Barometer, 29.90; temperature of air, 80°; of water, 81°. Wind: E. Fine trades and pleasant weather.

Sept. 21. Lat. 12° 24′ N.; long. 32° 21′ W. Barometer, 29.83; temperature of air, 81°; of water, 80°. Winds: E., E. by N., E. Fine trades and hazy weather. Saw strong tide rips.

Sept. 22. Lat. 11° 49′ N.; long. 31° 38′ W. Barometer, 29.90; temperature of air, 83°; of water, 83°. Winds: E. by E., W., N. W. First part, moderate winds; middle and latter, light airs and calms. Saw several tide rips.

Sept. 23. Lat. 10° 35′ N.; long. 30° 36′ W. Current, N. W., 0.5 knot per hour. Barometer, 29.90; temperature of air, 83°; of water, 81°. Winds: N., N. E., N. First part, moderate breezes; middle and latter, baffling.

Sept. 24. Lat. 9° 29′ N.; long. 29° 51′ W. Current, W. N. W., 0.6 knot per hour. Barometer, 29.90; temperature of air, 83°; of water, 82°. Winds: N. W., N., N. W. Very light winds throughout.

Sept. 25. Lat. 8° 20′ N.; long. 28° 34′ W. Barometer, 29.83; temperature of air, 83°; of water, 81°. Wind: N. W.; moderate breezes, and pleasant. A S. E. swell on.

Sept. 26. Lat. 6° 17′ N.; long. 26° 46′ W. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: N. W., W., S. W.; first part, strong breeze and squally. Latter part, fresh gale, with an ugly sea.

Sept. 27. Lat. 5° 54′ N.; long. 24° 54′ W. Barometer, 29.90; temperature of air, 81°; of water, 81°. Winds: S. S. W., S. by W., S. by W.; weather moderating, made sail, some head sea.

Sept. 28. Lat. 5° 32′ N.; long. 23° 11′ W. Barometer, 29.90; temperature of air, 80°; of water, 81°. Winds: S. S. W., S. by W. ½ W., S. by W.; light airs, and cloudy.

Sept. 29. Lat. 4° 47′ N.; long. 23° 40′ W. Barometer, 29.90; temperature of air, 79°; of water, 80°. Winds: S., S. by W., S.; moderate and cloudy.

Sept. 30. Lat. 3° 41′ N.; long. 25° 30′ W. Barometer, 29.84; temperature of air, 80°; of water, 80°. Winds: S., S., S. by E.; fine breezes and pleasant weather.

Oct. 1. Lat. 1° 52′ N.; long. 27° 14′ W. Current, W. N. W., 15 miles per 24 hours; variation 10° 30′ W. Barometer, 29.90; temperature of air, 79°; of water, 79°. Wind: S. S. E.; fine trades and pleasant.

Oct. 2. Lat. 0° 24′ N.; long. 28° 44′ W. Current, W. N. W., 0.5 knot per hour. Barometer, 29.95; temperature of air, 80°; of water, 79°. Winds: S. S. E., S. by E., S. S. E.; moderate and pleasant.

Oct. 3. Lat. 1° 35′ S.; long. 30° 33′ W. Current, N. 54° W., ¾ knot per hour. Barometer, 29.90; temperature of air, 79°; of water, 77°. Winds: S. S. E., S. S. E., S. E. by S.; fine trades and pleasant. The water looks green.

Oct. 4. Lat. 3° 35′ S.; long. 31° 27′ W. Current, N., 10 miles during the day. Barometer, 29.90; temperature of air, 79°; of water, 78°. Wind: S. E. by S.; pleasant trades.

Oct. 5. Lat. 5° 28′ S.; long. 32° 29′ W. Current, W., 13 miles during the day. Barometer, 29.98; temperature of air, 78°; of water, 79°. Wind: S. E. by S.; moderate trades and fine weather.

Oct. 6. Lat. 7° 34′ S.; long. 33° 40′ W. Current, S. 56° W., ¾ of a knot per hour. Barometer, 29.94; temperature of air, 79°; of water, 79°. Wind: S. E. by S.; moderate trades and fine weather.

Ship John Wade (J. H. Little), New York to San Francisco, thirteen days out.

Sept. 26, 1853. Lat. 21° 28′ N.; long. 34° 58′ W. Barometer, 29.80; temperature of air, 81°; of water, 81°. Winds: S. S. E., S. E., and S. E. by E. Light baffling winds and fine weather.

Sept. 27. Lat. 17° 44′ N.; long. 35° 10′ W. Barometer, 29.90; temperature of air, 82°; of water, 82°. Wind: E. Fresh breezes and clear.

Sept. 28. Lat. 15° 00′ N.; long. 34° 50′ W. Barometer, 21.40; temperature of air, 80°; of water, 80°. Winds: E., and E. S. E. First part, fresh breezes; middle part, strong gale. At 8 A. M. hove to under close-reefed main-topsail. At 8, barometer 29.60; at 10, 29.7; at 12 M., 29.3.

Sept. 29. Lat. 14° 32′ N.; long. 34° 31′ W. Barometer, 29.60; temperature of air, 80°; of water, 80°. Winds: W., S. S. W., S. S. W. Heavy gale, with violent squalls of wind and rain; middle part, by sharp lightning; latter part, moderate. Made sail. I think I was near the track of a hurricane.

Sept. 30. Lat. 13° 30′ N.; long. 32° 53′ W. Current, E. by N., 30 miles. Barometer, 29.80; temperature of air, 79°; of water, 79°. Winds: S. S. W., S. S. W., W. S. W. First part, squally; latter part, a light breeze.

Oct. 1. Lat. 13° 16′ N.; long. 32° 00′ W. Current, E. N. E., 35 miles. Barometer, 29.80; temperature of air, 79°; of water, 79°. Winds: W., S. W., S. W., and calm.

Oct. 2. Lat. 12° 57′ N.; long. 32° 10′ W. Current, 10 miles, S. W. Barometer, 29.90; temperature of air, 79°; of water, 79°. Wind: calm throughout. Ship without steerage way.

Oct. 3. Lat. 11° 51′ N.; long. 32° 18′ W. Current, N. ¼ W., 40 miles. Barometer, 29.90; temperature of air, 80°; of water, 80°. Winds: N. N. E., N. E., E. by S. Surprised at finding so much current, there being no sign of any.

Oct. 4. Lat. 9° 20′ N.; long. 31° 40′ W. Barometer, 29.90; temperature of air, 80°; of water, 80°. Winds: E. by S., E. S. E., and S. E. Squally and baffling; strong tide rips.

Oct. 5. Lat. 8° 58′ N.; long. 31° 18′ W. Current, for yesterday and to-day, 60 miles east. Barometer, 29.90; temperature of air, 81°; of water, 80°. Winds: S. E., calm, calm. Light breezes and showery.

Oct. 6. Lat. 8° 01′ N.; long. 30° 41′ W. Barometer, 29.90; temperature of air, 82°; of water, 81°. Winds: calm, E. S. E., and E. Baffling air; latter part, hard rain.

Oct. 7. Lat. 7° 23′ N.; long. 30° 10′ W. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: calm, S. S. W., N. E. Light baffling airs, calms, and rain.

Oct. 8. Lat. 6° 42′ N.; long. 29° 17′ W. Current, for two days, 30 miles E. by N. Barometer, 29.90; temperature of air, 82; of water, 82. Winds: calm, S. W., and calm. Light baffling airs and rain; S. W. and east winds striving for the ascendency.

Oct. 9. Lat. 5° 32′ N.; long. 28° 30′ W. Current, E. ½ N., 25 miles. Barometer, 29.80; temperature of air, 82°; of water, 82°. Winds: calm, W. S. W., N. First part, calm; latter part, baffling airs, and showery.

Oct. 10. Lat. 3° 57′ N.; long. 26° 52′ W. Current, east, 24 miles. Barometer, 29.80; temperature of air, 83°; of water, 81°. Winds: S. W., S. S. W., S. by W. Light baffling airs and cloudy.

Oct. 11. Lat. 3° 10′ N.; long. 26° 24′ W. Current, W. by N., 20 miles. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: S. by W., S. by W., S. Moderate breezes and cloudy. Tacked ship three times; have been as far east as 25° 50′ W., lat. 3° 22′ N.

Oct. 12. Lat. 1° 27′ N.; long. 28° 04′ W. Barometer, 29.90; temperature of air, 82°; of water, 81°. Winds: S. S. E., S. by E., S. by E.; light breezes, and cloudy, six days without any observation, and only two days pleasant since we left New York.

Oct. 13. Lat. 00° 33′ S.; long. 29° 40′ W. Barometer, 29.80; temperature of air, 81°; water, 81°. Winds: S. S. E., S. by E., S. by E.; light breezes and showery, crossed the equator in 29° 12′ W. at 7 P. M. 32 days out.

Oct. 14. Lat. 3° 09′ S.; long. 31° 12′ W. Barometer, 29.80; temperature of air, 81°; of water, 80°. Winds: S. S. E., S. E. by S., S. S. E.; light breezes, and fine weather.

Oct. 15. Lat 5° 37′ S.; long. 32° 30′ W. Barometer, 29.80; temperature of air, 81°; of water 79°. Winds: S. S. E., S. E. by S., S. E.; light breezes and fine weather; saw several meteors last night.

Oct. 16. Lat. 8° 18′ S.; long. 32° 22′ W. Barometer, 29.90; temperature of air, 80°; of water, 79.° Winds: S. S. E., S. E., S. E.; moderate breezes and fine weather. I have not had any current for 4 days past.

From Capt. George Scott, to Lieut. Maury.

SAN FRANCISCO, *April* 29, 1853.

Inclosed is the abstract log of ship Adelaide Metcalf, under my command, on her last passage from New York, *via* Callao, to this place. I owe an apology for not forwarding it before now, as I have been in port since the 13th ult.

I understood on my arrival here, that you had an agent to receive such communications, and endeavored to find him, but did not succeed; and, latterly, thought I would not send it until I had looked at the ship's bottom, to see if that had not something to do with my very long passage. I find upon heaving her out, that portions of the keel and shoe are gone, also, several planks cut nearly through, and the bottom quite ragged, caused by striking on the reef in East River, near Governor's Island, while coming out, and I am satisfied that this has been the cause of my long passage; although I think you will notice some peculiarities in the winds, as I found them in the northern tropic of the Atlantic and Pacific. I have all faith in your Charts and books, and value them highly, and endeavored to follow out your instructions. If I did not do so, hope I shall be convinced of my error at some future time. I shall continue to keep the abstract, on my future passages; and although poorly, still, I hope they will be of some slight service.

Ship Adelaide (Metcalf), George Scott, New York to San Francisco, twenty-four days out.

Oct. 8, 1852. Lat. 15° 21′ N.; long. 40° 22′ W. Current, W. N. W., half knot per hour. Temperature of air, 83°; surface, 81°; of water, at ten feet six inches depth, 81°. Winds: E., E. by N., E. S. E. First and middle, moderate; latter, light at 11h. 30m. Squall from W. S. W. Noticed many and strong tide rips, with intervals of very smooth water. It seems rather problematical when, where, and how I am to make my easting, but so long as I can make a south, or S. by W. course on this tack, I shall keep on. Barometer, 30.06.

Oct. 9. Lat. 13° 27′ N.; long. 40° 35′ W. Current, W. N. W., three-quarter knots per hour. Barometer, 30.06; temperature of air, 80½°; surface of water, 81°; water, at ten feet six inches depth, 81°. Winds: S. E., E. by S., E. S. E. First and middle, good breezes; latter part, light. Noticed tide rips and smooth places yesterday.

Oct. 10. Lat. 11° 57′ N.; long. 39° 34′ W. Current, W. N. W., one knot per hour. Barometer, 29.9; temperature of water, 81½°; of air, 82°; water, at ten feet six inches depth, 81°. Winds: E., E. N. E., E. N. E. From 12 to 2 P. M. two smart squalls from S., N. N. E., with rain, middle and latter part. Good breezes, with squalls of rain; ends with a thick haze on the horizon at the N. E., and strong tide rips, as yesterday.

Oct. 11. Lat. 9° 51′ N.; long. 37° 52′ W. Current, W. by N., half knot per hour. Barometer, 29.93; temperature of air, 82°; of water, 82°; water, at ten feet six inches depth, 82°. Winds: E. N. E., E. N. E., E. N. E. Good breezes and cloudy weather; squalls and showers; very powerful tide rips.

Oct. 12. Lat. 9° 05′ N.; long. 37° 22′ W. Current, S. E. by E., half knot per hour. Barometer, 29.98; temperature of air, 80°; of water, 83°; of water, at 10 feet 6 inches depth, 83°. Winds: E., E., variable. Light baffling winds and squalls, with heavy showers of rain. Some tide rips; the wind has been around the compass several times.

Oct. 13. Lat. 8° 24′ N.; long. 36° 20′. Current, S. E. by E., half knot per hour. Barometer, 29.98; temperature of air, 80°; of water, 82°; of water, at 10 feet 6 inches depth, 82°. Winds: calm, E. N. E., calm. Middle part, lightning in the N. W.; at 10 P. M. had a violent squall from the N. E. attended with heavy rain.

Oct. 14. Lat. 7° 48′; long. 35° 41′. Current, S. E. by E., one-quarter knot per hour. Barometer, 30.00; temperature of air, 81°; of water, 82°; water, at 10 feet 6 inches depth, 82°. Winds: calm, S. S. W., S. S. W. First part, calm; middle and latter part, light airs.

Oct. 15. Lat. 7° 40′ N.; long. 35° 22′ W. Current, E. S. E., three-quarters knots per hour. Barometer, 30.04; temperature of air, 83°; of water, 83°; of water, at 10 feet 6 inches depth, 82½°. Winds: calm, calm, calm. First and middle parts, dead calm; latter part, light airs from south for four hours.

Oct. 16. Lat. 6° 50′ N.; long. 34° 43′ W. Current, one knot per hour. Barometer, 29.98; temperature of air, 81°; of water, 82½°; of water, at 10 feet 6 inches depth, 82½°. Winds: S. W., S. W., S. S. W. Light airs, and clear pleasant weather. I confidently expected the S. E. trades here, and, in fact, 6° north of this, but there seems to be nothing for us but head winds and calms.

Oct. 17. Lat. 5° 40′ N.; long. 33° 50′ W. Barometer, 29.97; temperature of air, 79°; of water, 82°. of water, at 10 feet 6 inches depth, 82°. Winds: S. S. W., S. W., S. W. Constant and heavy rain with calms; light winds and heavy squalls, and very bad sea.

Oct. 18. Lat. 6° 05′ N.; long. 32° 14′ W. Current, N. N. E., one knot per hour. Barometer, 30.00; temperature of air, 82°; of water, 82°; of water, at 10 feet 6 inches depth, 82°. Winds: S., S. by E., calm. Stood E. by S. 12 hours, when, finding we were losing the wind, tacked to the S. W.

Oct. 19. Lat. 5° 36′ N.; long. 32° 13′ W. Barometer, 30.00; temperature of air, 82½°; of water, 82°; of water, at 10 feet 6 inches depth, 82°. Winds: calm, calm, E. First and middle part, calm; latter, light wind and clear weather.

Oct. 20. Lat. 5° 15′ N.; long. 32° 53′ W. Current, W., three-quarters knot per hour. Barometer, 30.04; temperature of air, 82½°; of water, 83°; of water, at 10 feet 6 inches depth, 82½°. Winds: calm, calm, S. by E. Noticed many and strong tide rips.

Oct. 21. Lat. 4° 29′ N.; long. 33° 41′ W. Barometer, 30.03; temperature of air, 82½°; of water, 81°; of water, at 10 feet 6 inches depth, 82½. Winds: S. S. E., S. S. E., S. S. E. Moderate breezes, stood S. W. 20 hours, and then tacked east; think we have got the trades.

Oct. 22. Lat. 4° 14′ N.; long. 33° 49′ W. Current, N. W., one knot per hour. Barometer, 30.03; temperature of air, 81½°; of water, 81½°; of water, at 10 feet 6 inches depth, 81°. Winds: S., S. S. E., calm. Light baffling winds and calms, and currents as per log. If I can get across the line anywhere, I shall do it as quick as possible, and take the chances at the southward of making easting, or beat by St. Roque near the land.

Oct. 23. Lat. 3° 58′ N.; long. 32° 35′ W. Barometer, 29.98; temperature of air, 80°; of water, 81°; of water, at 10 feet 6 inches depth, 81°. Winds: calm, S. by E., S. S. E. Middle and latter part, fresh breezes with thunder, lightning, and rain. Stood E. by S., and E. S. E., all day, excepting in two short but heavy squalls from east, when we stood south; no observations.

Oct. 24. Lat. 4° 36′ N.; long. 31° 32′ W. Barometer, 30.03; temperature of air, 81½°; of water, 81½°; of water, at 10 feet 6 inches depth, 81°. Winds: S., S., S. Stood E. S. E. all day, excepting in two or three short squalls. Find, by observations, to-day, that we have had a very strong current the last two days.

Oct. 25. Lat. 3° 48′ N.; long. 31° 56′ W. Current, N. N. W., one knot per hour. Barometer, 30.05; temperature of air, 82½°; of water, 81°; of water, at 10 feet 6 inches depth, 81°. Winds: E. S. E., S. E., S. by E. Light winds and cloudy weather, with heavy swells from S. S. E.

Oct. 26. Lat. 2° 47′ N.; long. 32° 23′ W. Current, N. N. W., one and a quarter knots per hour. Barometer, 32.02; temperature of air, 82°; of water, 81°; of water, at 10 feet 6 inches depth, 81°. Winds: S. S. E., S. S. E., S. S. E. Light winds and clear weather.

Oct. 27. Lat. 2° 16′ N.; long. 33° 00′ W. Current, N. W., one knot per hour. Barometer, 30.02; temperature of air, 80°; of water, 80°; of water, at 10 feet 6 inches depth, 79½°. Winds: S. by E., S. S. E., S. Light winds and clear weather; water colder than it has been since entering the tropics; tacked three times.

Oct. 28. Lat. 1° 44′ N.; long. 33° 33′ W. Current, W. N. W., one knot per hour. Barometer, 29.97; temperature of air, 81°; of water, 79°; of water, at 10 feet 6 inches depth, 79°. Winds: S. ½ E., S. S. E., S. E. by E. Light winds and pleasant weather; stood E. S. E. ½ E. 8 hours.

Oct. 29. Lat. 0° 03′ N.; long. 34° 58′ W. Current, N. W. by W., 1 knot per hour. Barometer, 29.95; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: S. E., S. S. E., S. E. by S., moderate breeze and cloudy. I am now on the line, after a passage of 46 days, and so far west that I shall fall to leeward of St. Roque, no doubt; and the question arises in my own mind, could I have done better by taking some other course? I have all faith in *Maury's Book and Charts;* I think I have followed them as far as possible. But if I have made no mistake in the route, mine is a hard case. I have not had a whole sail breeze eight consecutive hours since leaving New York. No trade either N. E. or S. E., until this day; for the wind has been so light and baffling, for three days back, that it could hardly deserve the name of trade-winds, and I have not, nor do now dare to stand east, for fear of the strong current, and that I shall lose the wind again.

Oct. 30. Lat. 1° 40′ S.; long. 36° 00′ W. Current, N. W., 1 knot per hour. Barometer, 29.98; temperature of air, 80°; of water, 78°; water, at 10 feet 6 inches depth, 78°. Winds: S. S. E., S. E. by E., S. E.; moderate and cloudy, middle squally. Heavy dew.

Oct. 31. Lat. 3° 33′ S.; long. 36° 40′ W. Barometer, 29.98; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: S. E., S. E. by E., S. E.; moderate and cloudy; middle squally. Heavy dews.

Nov. 1. Lat. 4° 43′ S.; long. 36° 54′ W. Current, W. N. W., ½ knot per hour. Barometer, 29.97; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: S. E., E. S. E., E. S. E.; moderate and clear. At 3 A. M. tacked to the N. E., in 9 fathoms of water. At 7 A. M. tacked south at 12 M. Point de Mel bore S. ½ W. 12 miles.

Nov. 2. Lat 4° 47′ S.; long. 36° 24′ W. Current, W. N. W., ½ knot per hour. Barometer, 29.97; temperature of air, 82½; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: E., E., E. All this day making short tacks from the land, and into 7 fathoms on St. Roque Banks.

Nov. 3. Lat. 4° 45′ S.; long. 36° 02′ W. Current, W. N W., ½ knot per hour. Barometer, 29.96; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: E., E., E. All this day making short tacks from the land, and into 7 fathoms on St. Roque Banks.

Nov. 4. Lat. 4° 43′ S.; long. 35° 33′ W. Current, W. N. W., ½ knot per hour. Barometer, 29.96; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 78½°. Winds: E., E., E. All this day making short tacks from the land, and into 7 fathoms on St. Roque Banks.

Nov. 5. Lat. 4° 47′ S.; long. 35° 08′ W. Current, N. W., ½ knot per hour. Barometer, 29.96; temperature of air, 82°; of water, 79½; water, at 10 feet 6 inches depth, 79½. Winds: E. S. E., E. S. E., E. S. E. Light winds, clear; making short tacks off the land, in 7 fathoms of water, on St. Roque Banks.

Nov. 6. Lat. 5° 44′ S.; long. 35° 05′ W. Current, N. W. by N., 1 knot per hour. Barometer, 29.95; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: E. S. E.,

E. S. E., E. S. E. I am now south of St. Roque, and in the five days I have been beating, I have not had one hour's stout wind, but less current than north of the line. I have been on the bank every tack, and in one instance into 4 fathoms, off Point Calcanhar: I think the soundings in the vicinity of the banks are correct in many places.

Nov. 7. Lat. 6° 20′ S.; long. 34° 50′ W. Current, N. N. W., ¾ knots per hour. Barometer, 29.99; temperature of air, 80°; of water, 79°; water, at 10 feet 6 inches in depth, 79°. Winds: S. E., E. S. E., S. E. by E. Light winds and clear. Tacked twice near the land.

Nov. 8. Lat. 6° 40′ S.; long. 34° 37′ W. Current, N. N. W., ½ knot per hour. Barometer, 30.01; temperature of air, 81°; water, 79°; water, at 10 feet 6 inches in depth, 79°. Winds: S. S. E., S. E. by E. Light winds and clear; tacked several times as the wind varied a point or two.

Nov. 9. Lat. 7° 50′ S.; long. 34° 42′ W. Current, N., ½ knot per hour. Barometer, 30.03; temperature of air, 81°; of water, 79½°; water, at 10 feet 6 inches in depth, 79½°. Winds: S. E. by E., E. S. E., E. S. E. At 10 P. M. had a squall from N. E. for half an hour, attended with heavy rain. Remainder of the day clear, with light wind.

[This tack is not quoted as an illustration of the route; for the vessel, as it appears from the captain's letter, had sustained injuries to her bottom by striking aground, which injured her sailing. This abstract, however, may be studied with profit by those who are making an October passage, for it gives much information touching the winds, &c., during that month.]

Annie Buckram (Barber), New York to Canton, nineteen days out.

Oct. 18, 1852. Lat. 16° 39′ N.; long. 30° 50′ W. Barometer, 29.9; temperature of air, 82°; of water, 80°. Winds: E. S. E. to S. W., calm and east. Good breeze; night wind baffling to S. E. and S. W., quite light; 4 A. M., calm; ends light airs from the east.

Oct. 19. Lat. 15° 02′ N.; long, 30° 29′ W. Barometer, 29.9; temperature of air, 82°; of water, 81°. Winds: E., E. by S., E. S. E. Light winds and fair weather all day. Several current ripples, but have had no current.

Oct. 20. Lat. 13° 28′ N.; long. 30° 05′ W. Barometer, 30.00; temperature of air, 82°; of water, 81°. Winds: E. by S., E. S. E., E. S. E. Light winds and overcast; light showers passing over us from westward without the wind's hauling. Latter part, moderate and pleasant.

Oct. 21. Lat. 10° 46′ N.; long. 29° 46′ W. Barometer, 30.00; temperature of air, 83°; of water, 82°. Wind: E. S. E. Moderate breeze and passing squalls all day.

Oct. 22. Lat. 8° 24′ N.; long. 29° 15′ W. Barometer, 29.9; temperature of air, 83°; of water, 82°. Winds: E. S. E., E. by S., E. S. E. to S. Moderate and pleasant; right good breeze; latter part, unsteady, baffling, with light showers.

Oct. 23. Lat. 7° 30′ N.; long. 29° 43′ W. Barometer, 29.9; temperature of air, 82°; of water, 82°. Winds: S., S. S. E., S. S. E. Light winds and calm; night, same; latter part, moderate breeze.

Oct. 24. Lat. 6° 43′ N.; long. 29° 33′ W. Barometer, 29.9; temperature of air, 82°; of water, 82°.

Winds: S. by E., S. S. W., calm; strong breezes. 8 P. M. tacked to S. E. Night rainy, with squalls; latter part, calm; and a bad bubble of southerly sea.

Oct. 25. Lat. 6° 18′ N.; long. 29° 5′ W. Current, 20 miles, S. E. Barometer, 29.9; temperature of air, 84°; of water, 82°. Winds: calm, all round calm; calm and hazy; night, light squalls all around; latter part, calm. The ship has not gone more than 20 miles through the water all day.

Oct. 26. Lat. 5° 32′ N.; long. 28° 50′ W. Current, 18 miles, S. by W. Barometer, 29.9; temperature of air, 83°; of water, 82°. Winds: calm, S. W., S. W. Calm in the beginning; during the night and latter part, very faint airs from S. W.

Oct. 27. Lat. 4° 55′ N.; long. 28° 29′ W. Current, 15 miles, S. Barometer, 29.9; temperature of air, 81°; of water, 82°. Winds: S. W., S. S. W., S. S. W. Very light airs all day; hardly steerage way; during the night, heavy showers; wind baffling from west to south.

Oct. 28. Lat. 4° 43′ N.; long. 27° 39′ W. Barometer, 29.9; temperature of air, 82°; of water, 82°. Winds: S. S. W., S. W., S. Light winds and squally, with plenty of rain; at times, nearly calm; a heavy southerly swell.

Oct. 29. Lat. 3° 38′ N.; long. 28° 40′ W. Barometer, 29.9; temperature of air, 81°; of water, 82°. Winds: S., S. by E., S. by E. First six hours squally; during the night and latter part, moderate and pleasant. Stood to eastward first three hours, then S. W. by W.

Oct. 30. Lat. 2° 20′ N.; long. 30° 6′ W. Barometer, 29.9; temperature of air, 80°; of water, 82°. Winds: S. by E., S. S. E., S. S. E., calm, S. by E. Unsteady breezes, with showers, from S. E. to S., every few minutes; calm for three hours.

Oct. 31. Lat. 1° 10′ N.; long. 31° 2′ W. Barometer, 29.9; temperature of air, 81°; of water, 82°. Winds: S. by E., S. S. E., S. E. by S. Moderate and fair weather. Stood 5½ hours to the eastward; tacked to the southward and westward at midnight.

Nov. 1. Lat. 55′ S.; long. 32° W. No current. Barometer, 29.9; temperature of air, 82°; of water, 82°. Winds: S. E., S. E., S. E. to S. S. E. Moderate breezes and pleasant. Crossed the equator about midnight, 35½ days from New York, in long. 31° 30′. Stood to the eastward the last two hours. My last three passages have been 27, 28, 27 days; in all of which, I went as far east as 26°, and crossed east of 29°. This time there was no choice; go ahead or beat.

[And you did right.]

Nov. 2. Lat. 3° 14′ S.; long. 31° 38′ W. No current. Barometer, 29.9; temperature of air, 80°; of water, 80°. Winds: S. S. E. to S. E., E. by S., E. Moderate trades and pleasant. Stood to the eastward 2 hours; tacked to the southward at 2 P. M. During the night and latter part, good breezes.

Nov. 3. Lat. 6° 19′ S.; long. 31° 42′ W. Barometer, 29.9; temperature of air, 80°; of water, 80°. Wind: E. to E. S. E. all day. Good breeze and fine weather. Steering south most of the time, wind free. No current since crossing the equator.

Nov. 4. Lat. 9° 34′ S.; long. 31° 31′ W. Barometer, 29.9; temperature of air, 80°; of water, 80°. Winds: E. by S., E. by S., E. Good breezes and fine weather. This is the first time I ever made a south

course from the equator to this latitude. We might have made easting, the wind being free on a south course. No current. Longitude ☉ and ☾ comes within 9 miles of chronometer.

Robert Wing (L. Crowell), New York to Buenos Ayres, fifteen days out.

Oct. 18, 1852. Lat. 20° 21′ N.; long. 44° 31′ W. Temperature of air, 83°; of water, 83°. Winds: E. by S., E. S. E., S. E. Very fresh breezes, attended with squalls of wind and rain, with high sea from S. E.; wanting to make more easting; wind hung very obstinate to E. S. E.; am afraid the wind may hang on too long to cross the equator where I intended; I never knew the trades to work so far to the southward and eastward at this or any other season.

Oct. 19. Lat. 18° 40′ N.; long. 43° 30′ W. Temperature of air, 84°; of water, 83°. Winds: E. S. E., E., E. Fresh breezes, with hard squalls of rain; very bad appearances; bad sea running from S. E.

Oct. 20. Lat. 17° 40′ N.; long. 43° 08′ W. Temperature of air, 85°; of water, 82°. Winds: E. by N., E. by S., E. S. E. Fresh breezes, with hard squalls of wind and rain. Latter part, pleasant.

Oct. 21. Lat. 16° 51′ N.; long. 42° 07′ W. Temperature of air, 85°; of water, 82°. Winds: S. S. E., S., S. by W. Light winds and pleasant; wind varying from E. S. E. to S. and S. W.; have had no N. E. trade-winds hanging obstinately at S. and E.

Oct. 22. Lat. 17° 15′ N.; long. 40° 36′ W. Temperature of air, 84; of water, 82°. Winds: S. by W., S., S. S. E. Moderate breezes and pleasant; wind varying from S. by W. to S. E.; very dull prospects, not finding any trades; wind hanging obstinately at southward and eastward.

Oct. 23. Lat. 16° 08′ N.; long. 40° 09′ W. Temperature of air, 84°; of water, 82. Winds: E. by N., E. by N., east. Moderate breezes and pleasant; all sail set.

Oct. 24. Lat. 14° 17′ N.; long. 39° 00′ W. Temperature of air, 83°; of water, 82½°. Winds: E., E., E. by S. Moderate breezes and pleasant; all sail set.

Oct. 25. Lat. 12° 22′ N.; long. 38° 55′ W. Temperature of air, 85°; of water, 82°. Winds: E. S. E., E. S. E., S. E. First part, fresh breezes, E. S. E., with squalls; middle and latter part, moderate, winds baffling from S. W. to E.; tacked to make easting when opportunity offers; appearances of strong current; heavy tide rips.

Oct. 26. Lat. 12° 12′ N.; long. 38° 55′ W. Temperature of air, 84°; of water, 82°. Winds: calm, calm, S. E. First and middle parts, calm; latter part, light airs from S. E. to N.; 11 to 12, heavy rain.

Oct. 27. Lat. 11° 31′ N.; long. 38° 30′ W. Temperature of air, 83°; of water, 83°. Winds: east, E. S. E., E. by S. Light baffling airs from E. N. E. to S. E.; pleasant weather; very heavy tide rips, more so than I have ever seen in the Atlantic, equal to the rippling on George's Bank, yet I have not experienced any current about here.

Oct. 28. Lat. 10° 05′ N.; long. 37° 45′ W. Temperature of air, 86°; of water, 84°. Winds: E. S. E., E. by S., S. E. Fresh breezes and pleasant; middle and latter, baffling airs from E. N. E to S. E.; heavy tide rips. Barque steering north. Air, E. N. E. Current, 15 miles during last 24 hours.

Oct. 29. Lat. 8° 11′ N.; long. 36° 29′ W. Temperature of air, 86°; of water, 84°. Winds: E. by N.,

E. by N., E. by S. Fine breezes and pleasant, with occasional light squalls of rain; 25 miles easterly current.

Oct. 30. Lat. 7° 17′ N.; long. 35° 58′ W. Temperature of air, 85°; of water, 84°. Winds: E., E. S. E., S. E. First and middle part, light variable winds; latter part, fresh breezes, heavy appearances.

Oct. 31. Lat. 5° 31′ N.; long. 36° 12′ W. Temperature of air, 85°; of water, 84°. Winds: E. S. E., S. E., S. E. First part, fresh breezes; middle and latter, baffling from E. to S.; had rain squalls.

Nov. 1. Lat. 5° 07′ N.; long. 35° 09′ W. Temperature of air, 84°; of water, 84°. Winds: E., E. by S., E.; light variable winds, from E. to S. E. with squalls; tacked several times, to take advantage of starts of wind, having had very bad chances to make easting when I wished, not getting any N. E. trade.

Nov. 2. Lat. 3° 12′ N.; long. 34° 35′ W. Temperature of air, 84°; of water, 82°. Winds: E. S. E., E. N. E., S. E.; light breezes and pleasant, from E. S. E. to S. E.; tacked three times, to make slants to the east. I have had 120 miles easterly current between lat. 11° 30′ and 3° N. in five days. Here, I should recommend a vessel to make her easting, in case the S. E. trades reach as far north as this parallel, as they have with me. I shall stand on for Cape St. Roque, rather than tack back to the N. and E.

Nov. 3. Lat. 2° 07′ N.; long. 35° 08′ W. Temperature of air, 83°; of water, 82°. Winds: E. S. E., S. E., S. E.; light winds and squalls; find it very difficult to make easting, unless making too much northing, having had no chance for a slant. The most unfavorable chance I ever saw.

Nov. 4. Lat. 00° 12′ S.; long. 35° 45′ W. Temperature of air, 82°; of water, 82°. Wind: S. E.; fresh breezes and clear. I have availed myself of every opportunity to make easting, since I first entered the region of the N. E. trade-winds, but have found none—a very singular occurrence; have very unwillingly crossed the equator in 35° 45′. Shall stand on for the land, unless I am favored with a slant; shall evidently fetch to leeward of Cape St. Roque; this I expected when I found the N. E. trades to fail me. If I fall to leeward of Cape St. Roque, it will not be the fault of Lieut. Maury, unless he can govern the elements; this we do not look for him to do; although the great improvements for navigators that he has been so attentive to, is indeed wonderful. No current.

Nov. 5. Lat. 2° 35′ S.; long. 35° 51′ W. Temperature of air, 80°; of water, 82°. Winds: S. E., S. E. by E., E. by S.; fresh breezes and pleasant; standing on for the land.

Nov. 6. Lat. 4° 48′ S.; long. 36° 08′ W. Temperature of air, 82°; of water, 78°. Winds: E. S. E., E. by S., E. by S.; fresh breezes, and clear. At 11 A. M. the water discolored; at 11 hours 30 min. saw the land 60 miles to the leeward of Cape St. Roque; meridian, on the reef; saw breakers ½ mile distant to S. W.; tacked off the land; the land here is low and sandy; but there is no danger with a good lookout; you can always tell by the water, as it becomes *white* as you near the Bank. A barque in sight, standing in.

Nov. 7. Lat. 4° 09′ S.; long. 35° 07′ W. Temperature of air, 82°; of water, 80°. Winds: S. E. by S., S. E., S. S. E. Fine breezes and pleasant; middle and latter part moderate. At 6 A. M. tacked to the southward. This is the first chance I have had to make a start to the eastward, for fifteen days.

Nov. 8. Lat. 5° 11′ S.; long. 35° 15′ W. Temperature of air, 83°; of water, 81½°. Winds: S. E.,

S. E. by E., S. E. First part, moderate breezes; middle and latter part, fine breezes and clear. At 5 P. M. tacked to the E. N. E. two hours; tacked to the southward, stood five hours; stood E. N. E. four hours; tacked to, eight hours. At 11 hours 30 min. A. M. water discolored; stood in to ten fathoms; saw the land, Point Calcanhar, bearing W. by N. 6 miles; found no difficulty in making to windward. Current, half mile, W. N. W.

Nov. 9. Lat. 5° 52′ S.; long. 35° 05′. Temperature of air, 84°; of water, 80°. Wind: S. E. Fresh breezes and pleasant; high sea from S. E.; standing off and on in shore; working along the coast; find the sounding quite regular, from 7 to 12 fathoms; reef showing very plain; little or no current about here.

Nov. 10. Lat. 6° 35′ S.; long. 35° 05′ W. Temperature of air, 84°; of water, 80°. Winds: S., S. S. E., S. E. by S. Fresh breezes and pleasant; working all along the coast. This has been a very unfavorable chance for any vessel to work up the coast; notwithstanding, I have made as much headway as I could have expected to, on the coast of North America; and I would also say that one need not fear Cape St. Roque, unless it is much different from what I found it. I shall always aim to cross the equator west of 31°, being sure that there is but little current about this cape.

Nov. 11. Lat. 6° 41′ S.; long. 34° 00′. Temperature of air, 85°; of water, 80°. Winds: S. S. E., S. E., S. S. E. Fresh breezes and fine weather. Working up the coast; wind obstinate at S. S. E, and S. E.

Nov. 12. Lat. 7° 56′ S.; long. 34° 27′ W. Temperature of air, 83°; of water, 80°. Winds: S. E., S. E., S. E. by S. Light breezes and fine weather. Saw several catamarans. Land in sight, off Pernambuco. This is the sixth day since I first made the land sixty miles to leeward of Cape St. Roque; have worked nearly dead to windward.

[Up to this time she had had the winds from the westward, principally from the northward and westward. She did not take sufficient advantage of them, and therefore crossed the equator farther to the westward than it is desirable to do. Nevertheless, her abstract proves that, by crossing as far west as 36°, one is not hopelessly to leeward.

It is very easy, after one sees how the winds have been, to say what the course should have been. But I hope navigators will not regard my critiques upon their tracks ever in an offensive light. We must profit each by the experience of others; and, though Captain Crowell did keep to the west of the track prescribed, it does not, therefore, follow that he is to blame. Whether the navigator be to blame or not, is no concern of mine. It is my aim to give sailing directions, and to lay them down so clearly that all who will, may understand them. And I know no better way of doing this than by making examples teach by the experience which others are kind enough to spread before me.

Though Captain Crowell did "stick her away south" sooner than in my judgment it was advisable, yet he had no cause to regret it. He gained upon the old route some ten or fifteen days, and in a week afterwards he was running off with topmast studding-sails set, with Cape St. Roque a long way off under his lee.]

Ship Capitol (Gorham), Richmond, to San Francisco, 16 days out.

Nov. 4, 1852. Lat. 19° 36′ N.; long. 34° 53′ W. Squally, E., S. E.

Nov. 5. Lat. 17° 16′ N.; long. 33° 55′ W. Moderate breezes, E. by S.

Nov. 6. Lat. 14° 54′ N.; long. 33° 08′ W. Moderate breezes, E.

Nov. 7. Lat. 12° 34′ N.; long. 32° 20′ W. Fresh breezes, E. by S.

Nov. 8. Lat. 10° 06′ N.; long. 31° 10′ W. Squally, E., E. N. E., N. E.

Nov. 9. Lat. 8° 04′ N.; long. 30° 38′ W. Squally, with rain, E., S. E., E.

Nov. 10. Lat. 7° 35′ N.; long. 29° 58′ W. Squally with rain, E., S. E., E. by S.

Nov. 11. Lat. 6° 39′ N.; long. 29° 30′ W. Squally with rain, S. E., E. S. E., E. N. E.

Nov. 12. Lat. 5° 29′ N.; long. 29° 04′ W. Squally with rain, N. E., E., S. E.

Nov. 13. Lat. 4° 51′ N.; long. 28° 52′ W. Light and baffling, S. S. E., N. E., S. E.

Nov. 14. Lat. 3° 45′ N.; long. 28° 50′ W. Squally, S. E., E., N. E.

Nov. 15. Lat. 2° 47′ N.; long. 29° 35′ W. Squally, S. E., E. N. E., E. N. E.

Nov. 16. Lat. 2° 31′ N.; long. 30° 00′ W. Calm and rain squalls, baffling airs.

Nov. 17. Lat. 1° 01′ N.; long. 30° 15′ W. Moderate breezes, S. S. W., S. E. by E., E.

Nov. 18. Lat. 1° 18′ S.; long. 31° 16′ W. Moderate breezes, S. E.

Nov. 19. Lat. 3° 49′ S.; long. 32° 16′ W. Moderate breezes, S. E.

Nov. 20. Lat. 6° 37′ S.; long. 33° 19′ W. Moderate breezes, S. E.

Ship George Raynes, Boston to San Francisco, twenty-two days out.

Nov. 4. Lat. 22° 00′ N.; long. 27° 18′ W. Winds: E. N. E., E., E. by S. First part, squally; latter part, moderate breezes.

Nov. 5. Lat. 18° 15′ N.; long. 26° 50′ W. Wind: E. Fine weather.

Nov. 6. Lat. 15° 58′ N.; long. 26° 40′ W. Wind: E. Pleasant breezes.

Nov. 7. Lat. 13° 06′ N.; long. 26° 40′ W. Wind: E. Pleasant breezes.

Nov. 8. Lat. 10° 15′ N.; long. 26° 24′ W. Winds: E., E. N. E., E. N. E. During the night, sharp lightning to S. E.; at noon, wind hauled to S. E. in a squall.

Nov. 9. Lat. 8° 30′ N.; long. 26° 20′ W. Winds: E. S. E., S. E., E. S. E. Begins with moderate breezes; middle part, squally. Ends light breezes.

Nov. 10. Lat. 7° 34′ N.; long. 26° 44′ W. Winds: S. S. E., calm, E. First part, light airs; middle, calm; latter part, light airs.

Nov. 11. Lat. 6° 32′ N.; long. 26° 36′ W. Winds: E., E. N. E. Light airs and calms; considerable lightning in S. and N. E.

Nov. 12. Lat. 5° 26′ N.; long. 26° 48′ W. Winds: E., E. S. E., calm. Begins calm with rain; at 8 P. M. wind hauled in, squall to S. E. Ends calm.

Nov. 13. Lat. 4° 55′ N.; long. 27° 04′ W. Winds: E. S. E., S. S E., calm. Light airs.

Nov. 14. Lat. 3° 27′ N.; long. 27° 18′ W. Winds: E.S.E., S.E. First part, squally; middle, light breezes; latter, moderate breezes.

Nov. 15. Lat. 2° 07′ N.; long. 28° 00′ W. Winds: S.E. by S. Moderate breezes and squally.

Nov. 16. Lat. 1° 15′ S.; long. 28° 42′ W. Winds: S., S.S.E. Light breezes.

Nov. 17. Lat. 0° 02′ S.; long. 29° 00′ W. Winds: S.S.E., S.E. Moderate breezes and fine weather.

Nov. 18. Lat. 2° 06′ S.; long. 29° 24′ W. Winds: S.E., E.S.E., S.E. by E. Steady breezes.

Nov. 19. Lat. 4° 44′ S.; long. 30° 55′ W. Winds: S.E. by E., S.E. Steady breezes.

Nov. 20. Lat. 7° 40′ S.; long. 31° 50′ W. Winds: S.E., E.S.E. Steady breezes.

Brig Georgiana (Chase), New York to Mozambique, eighteen days out.

Nov. 13, 1851. Lat. 20° 04′ N.; long. 31° 13′ W. Winds: S.W., S.S.W. Fresh breezes and fine weather.

Nov. 14. Lat. 19° 54′ N.; long. 29° 24′ W. Wind: S.S.W. Light breezes with fine clear weather.

Nov. 15. Lat. 18° 35′ N.; long. 29° 53′ W. Winds: S., S.S.W. Light airs and cloudy.

Nov. 16. Lat. 17° 52′ N.; long. 30° 25′ W. Winds: calm, S.S.W., calm. Cloudy weather.

Nov. 17. Lat. 15° 55′ N.; long. 30° 14′ W. Winds: S.S.W., S., S.E. First part, light; latter, fresh breezes.

Nov. 18. Lat. 13° 49′ N.; long. 29° 56′ W. Winds: S.E., E.S.E., E.S.E. Pleasant gales and fair.

Nov. 19. Lat. 10° 55′ N.; long. 29° 00′ W. Winds: E., E. by N. Fresh trades.

Nov. 20. Lat. 8° 26′ N.; long. 28° 04′ W. Winds: E.N.E., N.E. by E. Pleasant gales.

Nov. 21. Lat. 5° 39′ N.; long. 27° 05′ W. Wind: E.N.E. First part, fresh breezes and pleasant; latter part, light and squally.

Nov. 22. Lat. 4° 55′ N.; long. 27° 35′ W. Winds: S., W.S.W., S.W. Light and baffling airs; clear weather.

Nov. 23. Lat. 4° 01′ N.; long. 27° 20 W. Winds: S., S.S.W., W.S.W. Light baffling airs with heavy rain squalls.

Nov. 24. Lat. 2° 33′ N.; long. 28° 41′ W. Winds: S.E. by E., S.E. Strong breezes; very heavy squalls.

Nov. 25. Lat. 0° 10′ N.; long. 29° 40′ W. Winds: S.S.E., S.E. by S. Fresh breezes and fine weather.

Nov. 26. Lat. 1° 35′ S.; long. 30° 35′ W. Wind: S.E. Fine breezes and pleasant.

Nov. 27. Lat. 4° 06′ S.; long. 30° 40 W. Wind: E.S.E. Weather pleasant.

Nov. 28. Lat. 6° 59′ S.; long. 30° 30′ W. Wind: E.S.E. Fresh breezes with squalls.

Flying Fish (E. E. Nickels), Boston to San Francisco, nine days out.

Nov. 15, 1851. Lat. 21° 27′ N.; long. 37° 29′ W. Winds: N.W. to S.W.; pleasant weather; all sail.

Nov. 16. Lat. 19° 00′ N.; long. 34° 36′ W. Winds: S. W.; changeable weather.

Nov. 17. Lat. 17° 24′ N.; long. 33° 38′ W. Winds: S. W. to S. S. E.; changeable weather; all sail.

Nov. 18. Lat. 16° 21′ N.; long. 34° 38′ W. Winds: S. to S. E., light; weather unsettled, rainy; all sail.

Nov. 19. Lat. 13° 14′ N.; long. 35° 10′ W. Winds: S. E. by E., moderate; pleasant, trade-like weather.

Nov. 20. Lat. 9° 50′ N.; long. 34° 00′ W. Wind: S. E. to E., brisk; pleasant weather; all sail; two weeks out; average, 213 miles per day.

Nov. 21. Lat. 6° 34′ N.; long. 31° 55′ W. Winds: E. by S. to E. by N.; changeable weather; some rain; all sail.

Nov. 22. Lat. 5° 02′ N.; long. 30° 45′ W. Winds: E. by S., S. to S. W. moderate; changeable weather; tacked twice; all sail.

Nov. 23. Lat. 4° 58′ N.; long. 30° 07′ W. Wind: southerly; light or calm; very pleasant; all sail.

Nov. 24. Lat. 2° 31′ N.; long. 30° 48′ W. Wind: S. E., brisk; changeable weather; all sail.

Nov. 25. Lat. 0° 24′ S.; long. 32° 04′ W. Wind: S. E.; pleasant; all sail; nineteen days to the line, averaging 196 miles. Saw two American ships bound home.

Nov. 26. Lat. 2° 40′ S.; long. 32° 30′ W. Moderate winds; weather changeable and showery; all sail.

Nov. 27. Lat. 5° 04′ S.; long. 32° 50′ W. Wind: E. S. E.; pleasant weather; all sail; passed Fernando de Noronha Islands; 190 miles average.

Nov. 28. Lat. 7° 14′ S.; long. 32° 44′ W. Wind: S. E., baffling, moderate; unsettled weather; all sail. Saw a ship bound to the northward.

Ship F. W. Brune (D. C. Landis), New York to California, eighteen days out.

Nov. 18, 1852. Lat. 19° 44′ N.; long. 35° 50′ W. Barometer, 30.05; temperature of air, 79°; of water, 80°. Winds: N. to N. N. E., N. E. to S. E., E. S. E. to E.; pleasant; light squalls with rain, and smooth sea; middle part, light easterly breeze; latter part, light easterly breeze and smooth sea. Have not seen the Sargosso this twenty-four hours. The barometer has been fluctuating for some days past, being down to 30.00 in the evening, and up to 30.05 in the morning, similar to the tide of the ocean. I have observed this before in the South Atlantic beyond the trade-winds, but never so much difference—not being more than $\frac{25}{100}$.

Nov. 19. Lat. 18° 22′ N.; long. 34° 49′ W. Variation, 12° 45′. Barometer, 30.25; temperature of air, 79°; of water, 80°. Winds: E., E., E. by S. Moderate breezes and pleasant weather. Has the appearance of a strong current by the tide rips, but did not observe any by the observations. Sea smooth.

Nov. 20. Lat. 16° 20′ N.; long. 34° 11′ W. Current, W. S. W., ½ knot per hour. Barometer, 30.25; temperature of air, 78°; of water, 81°. Winds: E. S. E., and E. to E. S. E. First and middle parts, moderate breeze and pleasant; latter, fresh breezes and head sea; strong tide rips similar to those in the neighborhood of George's Shoals.

Nov. 21. Lat. 14° 34′ N.; long. 32° 53′ W. No current. Barometer, 30.5; temperature of air, 80°; of water, 81°. Wind: E. Pleasant weather; large swell from S. E. Did not observe any current.

Nov. 22. Lat. 12° 40′ N.; long. 31° 15′ W. Current, west, ¾ of a knot per hour. Barometer, 30; temperature of air, 80°; of water, 81°. Winds: E. to E. N. E. First and middle parts, fresh breezes; calm and pleasant weather; heavy head sea; latter part, moderate and hazy.

Nov. 23. Lat. (D. R.) 11° 12′ N.; long. 30° W. Barometer, 29.95; temperature of air, 78°; of water, 80°. Winds: E., E., E. S. E. Moderate breezes and unpleasant weather; not so much swell; latter part, heavy dark appearance to the southward, and I think the trade-wind is done; which is certainly farther north than I ever lost them before at this season of the year, though I have been 5° farther east.

Nov. 24. Lat. 10° 5′ N.; long. 28° 50′ W. Barometer, 29.95; temperature of air, 78°; of water, 81°. Winds: E. to S. S. E., E. by N., E. First part, cloudy gloomy weather; light baffling breezes; middle, moderate and unsteady; latter, light and pleasant; some swell.

Nov. 25. Lat. 8° 20′ N.; long. 27° 12′ W. Current, N. W., ¾ knot per hour. Barometer, 29.95; temperature of air, 80°; of water, 81°. Winds: E. to E. N. E. Fine breezes and pleasant. Still looks as though we were in the middle of the trades; but I do not think they will remain with us much longer.

Nov. 26. Lat. (D. R.) 6° 45′ N.; long. (D. R.) 26° 12′ W. Barometer, 29.90; temperature of air, 80°; of water, 80. Winds: E., E., and S. First part, moderate and pleasant; ends, squally and baffling; a heavy turbulent swell.

Nov. 27. Lat. 6° 9′ N.; long. 26° 13′ W. Barometer, 29.90; temperature of air, 81°; of water, 81°. Winds: S. to E., S. to E., E. S. E. Squally weather, with baffling winds; heavy swell from the south.

Nov. 28. Lat. 5° 13′ N.; long. 26° 30′ W. Current, N. W., 1 knot per hour. Barometer, 29.95; temperature of air, 81°; of water, 81°. Winds: E. S. E. to S. S. E. Squally, with light baffling breezes; heavy swell from the south.

Nov. 29. Lat. (D. R.) 4° 23′ N.; long. (D. R.) 26° W. Barometer, 29.90; temperature of air, 81°; of water, 81°. Winds: S. S. E. to E. S. E. Light winds and squally; swell from S. E.

Nov. 30. Lat. (D. R.) 3° 38′ N.; long. (D. R.) 26° 30′ W. Barometer, 29.90; temperature of air 78°; of water, 82°. Winds: S. S. E. to E., S. S. E. to E., S. S. E. to E. S. E. Light baffling winds; squally and showery; heavy head swell.

Dec. 1. Lat. 2° 45′ N.; long. 27° 25′ W. Current, ½ knot, W. Barometer, 29.70; temperature of air, 78°; of water, 82°. Winds: S. S. E. to S. E. calm, S. by E. First part, light baffling airs; middle and latter, squally; heavy head swell.

Dec. 2. No observations. No current. Barometer, 29.90; temperature of air, 77°; of water, 82°. Winds: S., S., E. N. E. to E. S. E. Moderate breezes, and squally weather. Still heavy swell from S. E.

Dec. 3. Lat. 1° 27′ N.; long 27° 55′ W. Barometer, 29.9; temperature of air, 84; of water, 82. Winds: calms, and squalls, S. by E. First and middle parts, cloudy; squally weather; latter part more settled; a heavy head sea.

Dec. 4. Lat. 00° 44′ N.; long. 28° 13′ W. Current, 1 knot, W. N. W. Barometer, 29.95; temperature of air, 84°; of water, 82°. Winds: S., S. and S. by E. Moderate winds, and squally; the wind sometimes S. S. W.; pleasant weather; has the appearance of the trade-winds; God knows it is nearly time we had them; must have had a strong current to the westward, these three days past; heavy swell.

Dec. 5. Lat. 00° 56′ S.; long. 29° 20′ W. Current, ½ knot, W. N. W. Barometer, 29.95; temperature of air, 83°; of water, 79°. Winds: S. by E., S. S. E., S. S. E. Light breezes, and pleasant; large head swell.

Dec. 6. Lat. 2° 48′ S.; long. 30° 35′ W. Current, ½ knot, per hour, W. Barometer, 29.95; temperature of air, 83°; of water, 79°. Wind: S. S. E. Light winds, and pleasant weather; close by the wind: heavy head swell.

Dec. 7. Lat. 3° 30′ S.; long. 31° 40′ W. Current, 1 knot per hour, W. N. W. Barometer, 29.95; temperature of air, 82°; of water, 79°. Winds: S. by E., S. by E., S. S. E. Moderate and pleasant; some swell; the wind hanging far south. Latter part, squally appearances. Birds around.

Dec. 8. Lat. 5° 37′ S.; long. 31° 33′ W. Current, none. Barometer, 29.92; temperature of air, 82°; of water, 79°. Wind: S. E. by S. Moderate and pleasant; smooth sea.

Dec. 9. Lat. 8° 00′ S.; long. 32° 41′ W. Current, ¾ knot per hour, west. Barometer, 29.95; temperature of air, 83°; of water, 79°. Winds: S. E. by S., S. E., S. E. by E. Fine breezes and smooth sea.

Dec. 10. Lat. 10° 47′ S.; long. 33° 01′ W. No current. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: S. E. by E., S. E. by E., E. by S. Fine breezes and a smooth sea.

Dec. 11. Lat. 13° 56′ S.; long. 33° 20′ W. Current, ½ knot per hour, south. Barometer, 30.00; temperature of air, 80°; of water, 80°. Winds: S. E. by E., S. E. by E., E. Fine breezes. The barometer fluctuating $\frac{50}{100}$, which I never observed before in the heart of the trades. Smooth sea.

Danube, New York to San Francisco, twelve days out.

Nov. 25, 1852. Lat., at noon, 24° 29′ N.; long. 42° 16′ W. Barometer, 30.10; temperature of air, 71°; of water, 73°. Moderate breeze all round the compass, and very dark, no one hour from one point. Evidently a very strong current setting S. W. No part of the 24 hours has ship's head been to south of S. S. E. Sharp lightning at S. E. Observations of yesterday and to-day, good. Ship, when heading E. N. E and S. S. E, carrying strong starboard helm. Strong ripplings like tide rips. Large quantities of dead-looking brown gulf-weed; no fish; no birds. Heavy swell from N. W.; frequent rain squalls from W. S. W. to S. E. Current, 1 mile per hour, S. W.

Nov. 26. Lat. 24° 29′ N.; long. 40° 29′ W. Barometer, 30.10; temperature of air, 76°; of water, 76°. Winds: S. S. E., S. by E., S. Fresh breeze; close atmosphere; no lightning; trade-clouds; 19′ W. S. W., current. Observations good.

Nov. 27. Lat. 24° 49′ N.; long. 37° 27′ W. Barometer, 30.05; temperature of air, 75°; of water, 75°. Wind: S. by E. throughout the day. Fresh breeze; gulf-weed; flying fish; lead-colored clouds.

[This vessel was quite far enough to the eastward for her latitude; and had the wind been fair, she

could not have wished a better than a south course. She should have beat across this belt, and should have gone in search of a wind, instead of dallying along in this calm place waiting for a wind to come to her.]

Nov. 28. Lat. 25° 25′ N.; long. 35° 27′ W. Barometer, 30.05; temperature of air, 74°; of water, 74°. Winds: S. by E., S. by E., S. E. Hard, long, heavy squalls; double reefs. Much gulf-weed.

Nov. 29. Lat. 23° 49′ N.; long. 36° 40′ W. Barometer, 30.00; temperature of air, 75°; of water, 75°. Winds: S. E., S. S. E., S. E. Much lightning at S. E.; heavy, hard-looking weather. During the 24 hours, the wind has varied from S. to S. E. Alternate calms and hard squalls; gulf-weed in abundance. Flying-fish, but no birds.

Nov. 30°. Lat. ——; long. ——. Barometer, 30.00; temperature of air, 72°; of water, 75°. Winds: all around the compass; very dark; heaviest kind of thunder and lightning, and hard, steady rain, with frequent and sudden heavy squalls from S. E. to S. S. E., S., S. W., back to S. E., calm; then very heavy from N. W.; then N.; then E. N. E.; then N. E., with steady rain, heavy thunder, sharp chain lightning. This noon it blows a gale from N. E.; am now in hopes the weather will change; close reefs; have now had the winds from the south for thirteen days.

Dec. 1. Lat. 21° 34′ N.; long. 36° 04′ W. Barometer, 30.00; temperature of air, 74°; of water, 75°. Winds: N. E. to E., S. S. E., S. S. E.

Dec. 2. Lat. ——; long. ——. Barometer, 30.00; temperature of air, 75°; of water, 76°. Winds: S. S. E., S., S. Extremely dark and squally; barely see the lines to write in front of a four-paned window. The squalls have not been so heavy this 24 hours, as previously, although the rain continues unabated; no gulf-weed, no birds, and no observations; every appearance of a strong westerly current; almost impossible to keep dead reckoning, as the squalls run in all manner of ways.

Dec. 3. Lat. 21° 57′ N.; long. 34° 00′ W. Barometer, 30.05; temperature of air, 74°; of water, 76°. Winds: S., variable, S. W., S. S. E. Dark, inky-looking weather; the current has set to the westward, I should judge, full 1′ per hour.

Dec. 4. Lat. 21° 29′ N.; long. 33° 57′ W. Barometer, 30.00; temperature of air, 75°; of water, 76°. Winds: S., S. S. E., S. E., S. E., S. S. W., S. W. Variable.

Dec. 5. Lat. 20° 49′ N.; long. 35° 05′ W. Barometer, 30.00; temperature of air, 76°; of water, 76°; variable winds from S. to E.

Dec. 6. Lat. 20° 24′ N.; long. 35° 06′ W. Current, ½ knot per hour, W. by N. Barometer, 30.10; temperature of air, 75°; of water, 76. Winds: E., S. E., E.; very light airs, sometimes dead calm.

Dec. 7. Lat. 20° 20′ N.; long. 35° 06′ W. Barometer, 30.00; temperature of air, 75°; of water, 76°; calm.

Dec. 8. Lat. 17° 50′ N.; long. 34° 06′ W. Barometer, 30.10; temperature of air, 75°; of water, 76°. Winds: E. S. E., E., E. S. E.; trades at last; fine breeze.

Dec. 9. Lat. 16° 00′ N.; long. 33° 10′ W. Barometer, 30.10; temperature of air, 76°; of water, 76°. Winds: E. S. E., S., S. W., E. S. E.; gone again; clear trade looking westward.

Dec. 10. Lat. 12° 18′ N.; long. 32° 00′ W. Barometer, 30.00; temperature of air, 76°; of water, 76°. Winds: E., E. S. E., E. S. E.; fresh breeze.

Dec. 11. Lat. 7° 47′ N.; long. 32° 00′ W. Barometer, 30.00; temperature of air, 76°; of water, 76°. Wind: E. S. E. throughout; steady, fresh gale.

Dec. 12. Lat. 5° 47′ N.; long. 30° 00′ W. Barometer, 30.00; temperature of air, 76°; of water, 76°. Winds: E., E., E. N. E.; steady, fresh gale.

Dec. 13. Lat 4° 00′ N.; long. 29° 00′ W. Barometer, 29.90; temperature of air, 77°; of water, 78°. Winds: E. S. E., S. E. by E., S. E.; first part, fresh breeze; latter part, moderate.

Dec. 14. Lat. 2° 6′ N.; long. 29° 43′ W. Barometer, 29.90; temperature of air, 78°; of water, 78°. Winds: S. E., S. E. by S., S. E. by S.; first and middle parts, very moderate; last part, fine.

Dec. 15. Lat. 1° 10′ N.; long. 30° 27′ W. Barometer, 29.90; temperature of air, 76°; of water, 77°. Wind: S. S. E. throughout; will stand on if possible; wind inclines far to the S. but varies to S. E. at times; much rain.

Dec. 16. Lat. 0° 57′ N.; long. 31° 00′ W. Current, 1¼ knot per hour, W. N. W. Barometer, 29.90; temperature of air, 76°; of water, 77°. Winds: S. S. E., S. E. by S., S. E. by S.

Dec. 17. Lat. 0° 10′ N.; long. 32° 00′ W. Current, 1½ knot per hour, W. N. W., ¼ W. Barometer, 29.90; temperature of air, 76°; of water, 76°. Wind: S. S. E. throughout. Very moderate; tacked to the eastward.

Dec. 18. Lat. 0° 8′ N.; long. 30° 00′ W. Current, 1¼ knots per hour, W. by N. Barometer, 30.00; temperature of air, 77°; of water, 76°. Winds: S. S. E., S. E., ½ E., S. E. ½ E. Moderate; fine weather; large sharks, flying-fish, albicore, nautilus.

Dec. 19. Lat. 0° 43′ N.; long. 29° 50′ W. Current, 38′ W. N. W. ¼ W. Barometer, 30.00; temperature of air, 77°; of water, 76°. Wind: very moderate from S. E. to S. S. E.

Dec. 20. Lat. 0° 50′ N.; long. 29° 08′ W. Current, 1⅙ knots per hour, W. ¾ N. Barometer, 30.00; temperature of air, 77°; of water, 76°. Winds: S. S. E. to S., S. to S. S. E., S. E. Tacked to the southward; very moderate weather.

Dec. 21. Lat. 1° 06′ S.; long. 29° 57′ W. Barometer, 29.90; temperature of air, 76°; of water, 76°. Wind: S. E. by S. throughout. Fine breeze.

Dec. 22. Lat. 3° 28′ S.; long. 30° 41′ W. Barometer, 29.90; temperature of air, 76°; of water, 76°. Wind: S. E. by S. throughout. A fine, steady breeze.

Dec. 23. Lat. 6° 02′ S.; long. 31° 26′ W. Barometer, 29.90; temperature of air, 76°; of water, 76°. Winds: S. E. by S., S. E. by S., S. E. by E. Fine, steady breeze. Boarded by U.S. frigate Raritan.

These tracks on the route to Rio, or Cape Horn, or Cape of Good Hope, are given, not so much for any light they themselves throw as to the passage, but because they serve, many of them at least, to illustrate the computed route of the tables; because they demonstrate the correctness of these routes, and because they serve, or ought to serve, to give navigators confidence in the Charts and the *Sailing Directions* based upon them.

In reviewing these tracks, one thing will not fail to arrest the attention of the navigator, and that is, the success with which the line may be crossed as far west as 32°. Seldom, indeed, has it occurred that any vessel, after crossing the line, upon that meridian, has experienced any difficulty in clearing St. Roque.

A new edition of the *Pilot Charts of the North Atlantic* is just out. The wind roses of these Charts, south of 30° N., are now nearly all pretty well filled up.

Vessels bound from Europe to ports beyond the equator, will be guided with fidelity by these Charts along the best routes, which for the most part is plain sailing. As a rule, it will be out of their way to come west of 25°, before they reach the doldrums. In them, they should beat across rather than steer E. S. E. or W. S. W., for any length of time along them.

They should also beat when necessary, and when not, stand due south, across the calm belt of the Horse Latitudes.

In these *Sailing Directions*, dull captains, and dull ships, are ignored. In crossing the calm belts and shaving ticklish points, such ships must crab it along as best they may, for I do not pretend to give any directions that are suited to them.

TIDE RIPS.

The appearance thus designated, is a ripple in the water, such as is seen in a tide way, or at the meeting of two currents. All the information that I have upon the subject, tends to show that, in these rips, there is no current, or, at least, none which can affect the ship.

These tide rips are met, most generally, about the region of the equatorial doldrums. They are occasionally seen in other parts of the ocean. But those to which I now refer particularly, are those which almost every vessel encounters near the equator, and which are so often mentioned in the preceding abstracts.

What produces this singular appearance so constantly in this part of the ocean? Vessels sail through these rips and feel no current. How would it be with a boat? for it appears to me that the motion in the water, which produces the appearance, is a horizontal, not a vertical, motion. If the former, the question comes up, can the trade-winds produce it?

On one side of this calm belt, near the borders of which these tide rips are seen, the S. E. trade-winds are perpetually blowing; on the other, the N. E.

Each of these systems of winds operating upon the ruffled surface of the ocean day after day, through a course of two or three thousand miles, has the tendency to drive before it a gentle surface current, and to pile the water up, one on one side, the other on the other, in this calm belt, into which these two systems of winds are blowing.

We know that the wind, as is often seen, when long unbroken sheets of water are open to its sweeping force, is capable of piling the water up at one end of a long canal or pond.

After the water is so piled up, suppose the wind should suddenly go down, what would take place? Should we not expect to see the piled up water, and not that below it, running back as a thin surface current?

These two trade-winds blow at right angles with each other (N. E. and S. E.), and may not the tide

rips be caused by the accumulation of water which the S. E. trades are driving before them, meeting with what the N. E. trades are driving before them?

Some are, perhaps, so caused; others, it may be, are produced by the water which the two trade-winds have piled up or accumulated in this calm belt, breaking loose, as it were, now here, now there, and escaping as a rippling shallow current, running, as it were, on the top of the sea. The vast amount of rain water which falls within this belt, would assist, both to pile up and make lighter.

This view, I am aware, has some plausibility, but it wants confirmation, and the subject is quite interesting enough to commend itself to the attention of navigators.

In what direction do these tide rips appear to run? and though the ship may not feel any current in them, will a boat? and do chips or other light substances thrown overboard show any signs of a current?

Co-operators will remember that these rips have been the subject of special inquiry for abstract logs for years, and now that light is breaking in upon us with regard to them, it is hoped that attention will not sleep nor inquiry cease.

PLATES XI. AND XII.

The tracks with the arrows (Plates XI. and XII.), are the tracks which I have recommended, and the dotted tracks are some of the tracks which have actually been performed.

Now, suppose we had the tracks of a hundred ships, hence to Rio, all made in the month of January of different years; that in every instance and with every change of wind, each one of the ships making these tracks had been managed without a mistake—that they had in every instance steered the best course it was possible to steer—that when necessary to go about, each one had gone about exactly at the right moment; and, that whenever the wind came out ahead, they had, all of them, without exception, invariably gone off on the right tack; and that the tracks of these hundred vessels—no two of them having, let it be supposed, sailed in company—was projected on a chart before us. What should we have? We should probably have a hundred separate tracks, for it can scarcely be supposed that any two of them would coincide all the way. And the navigator with that chart before him, would have displayed before him, as clear as he has the sun at mid-day in a cloudless sky, the best route to Rio in the month of January.

Now, suppose that with these 100 tracks before us, we should wish to draw a line or describe a route, which should represent the mean average track of the entire 100 ships. We should then point to this track and say, this is the route pursued by these 100 vessels, and this, therefore, is the route for all vessels to take in the month of January; and when we should come to look at the January route thus recommended, we should find, probably, that not one of these 100 vessels had actually sailed, even for one mile, or for one foot, upon it; that they had crossed this mean path, now in this place, now in that; at one time from this side, and again from that. Under such circumstances, no right-minded mariner would hesitate for a moment about taking this route. But he would not attempt to describe, with the keel of his ship, the line that he had drawn on the Chart merely to designate the parts of the ocean through which she was to pass.

Now, this has been actually done with regard to the routes here recommended: they are the mean or average tracks, in some parts of the way, of 700 such vessels in a month; in other parts, only for 20, or whatever be the number of observations that could be procured.

It is true that, in the case of the Charts, I have not actually had 100 such unerring vessels to give me the mean or best average route for each month, but I have had what perhaps was better. I have had the direction of the wind in each district of the ocean given for 100 times and upwards for each month in different years; and when the navigator is told the direction whence the wind comes, he can tell as well what course he could have steered as though he had himself been there, and actually steered it.

I have, therefore, summed up all the winds and calms for each month in every district on the Pilot Chart, and calculated the chances of head winds, and of fair winds, for every point of the compass, through every such district. With these, I then proceed to determine, by mathematical discussion, the mean or average route, which, taking both calms, head winds, and increase of distance into account, should give on the average the shortest passage, in time, to the equator.

Of course, then, when a vessel comes to try the new route thus computed, and to project on the Chart the track she actually makes through the water from day to day, it is not to be expected, that the track so performed, will, when laid down, exactly overlay the one already projected on the Chart as her guide. There will be a general conformity between the two, but nothing like the actual coinciding of two lines.

These remarks are called forth by the fact, that some navigators appear to think that there is some sort of virtue in the black mark on the Chart, which represents any one of these routes—as the April route, for instance: if driven from the April route by head winds, one of these navigators, had he been in the Memnon, at *a* (Plate XI.), would have stood north to get her keel on the black mark for April; and again at *b*, he would have stood to the southward and westward to get upon the April track again.

Now, the Memnon at *a*, or at *b*, was in just as good a position as she would have been had she been "right upon the track." Her very clever master, therefore, did right; he conformed to the *Sailing Directions*, and was pursuing the route recommended, as closely and as well as though his track had fallen all the way, from *b* down to the equator, upon the line with the arrows, which is projected on the Chart to represent the April route.

The tracks of the vessels projected on Plate XI. and XII., have not been selected on account of their short passages; many other vessels have made passages shorter than these. I have taken them only for the purpose of illustration and demonstration.

In the conformity between the April route of the Chart, and the actual track of the Memnon, in crossing the calms of Cancer, the Charts show a sharp elbow thence to the equator. The Memnon, without intending to make this elbow, was forced by the winds to make it; and the *Sailing Directions* indicated that there probably would be an elbow here. The Memnon (Capt. Joseph R. Gordon), crossed the line in 19 days; she had no difficulty in clearing Cape St. Roque, and made a fine passage.

It was the same case with the Surprise (Captain P. Dumaresq); with the Seaman (Captain Joseph Myrick), and with the Dragon (Captain Andrew), and with a host of others whom I am now (Dec. 1853)

able to quote. These had to the equator 22, 20, and 24 days respectively. And it is remarkable how the tracks of these vessels, and all others that have followed these *Sailing Directions*, have conformed in their windings and irregularities to the tracks of the Charts.

See the place at which all four of these vessels crossed the parallel of 5° N., to the place where they crossed the line; it is very nearly a direct south course, as represented by the tracks with the arrows, generally for winter and spring; and as before remarked, the lines which represent the tracks for these months do not represent the tracks which it is possible for one ship in 100 actually to make, but they represent the mean or average track, which 100 ships, sailed by navigators that never were wrong, would make.

Let us turn now to Plate XII., which is an illustration of the summer and fall routes:—

This is the season of the year in which short passages are the most difficult by any route, old or new.

Track *x* is the track of a ship that had the Charts on board. The captain of that ship, judging from the track that he made, evidently undertook to set up his "own experience" against the experience of the thousand of navigators who had gone before him, all of which the Charts held spread out before him.

The track of the brig Acasta is given as an illustration of an attempt often made to "split the difference" between the old and new route.

She sailed from Sag Harbor, September 20, 1850; went as far as 22° W., and crossed the line in long. 26°—November 14—55 days. She got the doldrums in about 11° N., and they stuck by her for 15 days, and until she reached 2° N.

The fragment of the track *w*, illustrates the case of a vessel that attempted the new route, and abandoned it when she fell in with the equatorial doldrums in 11° N.—September 25, 1850. She was going on very well, but here she met the southerly monsoons which the Charts warned her of at this season of the year. The wind came out S. S. W., and she went on fanning to the eastward and to *leeward*. From this place, it took her 16 days to reach the line.

Such cases as these are common—the errors are generally committed by standing too much towards the old track.

Sometimes, though rarely, vessels make mistakes by going on the other extreme. I find an example of this sort in the case of the U. S. ship Vincennes, Commander Hudson, on a voyage from New York to Rio, in 1849.

She had the *Wind and Current Charts* on board, and claims to have taken them for her guide. But I have not been able to reconcile the course pursued by her with the route recommended.

The Vincennes beautifully proves the correctness of the Charts; her track conforms in its general direction to the track of the Charts, but it is too far off. Any one who will examine the log of that ship—her track, and my *Sailing Directions*—will see that it would be just about as reasonable for that ship to have gone over to the Cape de Verdes (which would have been not quite as far on the other extreme), and then, meeting with a long passage of 60 days, to ascribe it to the Charts. The ship whose track I have marked *x*, might, with the same propriety, ascribe her long passage to the Charts also.

Navigators often follow the new route bravely, until they get into the equatorial calms; here their

heart seems to fail them, and they bolt at the very time when they should stick more closely to their guide.

The region which these calms usually include is in the shape of a wedge; it shifts about, but Plates XI. and XII. show its mean place at the four seasons. In each season, it is sometimes above and sometimes below the place assigned it on the Chart. But I have drawn it there to show navigators how they mistake, when being as far west even as 31° or 32°, they fall into these calms, and think of making longitude by fanning along to the eastward or an E. N. E. or perhaps a N. E. course. The farther they go on such occasions, the broader grows the belt, and the greater becomes the difficulty of getting across it.

I have projected on Plate XII., by a dotted line, the track of a ship, and marked it *y*, as an illustration of bad management under such circumstances, though it is by no means an extreme case. This ship had 40 days to the line, took the new route, and followed it bravely until she reached the equatorial calms, in longitude 29°. She was then far enough to the eastward, and should not have been afraid to cross the line as far west as 32°. But instead of proceeding to make the best of her way across this belt where it was narrow, and where two or three days at most would have sufficed for crossing it, she proceeded to flap along to the eastward as far as 21°; and thus, in consequence of the monsoons, found herself to *leeward.* When at *h*, that ship should, instead of making about an E. by S. course, have stood on the other tack, making the best of her way south, and not caring to get east of 30°. She might have been content to keep herself between 29°, or 30° and 31° or 32°, while she crossed these calms.

I have not yet found a single case in which there has been, after crossing the line as far as 32°, the least difficulty in clearing St. Roque. Navigators should not hesitate, if they are pinched, to go inside of Fernando de Noronha. But in doing that, they should take care not to run foul of the Rocas, lat. 3° 51′ S.; long. 33° 49′ W. These shoals were carefully surveyed by Lt. S. P. Lee, U. S. brig Dolphin. I have the track of one vessel that dashed on, crossed the line in 41° the 19th day out, and on the 32d day was south of the parallel of Rio. This, though, was in the winter and spring, when vessels can afford to keep to the westward, and it was going further west than I should advise.

But suppose a vessel to cross in 32° or 33°, and to get the S. E. trades at S. E. By standing on S. S. W., she keeps herself in a position in which any change of wind is favorable. If it haul to the eastward, she can lay up and clear the land; if it haul to the southward, she can go about and make easting, and get along rapidly by stretches upon long and short legs.

The current so much dreaded off St. Roque is a good deal of a bugbear. Navigators have been frightened at this current ever since some transports were cast ashore by it, some time in the last century. But it should be borne in mind that it was quite as much of an undertaking for the clumsy transport-built ships of England in the last century, to contend against a current of one knot, as it is now for one of our first-rate sailing clipper-built ships, to contend with one of 4 or 5 knots.

The log-book of the Celia, quoted in the 3d edition of this work, is an example. It would have been impossible for that ship to beat against a one-knot current. In the days of this wreck, the passage from England to India averaged nine months. Warren Hastings, when he went out, was 10 months on the way.

The passage is now often made by our ships in less than 3 months. Therefore, the ships of those days might be well cautioned against currents as dangerous, which the ships of the present day would scarcely regard.

Now, my investigations show that there is rarely off Cape St. Roque, and in the fair way from the equator south, either a sweeping or a horsing current. Indeed, many accurate and close observers pass there without reporting any current at all; and though navigators should always be on the look-out for a current there, and should always make allowance for one that is to set them on the land, yet when they do encounter a current there, they may be assured that, as a general rule, it is neither difficult to overcome, nor dangerous on account of its set.

For the guidance of navigators who follow the new route, and are pinched in clearing St. Roque, as they no doubt will occasionally be, I repeat the following suggestions:—

From the line, in longitude 33°, Cape St. Roque bears S. S. W. From this crossing-place, in a smart ship, that will fetch where she looks, a S. E. wind all the way from the line would just prevent the vessel from clearing. But the chances are more than a hundred to one that the wind will not hang steadily at S. E. all the way from the line to St. Roque. If it haul to E. S. E. you can lay up and clear. If it haul to S. S. E. you can put about, and make easting.

But suppose the wind holds steadily at S. E. or at any other point which will prevent you from clearing the cape; draw a line from your place on the Chart to the cape, and avoid falling to the west of that line, by taking advantage of slants, or by beating, accordingly as you may have the wind, and making long and short stretches. I quote the case of the Stag Hound as an example.

Captain Richardson to Lieutenant M. F. Maury.

"SAN FRANCISCO, *June* 12, 1851.

"Herewith I send you abstract of ship Stag Hound's passage from New York to San Francisco, stopping at Valparaiso. Our passage from New York to Valparaiso was sixty-six days; from Valparaiso to San Francisco was forty-two days—nearly all the way light trades: S. E. and N. E.

"Six days out from New York, broke off main topmast, and that in its fall took all three topgallant masts. Soon after took a W. S. W. and west gale—run the ship dead before the sea and wind; in consequence of this, crossed the equator in about longitude 28° 30′ W. in twenty-one days from New York. Losing topmast, we had no main topsail in the ship for nine days, and no topgallant sails for twelve days; had we not met with this accident, I think we should have been down to the line in sixteen days.

"In latitude 4° N. the N. E. trades left us, then baffling down to latitude 2° N. Then took the wind at S. S. E. and S. E. until near the coast of Brazil, when the wind hauled, so we did not have to make a tack; presume, had we crossed in longitude 30° W., we should have fetched along the coast."

This letter of Captain Richardson is quoted as an illustration of what I have endeavored to impress

upon navigators, with regard to their course, after crossing the line well to the westward, and when it appears to be touch and go, as to clearing St. Roque, viz: stand boldly on, and take advantage of slants and short legs to make long ones.

I received the abstract of another vessel about the same time that crossed in 31°, and I notice in the remarks, after crossing the line—"back-strapped"—"no chance of weathering Cape St. Roque"—"shall evidently fall to leeward," "bad luck," &c. Yet this desponding navigator stood boldly on, took advantage of a slant, stood off for eight hours, went past St. Roque like a shot, and the thirty-second day out from New York crossed the parallel of Rio.

Mistakes in the route to Rio are, I am happy to say, becoming much less frequent. The Charts are evidently much better understood now than they were formerly. Since the last edition of these *Sailing Directions* went to press, no such mistake as that of the Vincennes has come to my knowledge.

With a view of contrasting the passages of the new route, Lieutenant Minor has, at my request, taken the logs of all the vessels that have come to hand between the publication of the fourth edition, and the going to press with the sixth edition of this work, and from them tabulated the passages to the equator, and thence to clearing Cape St. Roque.

The old route is nearly broken up. It is now rarely attempted. But occasionally vessels evidently aim to "split the difference" between the *old route* and the *new*, by steering a sort of middle course between them. This I have called the MIDDLE ROUTE.

Many of the vessels which take this middle route, evidently set out with the intention of trying the new route, but they get a little pinched; or the winds are too favorable; or the dread of that bugbear off Cape St. Roque—a westwardly current—seizes them; or, through fear of falling to leeward, of getting back-strapped, &c., they go too far east and get delayed in the doldrums.

New Route Crossings.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
	JANUARY.									
Diadem	N. York, 1st	37°00′	28°00′	29°00′	28°00′	27°00′	27°00′	29°00′	38	42
Black Squall (barque)	Baltimore, 8th	40 00	39 00	38 00	36 00	36 00	30 00	27 16	24	27
Great Britain	N. York, 9th	36 00	37 00	36 00	35 00	33 00	29 00	30 00	27	30
Miantonomi (barque)	" 8th	45 00	44 00	44 00	41 00	40 00	38 00	30 23	39	43
A. Cheseborough	" 12th	47 50	44 00	41 00	37 30	35 00	30 15	31 20	29	32
Amelia	" 8th	39 00	36 00	34 30	33 30	31 30	28 30	30 40	29	31
Rattler	" 8th	37 45	41 00	39 30	38 00	36 00	33 00	31 50	25	27
Eagle*	" 7th	33 25	34 30	32 58	31 50	30 30	29 30	29 00	24	27
Tornado	" 11th	46 00	38 45	36 30	33 50	31 30	30 00	30 06	22	24
Celestial	" 8th	45 30	38 30	38 00	35 30	32 00	29 00	27 52	23	26
Esther May	Boston, 6th	36 30	39 45	38 00	36 00	32 40	30 20	30 20	28	31
Lucknow	" 15th	42 00	40 00	36 30	34 00	31 45	28 15	30 40	22	25
Golden Rover	" 30th	37 00	35 15	30 45	30 45	30 30	29 00	29 55	33	35
Phantom (barque)	" 6th	37 00	41 30	42 00	41 50	38 30	34 00	32 40	25	27
Susquehanna	Philad., 12th	41 40	39 00	36 40	33 36	31 30	29 00	28 00	30	34
Phantom (barque)	Baltim'e, 31st	44 00	44 50	39 00	34 20	34 30	31 20	29 45	31	34
Means		40 22	38 43	37 37	35 03	33 08	30 22	29 56	28	31
Means of the best six		40 17	39 02	37 35	35 58	33 22	30 34	30 21	23.5	26
	FEBRUARY.									
Kate Hays	N. York, 3d	49 00	42 00	38 00	34 00	30 00	29 00	28 40	29	33
Isabelita Hyne (barque)	" 5th	55 30	53 00	51 00	49 00	45 00	38 00	33 20	22	25
Wallace (barque)	Boston, 6th	44 00	43 00	39 00	35 00	31 00	29 00	29 25	38	43
Francis	N. York, 12th	53 00	39 00	39 00	38 00	34 00	30 00	29 00	38	43
Eastern State	" 13th	39 00	36 00	33 00	30 00	30 00	29 00	29 30	24	27
Sacramento (brig)	" 21st	42 00	40 00	39 00	36 00	31 00	26 00	27 00	30	33
Maria	" 21st	47 00	41 00	38 00	34 00	31 00	29 00	29 00	21	24
Ariel	" 24th	38 00	34 00	32 00	30 00	29 00	28 00	27 20	32	35
Tornado	" 23d	47 00	40 00	38 00	35 00	32 00	30 00	28 48	28	31
New York	" 20th	45 30	43 10	40 00	35 30	31 45	28 45	28 30	24	28
Sea Serpent	" 12th	50 30	43 49	39 45	36 45	33 45	30 45	30 20	20	22
Archer	" 20th	45 45	46 45	44 45	40 30	35 30	30 30	29 00	27	30
Stag Hound	" 24th	34 35	34 30	34 00	33 30	31 45	30 15	29 30	22	24
Swordfish	" 12th	39 00	37 00	36 00	34 10	32 30	30 15	29 08	23	26
Honqua	" 22d	44 10	43 00	39 50	35 27	32 30	30 15	29 10	27	30
Gov. Morton	" 8th	44 10	39 45	33 45	32 05	31 00	29 50	30 50	25	28
Paragon	" 8th	44 30	34 35	31 00	29 20	28 00	26 50	27 50	28	31
Sirocco	" 16th	39 45	35 15	33 10	31 10	28 45	28 20	28 05	25	32
Herculean	" 9th	44 00	37 45	35 30	33 20	31 30	29 00	28 00	27	31
Hampton	" 18th	37 40	36 45	34 00	31 00	29 20	29 00	29 30	32	36
Morgan Dix (barque)	Boston, 26th	43 00	38 51	36 45	34 45	32 20	30 00	31 10	24	28
Golden Rover	" 8th	37 00	35 15	30 45	31 00	30 45	29 00	29 55	25	27
Robt. Harding	" 23d	36 45	35 00	32 50	30 40	29 00	28 40	28 30	27	30
Marion	Philad., 4th	48 30	37 20	30 50	29 45	29 45	29 50	30 40	31	34
Petrel	" 24th	37 40	34 45	32 00	30 15	30 30	29 00	29 30	26	29
Hugh Birckhead	Baltim'e, 26th	45 50	41 45	40 45	35 30	31 40	30 30	29 37	23	26
Means		43 10	38 50	36 07	33 29	31 14	29 13	29 06	27.7	30.3
Means of the best six		44 15	40 53	38 37	36 14	34 00	31 12	30 08	22	24.7

* Forced to the eastward.

New Route Crossings—Continued.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
	MARCH.									
Stag Hound	N. York, 1st	40°00′	32°00′	32°00′	27°00′	27°00′	28°00′	28°00′	26	29
Michael Angelo . .	" 6th	48 00	38 00	33 00	30 00	28 00	25 00	23 30	26	32
Sarah Boyd	Philad., 9th	42 30	37 00	34 00	32 00	31 00	29 00	28 00	32	38
Sea Serpent	N. York, 10th	47 00	41 00	39 00	35 00	32 00	31 00	29 30	18	23
Parana	" 16th	36 00	31 00	30 00	29 00	28 00	28 00	28 15	24	26
Gov. Morton	" 12th	43 00	38 00	35 00	33 00	30 00	29 00	28 00	26	31
Candace (barque) . .	" 25th	45 00	43 00	42 00	41 00	38 00	32 00	30 10	30	32
Kedar (barque) . . .	Boston 27th	39 00	32 00	30 00	29 00	29 00	29 00	29 30	40	44
Golden Era (barque) .	N. York, 25th	40 00	38 00	38 20	34 45	31 30	28 30	26 20	38	41
Surprise	" 13th	49 00	43 10	41 50	40 00	36 22	32 00	30 00	20	22
Empress of the Seas .	" 13th	48 00	42 00	40 00	38 00	35 30	31 30	30 10	24	28
Seaman's Bride . . .	" 19th	44 00	37 20	36 40	34 30	32 10	29 45	29 05	23	25
Lantao	" 21st	43 00	40 00	39 00	36 30	32 45	30 00	29 45	24	27
R. C. Winthrop . .	Boston, 27th	40 02	35 00	33 30	31 30	30 43	29 07	27 30	26	31
Horsburgh	" 25th	46 30	40 40	38 30	36 00	33 30	29 45	29 20	24	27
Competitor	" 27th	36 08	33 00	32 00	31 40	30 00	28 20	28 45	24	27
Climax	" 28th	43 00	41 00	38 40	36 10	32 00	29 00	29 20	20	25
Parthian	Richm'd, 23d	43 30	37 00	35 00	33 00	31 10	29 30	29 40	22	26
Means		42 34	37 12	35 18	33 04	31 03	29 07	28 31	27	30
Means of the best six		44 55	39 55	38 21	35 51	32 44	30 12	29 32	21	24.7
	APRIL.									
Empire	N. York, 2d	40 00	34 00	35 00	35 00	32 00	29 00	28 40	26	30
Thos. B. Wales . . .	Boston, 7th	42 00	39 00	34 00	33 00	30 00	29 00	28 00	26	30
White Squall . . .	N. York, 10th	38 00	34 00	32 00	31 00	29 00	28 00	27 00	21	24
Nestorian	" 24th	36 00	34 00	35 00	33 00	30 00	27 00	29 32	31	35
Huma (barque)* . .	" 25th	59 00	54 00	51 00	46 00	43 00	39 00	37 10	40	48
Hazard (barque) . .	Boston, 27th	39 30	38 00	37 00	34 00	31 00	28 00	28 30	25	27
North American . .	N. York, 3d	54 00	42 00	36 00	34 00	35 00	30 00	27 00	26	30
Southerner (barque) .	" 22d	41 20	40 30	41 00	39 30	36 30	32 00	29 40	27	32
Swan (barque) . . .	Richm'd, 12th	38 10	36 30	34 45	33 00	30 45	29 00	30 45	25	27
Means		42 59	39 05	38 35	35 25	33 03	30 07	29 36	26	29.3
Means of the best six		39 50	37 00	35 34	34 15	31 32	29 10	28 46	25	28.3

* Fell to leeward; therefore is not included in the means which are intended to show the *best average* crossings.

New Route Crossings—Continued.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
	MAY.									
Staffordshire . . .	Boston, 3d	52°00′	50°00′	45°00′	42°00′	37°00′	32°00′	29°40′	25	28
Robert Wing (brig) .	" 6th	41 00	39 00	35 00	33 00	31 00	28 00	29 55	31	34
Equator	" 9th	43 00	39 00	38 00	38 00	36 00	33 00	31 02	43	46
F. Copeland (brig) . .	" 11th	43 30	39 00	36 00	34 00	32 00	29 00	32 00	37	40
Carioca	Philad., 13th	43 00	39 00	37 00	35 00	32 00	27 00	32 00	35	40
Sea Breeze	Boston, 15th	44 00	40 00	40 00	39 00	37 00	32 00	30 00	35	38
Isabelita Hyne (barque)	N. York, 21st	40 00	36 00	35 00	32 00	30 00	29 00	30 34	25	28
Albany	" 24th	39 00	37 00	35 00	33 00	30 00	27 00	27 30	42	45
Flying Cloud . . .	" 14th	42 50	37 30	35 20	34 00	32 30	31 30	33 41	29	31
N. B. Palmer . . .	" 2d	40 45	33 10	32 00	30 15	27 30	25 30	28 50	24	26
Eliza Mallory . . .	" 18th	41 00	37 20	34 45	32 20	30 00	27 30	31 00	32	36
Ottawa (barque). . .	" 6th	45 20	45 00	43 00	40 20	35 00	32 15	33 00	35	37
Audubon	Boston, 8th	42 30	39 50	38 00	36 00	33 43	32 00	31 53	24	28
Mary Maukin (sch'r)*	G. Town, 13th	33 00	32 10	32 30	31 00	29 15	28 15	30 15	32	36
Means		42 30	39 08	37 07	34 57	32 39	29 36	30 29	33.2	36.5
Means of the best five		43 37	39 25	37 04	34 51	32 12	30 00	30 55	25.5	28.2
	JUNE.									
Union	N. York, 2d	43 00	42 00	40 00	39 00	37 00	27 00	30 20	24	26
Flying Cloud . . .	" 3d	40 00	40 00	40 00	38 00	36 00	32 00	33 00	22	24
Russell (brig) . . .	Salem, 6th	35 00	33 00	32 00	29 00	27 00	23 00	28 00	32	35
Cohota	Boston, 17th	48 00	43 00	40 00	37 00	31 00	25 00	26 00	32	34
Valparaiso	N. York, 18th	35 30	35 00	35 00	32 00	31 00	27 00	31 41	34	37
Witch of the Wave .	Boston, 23d	51 00	50 00	49 00	47 00	44 00	38 00	33 25	27	32
Defiance	N. York, 26th	44 00	46 00	45 00	43 00	39 00	27 00	31 00	36	38
Miantonomi (barque) .	" 28th	45 00	43 00	41 00	40 00	36 00	26 00	32 13	36	40
Helena*	" 10th	34 40	33 30	33 20	32 15	31 20	29 10	31 50	25	29
Messenger	" 1st	43 30	41 42	39 30	38 00	33 20	27 00	31 54	24	26
Means		41 58	40 43	39 29	37 31	34 34	28 07	30 57	29.2	32.1
Means of the best five		42 26	41 14	40 22	38 51	36 20	31 38	32 05	24.4	25.4

* Forced to eastward.

New Route Crossings—Continued.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
	JULY.									
Mermaid (barque) . .	N. York, 2d	52°00′	52°00′	50°00′	46°00′	43°00′	30°00′	34°00′	33	37
Telegraph	" 13th	50 00	48 00	46 00	43 00	39 00	26 30	29 00	33	35
Horatio	" 15th	39 00	36 10	34 30	33 30	32 10	29 48	30 55	33	36
Hazard (barque) . .	" 16th	36 05	34 30	34 30	34 00	33 20	31 30	34 00	32	36
Wild Pigeon . . .	" 11th	48 30	38 00	36 20	35 30	32 50	30 30	33 30	33	37
John Gilpin	" 28th	35 50	34 10	33 30	32 50	31 15	29 40	31 00	25	27
Robert Wing (brig) .	" 29th	49 20	45 30	44 20	39 30	37 50	35 00	35 40	33	37
Georgiana (brig) . .	" 26th	46 00	40 00	30 30	30 00	28 45	27 30	29 50	31	34
Parana	" 2d	44 00	44 45	44 16	39 45	38 10	35 25	34 45	38	42
Capitol	Richm'd, 18th	44 00	37 30	35 00	33 08	31 00	29 00	30 15	30	33
Means		43 39	39 19	36 12	33 38	31 58	28 59	30 23	33	36.5
Means of the best six		41 49	38 23	35 40	34 24	32 33	28 59	30 50	30.6	33.5
	AUGUST.									
Raven	N. York, 1st	34 00*	34 00	34 00	34 00	33 00	26 00	31 00	33	35
Sea Witch	" 2d	47 00	45 00	41 00	28 00	35 00	26 00	27 00	28	30
Typhoon	" 3d	47 00	46 00	45 00	42 00	35 00	26 00	29 00	28	30
Seaman	" 3d	40 00	39 00	38 00	36 00	35 00	27 00	31 51	29	31
Winged Arrow . .	Boston, 5th	47 00	46 00	45 00	43 00	39 00	30 00	31 00	28	30
Raven	" 6th	44 00†	41 00	39 00	37 00	33 00	25 30	28 00	25	27
Cohota	" 11th	44 00†	41 00	39 00	36 00	29 00	28 00	24 00	29	32
Sovereign of the Seas	N. York, 14th	34 00	34 40	34 50	33 45	33 00	27 10	36 00	25	28
Sea Witch	" 23d	41 00	37 00	36 00	34 00	30 00	25 00	27 00	29	31
Oliver J. Hays . . .	" 29th	43 30	41 00	39 00	35 00	34 00	30 00	28 00	51	54
Seaman	" 3d	40 00	39 00	38 00	36 00	35 00	27 00	31 51	29	31
Means		41 57	40 20	39 00	37 07	34 00	26 57	29 52	30.5	32.8
Means of the best six		43 10	42 00	40 30	38 20	34 50	27 00	30 28	27.1	29.3
	SEPTEMBER.									
Senator Roland . . .	N. York, 12th	39 00	36 30	34 30	33 45	30 30	26 30	29 00	38	41
Realm	" 23d	42 00	32 30	32 00	31 20	31 00	28 10	30 45	43	45
John Wade	" 12th	40 25	37 30	35 00	34 51	32 00	28 00	29 00	32	34
Annie Buckram . .	" 26th	40 00	33 00	31 20	30 29	29 30	28 30	31 30	36	38
Revere	Boston, 15th	40 00	37 45	35 00	33 30	31 30	27 50	32 30	35	39
Eolus (barque) . . .	" 28th	37 30	34 45	32 15	31 00	28 45	27 15	30 20	38	40
Anstiss	Richm'd, 28th	57 00	47 50	40 20	37 45	34 00	26 00	29 00	45	48
A. F. Jenness . . .	Philad., 27th	40 45	39 20	38 30	37 30	36 00	27 30	30 30	77	80
Means		42 16	37 08	34 21	33 14	31 01	27 27	30 17	38	40.4
Means of the best five		39 30	35 54	33 37	32 43	30 27	27 37	30 28	35.8	38.4

* Winds forced her to go too far east.

† Got S. W. monsoon, and went unnecessarily too far east.

New Route Crossings—Continued.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
	OCTOBER.									
Comet	N. York, 2d	45°00′	41°00′	37°00′	35°00′	32°00′	29°00′	31°00′	25	27
Russell	" 3d	41 00	36 00	33 00	31 00	29 00	26 00	28 12	36	39
Miantonomi	" 3d	46 00*	46 00	45 00	41 00	41 00	37 00	34 00	47	51
Somerset	Boston, 4th	51 00	44 00	38 00	35 00	31 00	29 00	30 25	43	46
Wild Pigeon	N. York, 14th	40 00	36 00	32 00	31 00	32 00	28 00	28 00	27	29
Golden Gate	" 14th	40 00	36 00	32 00	32 00	32 00	27 00	28 00	27	29
Miguelon (barque)	Salem, 15th	48 00*	45 00	49 00	34 00	33 00	30 00	32 00	40	43
Helena	N. York, 30th	50 00	44 00	40 00	40 00	40 00	37 00	32 10	39	45
Means		44 30	39 20	35 20	34 40	33 10	32 40	29 38	32.8	35.8
Means of the best four		41 15	37 15	33 30	32 15	31 15	27 30	28 48	28.7	31
	NOVEMBER.									
Celestial	N. York, 2d	45 00	37 00	32 00	32 00	30 00	28 00	31.00	24	26
Newton	Boston, 7th	42 00	42 00	41 00	40 00	38 00	35 00	32.30	34	38
Flying-Fish	" 7th	49 00	42 00	36 00	35 00	34 00	30 00	32.00	19	21
R. C. Winthrop	" 8th	42 30	42 00	41 00	30 00	37 00	34 00	32.30	32	35
Swordfish	N. York, 12th	44 00	39 00	37 00	36 00	35 00	31 00	32.00	23	25
Horatio	" 18th	44 00	33 00	31 00	30 00	29 00	29 00	30 30	25	27
Esther May	Boston, 19th	35 00	32 00	33 00	33 00	32 00	31 00	31 00	27	31
Lucia Field (barque)	" 20th	37 00	34 00	31 00	30 00	29 00	28 00	31.00	31	34
Geo. Brown	Philad., 24th	41 00	35 00	32 00	30 00	28 00	28 00	29.00	29	34
Esther May	Boston, 19th	38 00	33 00	32 00	33 00	32 00	30 00	31 45	27	29
Uriel	N. York, 27th	45 00	39 00	36 00	33 00	31 00	29 00	30 00	26	30
Tuscany	" 28th	43 00	36 20	34 30	33 20	32 20	30 20	32.00	42	45
Contest	" 16th	48 00	37 46	36 00	35 30	33 00	29 56	31 00	27	29
Living Age	" 24th	42 50	40 00	35 00	32 00	28 40	26 00	28 30	29	32
Alboni	" 21st	46 00	39 30	37 50	35 30	32 45	32 00	32 20	26	28
Thos. Church	" 20th	48 00	37 00	34 00	32 00	29 00	26 00	29 40	29	32
Walter	" 29th	49 30	45 20	39 40	36 40	34 00	30 30	31 00	33	35
Danube	" 13th	50 00	36 00	35 06	32 40	32 00	29 30	29 20	37	40
Trade-Wind	" 13th	49 00	30 00	30 20	31 00	30 20	30 00	34 00	22	26
Tingqua	" 24th	43 00	40 00	39 25	37 45	33 50	31 20	32 00	20	23
Gray Feather	" 8th	38 30	34 40	35 40	35 00	32 30	29 00	32 00	32	34
Kentucky	Boston, 24th	46 30	39 25	36 34	34 50	33 00	30 20	32 45	24	27
Cygnet	" 3d	39 30	36 00	31 25	30 00	28 00	26 00	30 00	38	41
Telegraph	" 15th	49 00	40 00	34 40	34 30	31 45	30 00	32 00	27	29
Sophronia	Salem, 6th	40 30	41 12	41 10	39 00	36 40	32 20	30 20	32	35
Means		43 09	38 01	35 20	33 59	32 07	30 41	31 11	28.6	31.5
Means of the best six		45 40	36 50	34 17	33 27	32 01	29 53	30 55	22.2	24.7

* Not included in mean crossings, because she fell to leeward.

New Route Crossings—Continued.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
	DECEMBER.									
Southerner (barque) .	N. York, 1st	40°00′	41°00′	40°00′	38°00′	35°00′	32°00′	30°00′	38	42
Hazard	" 4th	45 00	41 00	39 00	38 00	35 00	32 00	32 00	21	24
Samuel Russell . . .	" 5th	53 00	46 00	43 00	41 00	36 00	32 00	30 00	19	20
Element	" 5th	44 00	42 00	39 00	36 00	33 00	31 00	31 00	22	24
Grafton (barque) . .	" 8th	35 00	31 00	33 00	32 00	32 00	30 00	29 00	29	31
Lantao	" 8th	44 00	41 00	41 00	41 00	37 00	31 00	29 00	30	32
St. Lawrence, U. S. frig'te	" 12th	42 00	39 00	36 00	35 00	33 00	30 00	31 00	31	34
Seaman's Bride . . .	" 12th	41 00	40 00	40 00	36 00	34 00	30 00	31 00	28	32
Portsmouth (U.S. ship)	Boston, 16th	36 00	39 00	38 00	38 00	36 00	33 00	31 00	26	30
Hurricane	N. York, 17th	45 00	42 00	41 00	40 00	38 00	34 00	34 00	27	30
Benjamin Howard . .	Boston, 25th	41 00	35 00	33 00	32 00	29 00	26 00	27 00	25	28
Pontiac	" 25th	43 00	38 00	36 00	35 00	32 00	30 00	30 00	23	27
Winged Racer . . .	N. York, 12th	39 00	36 00	34 30	32 00	30 00	28 15	31 00	22	24
Golden Gate	" 6th	46 14	40 30	37 00	35 10	33 30	31 20	33 56	20	23
John Holland . . .	" 1st	45 30	42 10	38 40	36 50	33 40	29 14	31 00	39	43
Storm (barque) . . .	" 21st	44 00	41 00	39 00	37 30	34 45	33 30	35 30	18	25
Golden West . . .	Boston, 13th	41 00	39 20	38 30	38 20	36 00	34 00	31 20	28	30
Dancing Feather (sch'r)	" 12th	53 00	47 30	43 00	38 51	34 30	30 00	30 42	33	35
John Bertram . . .	" 12th	49 30	45 20	44 00	38 13	36 45	31 00	29 30	27	29
Flying Childers . .	" 18th	49 30	47 30	43 30	41 00	36 40	32 30	30 40	23	25
Aldebaran	" 25th	39 20	36 20	36 10	32 50	29 15	26 10	28 00	37	40
Means		43 05	40 30	38 43	36 54	34 03	30 50	30 48	25.1	29.9
Means of the best six		45 57	42 10	39 15	37 06	33 59	31 16	32 01	20.5	23.5

Middle Route Crossings.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
Boston	Boston, Jan. 1st	32°00′*	28°00′	27°00′	26°00′	25°00′	23°00′	24°50′	27	31
Star of the Union	" " 28th	35 40	33 00	29 00	29 50	29 45	29 20	29 50	34	36
Wisconsin . .	N. York, " 20th	30 00*	30 30	31 00	31 00	28 00	27 00	28 11	25	28
Vandalia . . .	" " 20th	31 00*	29 30	27 00	26 30	26 30	26 00	28 00	37	41
St. Lawrence .	" Feb. 8th	31 30	29 30	28 00	28 30	28 15	28 00	28 00	36	41
Bark Emily . .	Philad., " 20th	33 00	31 30	30 40	29 40	28 40	28 30	28 40	30	34
M. Hawes . . .	N. York, " 22d	40 00†	32 00	30 00	27 00	26 30	26 00	26 18	35	41
Rose Standish .	" March 1st	33 00	29 00	28 00	27 00	26 30	26 00	27 00	27	30
Ariel	" " 10th	33 00	31 00	30 30	29 30	28 00	26 30	26 26	30	34
Harriet Hoxie .	" " 24th	30 00*	26 00	28 00	28 30	29 00	29 30	30 20	27	30
Queen of the East	" April 8th	31 00*	27 00	27 00	26 00	25 00	23 00	23 00	31	36
Thames . . .	Portland, " 24th	50 00†	42 00	38 00	33 00	30 00	25 00	26 08	41	44
Rome	N. York, " 26th	32 00*	30 00	30 00	29 00	26 00	25 00	26 00	43	46
Arthur Pickering	Salem, " 30th	38 00	36 00	36 00	33 00	29 00	26 30	27 50	36	39
Milton	Boston, May 15th	37 00	36 30	35 00	32 00	27 30	26 00	28 15	37	40
Lamartine . .	N. York, June 10th	34 00	32 00	31 30	31 00	29 00	26 00	28 49	33	37
Z. D.	" " 15th	39 00†	37 00	35 00	34 00	33 00	24 30	28 50	35	37
Sarah H. Snow .	Boston, " 23d	39 00†	36 00	33 00	31 00	29 00	23 00	27 00	38	42
Talbot	N. York " 27th	35 30	34 00	30 00	28 30	25 00	19 00	25 00	41	43
Thactus . . .	" " 29th	34 00	32 00	30 00	27 00	25 00	24 30	30 48	43	46
Plato	Boston, July 1st	40 00†	36 00	34 00	29 30	26 00	20 00	27 00	35	37
Wessacumcon .	" " 7th	41 00†	39 00	35 00	30 00	25 00	23 00	29 00	50	54
Eagle	N. York, " 11th	49 00†	47 30	46 30	44 30	44 00	23 00‡	28 00	33	35
Cohansey . . .	" " 20th	46 00†	43 00	40 00	37 00	34 00	24 30‡	28 56	35	38
John Wade . .	Boston, Sept. 5th	45 00	42 00	41 00	39 00	32 00	24 00	29 00	34	37
U. S. S. Relief .	N. York, " 27th	42 15	38 30	37 15	31 42	27 00	25 20	28 00	53	57
Lewis	Salem, Oct. 10th	37 00	33 00	30 00	27 00	26 00	25 00	28 00	34	37
Sartelle . . .	N. York, " 23d	39 00	28 00	29 00	28 00	27 00	24 00	26 55	43	46
Loo Choo . . .	Boston, Nov. 2d	35 30	35 00	35 00	33 00	30 00	27 00	30 00	34	37
Juniata . . .	Baltimore, " 23d	30 00	27 00	27 30	27 30	27 30	27 30	28 00	28	30
Europe	N. York, " 25th	37 00	30 00	28 00	26 00	25 30	25 30	26 22	32	35
John Stuart . .	" Dec. 9th	29 20	33 20	34 50	34 00	31 00	29 30	31 40	35	38

It will be seen, by consulting the crossing table, that the mean crossing-place on the equator, by the vessels of the new route, is in 30° 5′ west: that out of the 180 vessels there recorded, but three fell to leeward—two in October, and one in December. The two in October crossed 5° N. in 37° W.; a smart ship, we may therefore infer, need not fear to cross the line as far as 33° or 34° west, especially in the winter time.

Lieut. Kennedy, commanding the U. S. storeship Supply, on her recent voyage to Rio, mentions a striking instance of the advantage of sticking to the Charts, and conforming to the *Sailing Directions*. He crossed in the month of February, 34 days out, in long. 33° W. He was pinched, and made the land 7

* Should not have cared to make any more eastings than she could help, after this.

† Started on the new route, but abandoned it.

‡ Entered on the doldrums too far to the eastward.

miles to leeward of Cape St. Roque. He stood boldly on; took advantage of a slant, as recommended, and got by without any difficulty. The barque Polka, however, which was in company, stood off to the northward and eastward in order to get an offing, and pass to windward of the Island of Fernando de Noronha. This brig, though a better sailer than the Supply, did not arrive until several days after the Supply.*

The chief point of information as to the new route, appears now to be in the practical answer to this question: Which is the best way of crossing the "equatorial calms?" The region most liable to these calms is, as I have before explained, wedge-shaped, with the point of the wedge directed towards South America.

The winds in these calm regions are often from the southward and westward; indeed, as you approach the coast of Africa in summer and fall, these southwardly winds assume the character of a regular monsoon.

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* *Extracts from Log of the United States storeship Supply, Lieutenant C. H. Kennedy, commanding.*

January 6, 1850 (lat. 39° N.; long. 63° W); at 10 A. M. a whirlwind passed between our fore and mainmasts, doing no damage. At the same time, two others were observed, one on the port-beam, the other on the starboard quarter. Their formation was very sudden, giving no warning whatever of their approach; nor was the *force* or direction of the wind, which, at the time, was blowing fresh, in the least affected; the diameter of the one which passed between our masts was about ten feet, with a rotary velocity of about one hundred miles per hour, and a progressive velocity of about sixty or seventy miles per hour. The one on the port-beam was much larger, carrying with it large quantities of water, and moving with a higher velocity.

February 6, 1850 (lat. 1° 40′ N.; long. 32° W.); at 3 hours 30 min. a large and heavy whirlwind passed across our bow, about two hundred yards distant, with a very high velocity, and carrying with it large quantities of water.

The ship did not sail well during the first part of the passage, having been stored out of trim, and griping to such a degree that all the sails on her mizzen-mast were useless. I could not make any change in her trim by shifting weight from one extreme (a bad way at best) as every crack and crevice was crammed with stores, baggage, &c.

The first part of the passage was rough, and the southwesterly winds drove me far out of my track. I was at one time apprehensive of being forced in sight of the Cape de Verde Islands.

When the trade-winds north of the equator began to fail me, the weather became squally, and the wind light; though in general the squalls were of rain only.

On the 6th of February, however, we had some wind in them, and a violent whirlwind passed ahead of the ship about two hundred yards. It would have passed over the ship, had it not been met, and driven ahead of a squall.

I was forced across the line in long. 32° 50′ on the 7th of February. To avoid being back-strapped, I stood to the east for twelve hours between the 8th and 9th, and twenty-one and a half hours between the 10th and 11th; but I am now inclined to believe that I might have fetched past St. Roque by standing on. On the 11th, stood in for the land, and made it on the 12th at 2 P. M. At 3 hours 30 min. tacked ship in a half twelve; shells and gray sand mixed with coral, which was the general character of the soundings every time we got bottom. Stood off shore; 4 hours 45 min. tacked and laid up along the land, which was again made on the 13th; stood in to ten fathoms, and tacked at 2 hours 30 min. P. M. Cape Branco bearing, per compass, S. by W. ½ W., distant about thirty miles, and the land abeam, distant about eight miles. At 9 P. M. tacked again and laid well up along the land, which we did not again see till we made Cape Frio. The wind fanned us on both tacks, and when we "went about" the last time, we made a S. by E. compass course. Thus we cleared the land in two off-shore tacks, each of 5 hours 30 min., the current sweeping *along* or *off* shore. The distance run per log is six thousand five hundred and sixty-three miles. No vessel that sailed in January has yet arrived. We spoke the Green Point between 1° and 2° N., and 30° 54′ W., bound to Rio; she had sailed two days before us (January 1) from New York. We also saw the bark Polka standing in for the land on the afternoon of the 10th of February. We were on the opposite tack, having gone about to avoid the bight to the westward of St. Roque.

I have endeavored to obtain accurate information of the passages made in December, but the Register is so loosely kept that I can learn nothing more than the number of days of the voyage, not even the time of sailing or arrival, or the meridian on which they crossed the equator.

The place of these calms varies, too. It is sometimes at the equator; sometimes in 5°, 10°, or even in 15° north, according to the season of the year.

And the answer to the question, "How to cross them?" is this. Unless you are fearful of falling to leeward, or you are already too far to leeward, and want to make easting in the southwardly winds of the doldrums, do your best to make southing, for by that course you will clear them soonest. By that course you run directly across them; by an east or west course, you run along with them.

It appears, however, by these tables, that the average passages to the equator, by the new route, have been greatly reduced.

Moreover, by comparing the new route crossings with the "middle route," as the tracks made by those navigators who attempt to "split the difference" between the old route and the new are called, we shall see how much they lose: they lose on the average, during a portion of the year, a week or more, and several days at any season.

It will not escape the notice of men who study these tables as carefully as they ought to be studied, that from May to November, inclusive, vessels that go the new route cross the parallel of 5° N., farther to the eastward on the average, than they do the equator. The cause of this is obvious: it is owing to the monsoons of the doldrums. Hence, we deduce a rule which will apply to all months, and it is this: When you cross the parallel of 10° N. in 30°, or 31°, or 32° W. and can make a south course good, don't care to go any farther east. Of course, if you meet these southwest monsoons, as in the summer and fall you will sometimes do, even as far west as 32°, you will in that case be compelled to obey the winds, and make easting; but when you are east of 30° always prefer the tack that will give you most southing, because it will put you across the doldrums soonest; and if it bring you across no farther west than 31°, or even 32°, you may consider yourself in a good position, and clear of a region of light airs and baffling winds.

The average passage for the year by the "middle" route is 35 days; by the old it is 41; by the new 29. Thus, it will be perceived that those who attempt to "split the difference" between the old route and the new, split it as completely with regard to time as they do with regard to distance.

It is hoped that this exhibit, including everything that I have received with regard to the Rio passage, since the publication of the last edition of these *Sailing Directions*, will serve to convince the skeptical that these Charts are what they purport to be: *i. e.* the result of the experience of all the navigators, whose logs I could lay hand on for comparison, and that they are not based on *any* theory of *any* body.

Some vessels are put down on the middle route, which did not intend to take it. They were forced farther to the eastward, before crossing the horse latitudes, than they intended to go. They did the best they could; and might have been classed under the new route; for when winds are ahead, the "new route" expects the navigator to do the best he can, for head winds will now and then drive him broad off the track.

If the few passages that come under this category had been so classed, the contrast in favor of the new route would have been still more striking than it is.

There is a remarkable conformity between the average track by the crossing tables and the computed route, or what may, in some sort, be called the theoretical route; inasmuch as it was predicated on the Pilot Charts, and is the deduction entirely of figures and calculation.

Thus, the average crossing of the six vessels that made the best passages in February, were in reality—

Latitudes: 30°, 25°, 20°, 15°, 10°, 5°. Line, in longitude 44° 15′; 40° 53′; 38° 37′; 36° 14′; 34°; 31° 12′; 30° 8′ W. By table: 45° 40′; 37° 45′; 35° 35′; 33° 28′; 31° 23′; 31° 23′ W.

It appears from this, that the best average route which, according to the Pilot Charts, a vessel should take to reach the equator in February, deviates from the mean of the six best tracks that have been actually made, nowhere more than 75 miles.

Thus, we find that the routes of the tables have stood every test. The time it would take to make the passage by them was computed, entered in the tables, and recommended to navigators for adoption. Ships try the route, and find the time correct.

The distance to be sailed through the water, taking into the account the detour which a vessel under canvas must make on account of head winds, was calculated. Trial proves the tables surprisingly correct here too, for navigators have kept their run by the log, summed it up at the equator, turned to the computed distance to be sailed by the new route for that month, in the tables, and found the two agreeing in some cases within ten miles of each other, and seldom differing in any over a hundred. In a voyage of 4,000 or 5,000 miles, a steamer could not run closer to the actual distance than this.

But of all the tests to which these calculated routes were to be subjected, perhaps the severest one was that which related to the track which the vessel should make through the water—the path she was to follow over the ocean and to make these quick runs.

The winds had been tabulated, the currents had been considered, and taking into account these fickle elements, with such arguments as might be legitimately drawn from the doctrine of chances, the actual course which a vessel under all these influences would make from day to day on her destination was, like the path of a comet through the skies, made the subject of calculation, determined and announced.

Now, when we come to compare the mean track which, for any month, the vessels that have best fulfilled the requirements of the new route with the track of the tables, we find the two tracks identical. These tracks are quite as close together as would be the tracks of the individual vessels of a fleet attempting a voyage of such a length in company.

Thus, these Charts are bringing out the fact that there are, upon the broad ocean, great highways or turnpikes, if you please, almost as clearly marked out by the winds and the currents, as are the common highways of the earth, by marks upon the land.

There is another valuable piece of information which this table of crossings affords, and it is this: that from the line, in 34°, it seldom takes more than four days to clear Cape St. Roque; and, that in July, vessels are most apt to fall to leeward, so as to have to cross the line west of 32°.

Out of the ten whose crossings we have for that month, five crossed west of 32°; and each one of the five—though one of them, the Robert Wing, crossed in 35° 40′—had four days thence to St. Roque.

In January, there was no difficulty except with the Simoom, who split the difference by taking the old route for the first part of the voyage, the new for the last. She fell to leeward, crossed in 34° 45′, and was a week thence in clearing St. Roque.

Neither in February nor March was there a single miscarriage.

In April there was one, the Hazard. She crossed in 37°, and was eight days in clearing St. Roque.

In May, two crossed as far as 33°; but in two days they both got clear of St. Roque, notwithstanding the fabled mill-tail current around that headland, which needlessly makes so many navigators afraid.

There is a current there sometimes to the westward, but it is not a horsing current, or one which any smart ship need dread to encounter.

In June, two also cross as far as 33°, but one clears Cape St. Roque in two days; the other, in five. The latter, therefore, had some difficulty; but found it easily overcome.

In July, failures to cross as far east as 32° were common; but they only caused the loss of a day on the average; for three days from the old crossing to the parallel of St. Roque was a fair passage. And none of them was more than four.

In August and September no failures occurred.

In October, there was one crossing in 34°, and one other west of 32°, viz: in 32° 10′. And this one had more difficulty in weathering the cape than the other had.

In November, five out of twenty-two fell on the line west of 32°, but none of them lost more than a day (though one crossed in 34°) by it. One, the George Brown, crossed in 29°, and had five days in clearing Cape St. Roque. That was a longer time from the line to this headland than any other of the twenty-two.

In December, three had to cross west of 32°, and but one of these was delayed in consequence; that was the Storm; though she was a week in getting round from her crossing, yet she made the capital time of only twenty-five days from New York to Cape St. Roque.

The Jenness had seventy-seven days from Philadelphia to the line. Her case is an exception to the rule; and, therefore, I do not include it among the averages; though, to adhere to the rule of not selecting, I have recorded her among the September vessels.

In viewing the Rio routes, which include the routes of all vessels bound from the Northern into or through the Southern Atlantic Ocean, and comparing them, as recommended in this work, with them as they formerly were, we find the gain, on the average by the new route over the old, to be for

January,	3.1 days;	May,	9.5 days;	September,	4.9 days;
February,	8.6	June,	12.3	October,	6.3
March,	16.0	July,	15.0	November,	14.0
April,	11.3	August,	12.1	December,	13.4

The passage to the line by the old route the year round was forty-one days. By the new route, notwithstanding the bad running in September, it is thirty days.

A saving of twenty-five per cent. in time, for all the men and the commerce that pass that way, is

certainly an achievement, which those who have co-operated, and worked together to bring about, may well contemplate with pleasure and satisfaction. And who are they? Sailormen, all; the navigator, who has assisted in the collection of materials, and the brother officer who has so faithfully and patiently helped to discuss them here.

OF THE PASSAGE AROUND CAPE HORN.

The force engaged upon the Charts at the Observatory has been so much interrupted, that I have not yet had time to discuss the Cape Horn route, according to the method used for discussing the best routes to the line. Pilot Charts from 50° S. to 62° S., and from 55° W. to 91° W., on a scale of 1° lat. 2° long., have been published to aid navigators in their Cape Horn perplexities. A careful study of these Charts is necessary to a proper knowledge of this passage. The first injunction, therefore, in a set of Sailing Directions for doubling Cape Horn, is to consult, whenever the winds are adverse, the Cape Horn Pilot Charts.

Vessels bound round the Cape, should first, however, after leaving Cape St. Roque, aim, if the winds will let them, to cross 25° S. in about 35° W. At any rate, as far off from the land as, with a good clean rapfull, they can without going to the east of 33° or 34°.

After passing the parallel of Cape Frio, they should make the best of their way south, aiming always to pass *inside* of the Falkland Islands, and, if wind and daylight serve, through the Straits of Le Maire.

The reason for this recommendation is this: After crossing the parallel of Tierra del Fuego, the difficulty is to get to the westward. Therefore, it is better to make westing on this side, when it is practicable, and where the weather is mild, than to put it off for the stormy latitudes, where it is more difficult.

Captain Smyley, who has been engaged for many years in the seal fishery of the South Seas, has furnished me with some remarks and sailing directions in relation to this part of the ocean; so also have Captain Bryson, and others; navigators may find these remarks useful; I therefore copy them.

From Captain Leslie Bryson, of the Brig Daniel, to Lieut. M. F. Maury.

In compliance with your published request, I avail myself of the earliest opportunity to forward to you an abstract journal of the brig Daniel, formerly the United States bomb brig Hecla, kept by me on her voyage from New York to California, which is but a poor tribute for the manifest advantage and valuable knowledge, imparted by the aid of your truly useful and ingenious system, which I regard as one of the most valuable inventions of the age, and doubtless will yet lead to results, far beyond its present apparent purpose, to speed the voyage.

Noticing your intimation to West India traders for farther data, to complete your Wind and Current Chart of the West Indies, I have written a friend to send you my private journals, embracing a period of about six years, commencing May, 1838. These journals were kept for the purpose of facilitating a practical knowledge of winds, &c., for which I thirsted, without the means of obtaining any reliable information, except the divers accounts furnished by casual observers, which, like the various sailing directions for Cape

Horn, serve rather to distract the mind than to assist the judgment. I was in the constant habit for several years of referring to these journals, with the sole view of obtaining the very information that your Charts so plainly and beautifully illustrate. My personal observation, therefore, confirms me in the truth of your system. Having been kept solely for private use, you will find many remarks in those journals quite irrelevant to your purpose; nevertheless, in your hands, I trust they will be acceptable. The temperature of the air and water was only noted in approaching and departing from our coast. At different times, I have found a cold place in the centre of the gulf, bearing about S. E. by S. from Montauk. I do not know whether the remark is noted in my journals, but I am certain of the fact.

The currents may not always have been regularly noted, except when unusually strong. In reference to my present passage, I would state that I followed your directions, as near as winds would permit. Although the vessel was deep, and sailed heavy, I have reason to think our passage was thus materially shortened.

About the parallel of 45° S. a marked change in the weather occurred, followed by a constant succession of gales. The temperature of the sea had also suddenly fallen some 6° below the temperature of the air, as indicated by the thermometer attached to the barometer in the cabin. The difference of temperature between the air and the water continued with little variation, until we passed the cape, except a part of the 14th, 15th, and 16th of February, when we stood far enough eastward to bring Falkland Islands in a line with Cape Horn. At those times, the temperature of the sea rose to about the same range as the air; from that circumstance, in connection with the N. E. current, I was strongly impressed with the idea that a steady cold stream set to the northward and eastward, like the Gulf Stream on our coast, the elements being only reversed, which would account for the continual storms that seem to prevail in that region.

The current continued more or less strong in proportion to the strength and duration of the gales; but varying more easterly as we drew up with the Horn, until we were fairly past it, and nearly up with the latitude of Cape Pilar, amounting to no less than 650 miles! Considering this great drawback in connection with the almost constant adverse gales, many of which were so heavy that no ship could bear canvas, it seems highly important to ascertain the most desirable route, if possible, to avoid such serious dangers and delays. It was my intention to have doubled the cape close, and keep near the land all the way round. But after making Diegos, the violence of the gale seemed to render it a matter of prudence to keep an offing; then there was difficulty in making northing without also making much easting. When we finally succeeded in again attaining the latitude of the Horn, the gales were not so furious but that we could carry close-reef topsails. The second day after our departure from Diegos, the current had set us so far to the E., I could not believe my chronometer, and supposed I might have inadvertently stopped her 10′, which I deducted in order to make our position where I wished it to be. I continued to work time every day when an opportunity offered, and seldom missed a day, considering the dreadful weather. Arriving at Juan Fernandez, I found my chronometer perfectly correct, and have since corrected the longitude for the 10′ subtracted. I mention the above, to show that you may rely upon my observations upon the currents, &c., with more accuracy than is usually bestowed by merchantmen. Adverting to the winds of Cape Horn, I

would state that I projected wind circles, like yours on the margin of your Chart of Tracks for the cape. The result led me to expect S. W. and N. W. as the prevailing winds for the months of February and March; but it was our hard fate to find them from W. S. W. to W. N. W. per compass. I contemplate making the voyage round *via* China. If so, shall continue the abstract, with such remarks on the movement of the elements and natural phenomena as may come within the range of my observation.

From Captain Smyley to the same.

In looking over your valuable *Sailing Directions and Charts*, which I consider the best guides ever given to the navigator in pointing out the means of shortening the passage to his port, as well as shunning the calms, which has caused so much detention in vessels crossing the line, and also of the advantages taken by standing more to the westward, and passing nearer Cape St. Roque. I have tried both routes to my own satisfaction, and am well satisfied on my own part that the western route is far the best, and have for several years recommended it to be taken, and I am happy to say I have been since told by many that it is the most preferable.

I sailed from Newport, R. I., July 3, 1836, in the schooner Sailor's Return—myself master—bound to the Falkland Islands and South Shetlands. The schooner Geneva, Captain A. Padack, my consort, sailed the same day, and kept company with me until we arrived in the latitude of 4° N. and 25° W. The winds were light and baffling, from S. W. to S. S. W. for one or two days. I stood to the westward, but *he* began to worry for fear of falling to the leeward. I left him, giving him instructions to proceed with all possible dispatch, and meet me at the Falkland Islands; we were then in 4° 16′ N., and 26° W., wind S. S. W. The Geneva stood on her eastern tack, *I* to the westward, and arrived at the Falkland Islands twenty-one days before her.

On examining our journal, I found I gained thirteen days of the time between 4° N. and 8° S., by nothing but his being afraid of falling to leeward; whilst I could lay the land along, he was continually tacking about; and as for a current, I tried several times, and found but very little setting N. W. There was the schooner Ann Howard, of New London, had the same passage as the Geneva, and took the same route; she had eighty-one days to the coast of Patagonia, and eighty-three to Port Desire, latitude 47° 45′ S.; longitude 65° 54′ W. The A. H. sailed within one day of the Geneva, and arrived within two days of her, giving me twenty days ahead of one, and twenty-three ahead of the other.

Sailor's Return, a second voyage, sailed 22d August, 1838; and in thirty days was cast away at Cape St. Roque, standing along shore on the off-shore tack, having made the land that morning. I was bound in, to Rio Grande, north, to repair my sheathing, which had started off the bottom. I crossed the line in 35° 40′; I found no trouble in getting up the coast, until I struck on the reef at Cape St. Roque.

I found the tides tolerably regular at the cape during the two days I was on shore, and the pilots say the currents are trifling on the coast from St. Roque to St. Augustine, when you are in more than forty fathoms water; and I believe it is true, for I have tried it since, and found very little, if any.

Schooner Benjamin De Wolf, W. H. Smyley, master, sailed from Newport, R. I., for the Falkland

Islands, 2d of April, 1839. Having a sharp vessel, and every confidence in my own mind of the western route, I determined to steer my course as if bound to Fernando de Noronha, and to pay no attention either to winds, weather, or currents, no more than if such were not to be found on the route. I found no calms, and but little rain. I passed inside of Fernando de Noronha, distant twelve or fifteen miles, and passed Olinda in twenty-one days and eight hours; and from St. Augustine to Port Egmont, I had but twenty days —making but forty-one days and eight hours passage to the Falklands.

Schooner Benjamin de Wolf, second voyage, W. H. Smyley, master, sailed from Newport, R. I., 28th May, 1840, for Patagonia, and arrived at Rio Negro, latitude 41° 4′ S., longitude 62° 49′ W., in forty-one days, passing about fifty-five miles east of Fernando de Noronha, and crossing the line in 36° 15′. I found the wind from N. W. to S. W., more than from any other quarter, from the line to St. Roque. The current I had no opportunity to try, but am sure it is more governed by the wind than anything else, but far less than people in general suppose.

Schooner Ohio, W. H. Smyley, master, from Newport, R. I., to Rio Negro, Patagonia, sailed September 29, 1842, in company with the Sarah Ann, Gough, master—consort to the Ohio; kept company until in 16° north and 40° west. Captain Gough, as well as Padack, wished to cross the line well to eastward, and although they were both under my instructions and control, I permitted them to have their choice. After leaving Captain Gough, I steered for Fernando de Noronha, as before, but kept on until I found myself in sight of Cape St. Roque, passing inside of the Rocas, ten miles, and by making a short tack off Mernanguapa, passed Pernambuco, distant about eight miles, being then out thirty days. I stopped three days at San Francisco, and three at Isapacaray, making my passage to Rio Negro in sixty days including stoppages.

The Sarah Ann made no stoppages and came in ten days after me, making my passage sixteen days shorter than hers, exclusive of being embayed two days. I found by overhauling their journal and log that they kept well to the eastward in that old *beaten turnpike* of former navigators, crossing in from 24° to 25° W., and that most of my gaining was from about 4° N. to 8° S., which convinced me of the advantages of the western route.

Schooner Ohio, first voyage, W. H. Smyley, master, sailed from Newport, R. I., July 14, 1841—making my passage in fifty days, including two days' stoppage at the Brazils for recruits. I passed so close to the Rocas, and not being able to get good observations, owing to the weather, that I am not sure which side I went on.

On my arrival in the Brazils, I tried my chronometer by artificial horizon, and found it correct. It was in the daytime, and I kept a good look out for them, until I was sure I was to the south of them. This voyage I had no consort; I found but little current setting W. N. W.; this was near the Rocas, perhaps one degree, or a little more, north of them.

There is another thing still more remarkable; although you have more wind near the land, yet the sea is much smoother than it is further to the eastward. The natives who fish on the catamarans along the coast, have repeatedly told me that the current was but trifling; you will often see two of these catamarans

at anchor, tailing in different directions, but generally with the wind. If the current about Cape St. Roque was as strong as persons in general imagine it to be, the clump-built coasters would not be able to make headway, and beat from ——— up to Pernambuco, at all seasons of the year, as they do.

Schooner Catharine, of Newport, W. H. Smyley, master, bound to Patagonia. I left Newport, September 10, 1845, and stood to sea, with the intention of taking my old route, that is, to steer for Fernando de Noronha, or nearly that course, so as to pass east of the Bermudas, but the wind prevailing more to the south, gave me a chance to keep well to the eastward. I stood boldly on; but had the wind light, with heavy rain squalls, and much thunder and lightning; crossed the line in 23° 32′, making little headway, having light airs and a very irregular sea. Although I found so much rain and light winds, the sea did not seem to fall in the least, causing the vessel to thresh heavily, and be very uneasy. I spoke a brig, which had been eight days longer than myself in these rainy regions, and off Pernambuco I spoke one which had been ten days less, being to the westward of me. I was forty-five days to Olinda, and twenty days from there to Rio Negro, Patagonia; and I fully believe, if I had taken the western route, I should have made a very short passage, as the vessel sailed very fast, was in good trim, and well manned.

Pilot-boat John E. Davidson, W. H. Smyley, master, from New York, towards coast of Patagonia, sailed July 5, 1849.

July 6.	- -	The Hook and Light-house in sight.							
7.	- -	Wind W. S. W.	Latitude	38°	43′ N.	Longitude	none.		True Longitude.
8.	- -	Wind light S. E.	"	38	31	"	none.		
9.	- -	" S. S. E. and S. E.	"	38	14	"	none.		
10.	- -	" S. S. E. and calm	"	38	03	"	none.		
11.	- -	" Calm.	"	38	00	"	none.		
12.	- -	" North.	"	35	07	"	66°	53′	59° 07′
13.	- -	" S. W. and calm	"	35	04	"	65	02	
14.	- -	" South	"	34	48	"	63	32	
15.	- -	" South	"	34	29	"	61	23	47 40
16.	- -	" Variable	"	33	38	"	60	52*	

* NOTE.—The above is taken from the log-book of the mate; the winds and latitudes are put down correctly, but the longitude is 13° 15′ out of the way. I merely put down this to show you how erroneous some persons will be. I gave him his longitude on the 16th, when I spoke a vessel whose longitude agreed with mine within four miles, but, in crossing the line, he was almost as *far out* again. I crossed the line in 34° 15′ on the 5th of August, and on the 7th passed ten miles west of Fernando de Noronha, the weather clear, the Island plainly in sight. On the 9th, passed Pernambuco; I found no trouble in getting to the southward. It was my intention to have stopped at Pernambuco, for the purpose of landing some of my crew, who had mutinied on the passage, nearly killing my mate, and shooting me with a pistol. Their attempt to take the vessel left me without a sufficient number of men to work her, which caused my passage to be much longer than it otherwise would have been. I kept but little reckoning afterwards, and that mostly in my head, for fear of another mutiny, for the crew shipped in New York for the purpose of taking the vessel, and nearly succeeded in doing so. The weather being squally off Pernambuco, I kept on for St. Catharine's, and arrived there on the 22d of August; on the 23d or 24th gave my men up to the U. S. Consul; on the 7th of September got under way from St. Catharine's; and on the 16th anchored on the bar off Rio Negro, Patagonia.

Giving me 30 days to the line.
47 days to St. Catharine's.
56 days to Rio Negro.

Homeward passages in the above-mentioned vessels,	Days.	Hours.
Sailor's Return, from Rio Grande North to Newport	27	4
Benjamin DeWolf, first voyage, arrived from Morea Mernanguapa	26	
" " second voyage, arrived in March from Morea Mernanguapa	30	
Ohio, from Rio de Janeiro to New York	34	
John E. Davidson, Rio Negro to New York	39	16

In these five passages, after passing Cape St. Roque, I have kept "good full;" and always found, as I neared the West India Islands, that the wind hauled favorably, and the weather became less squally.

Mernanguapa is a small port near Parahiba.—See Chart.

There are few portions of the continent of America less known than from the Rio de la Plata to Cape Horn, and none of more importance. The whole of that portion of country, except part of Belgranna and Rio Negro, being inhabited only by Indians. It has been the custom of vessels bound to the Pacific, after passing the La Plata, to go to the eastward of the Falkland Islands; some wishing to avoid running by La Agle shoal, others fearing to get *jammed* on the coast of Patagonia. This should no longer be an excuse; for the first does not exist, and of the latter there is no danger. I have cruised for the above-mentioned shoal several times, taking a good departure from the Jasans and from New Island in the Falklands, and crossed to Cape Virginis and back in the long summer days, seeing no signs of it. In 1842, I left East Harbor, Staten Land, with my consort in company, and steered for the shoal, keeping about eight miles apart; the weather was clear. I kept men at the mastheads, and saw nothing of it. My observations were to be relied upon; for I had on board three chronometers, which had been well proved at Cape St. John. I kept on for Rio Negro, and on my arrival, again tried my chronometers, and found them correct. I am well aware that no such shoal exists. I have since then tried to find it with the schooner, but without success. The Beagle and Adventure, and Captain Sullivan of the Navy, have also hunted for this shoal without finding it.

As for a vessel getting blown on shore on the coast of Patagonia by N. E. gales, it is out of the question. I have spent twenty-two years of my life mostly from South Shetlands to the River La Plata, and once I remained six years without coming north of 41° S., and I cannot say that I ever knew, during that time, the wind to blow heavily directly on shore for twelve hours. My voyages being principally made for sealing or whaling, caused me to keep close into the coast, whereby I had the best opportunities for observing the weather, currents, tides, &c.; in fact, my voyages depended partly on these, and it stood me in hand to make myself acquainted with them.

I have always found that the sooner I got to the westward, after crossing the line, the better. I always try to make the Peninsula of St. Joseph's, between New Bay and Port Valdez. The land is high, steep, clay cliffs, flat on top. Then, I endeavor to keep near enough to see the land until I get well to the south, so as to pass close by Staten Land; by doing this, I have smooth water, winds from N. W. to W. N. W., and pleasant weather; while another vessel will have the wind from W. N. W., and S. W. off the Falkland Islands, and on the south side of the islands the wind will be from S. W. to S. This I have proved by

having left men on the Jasans and the Bushenes (these being the extremes of the islands, both sealing grounds), and requiring them to keep a journal of wind and weather. I found the wind to prevail much more from the S. W. and S. S. W., about one-third or one-half way between Cape Horn and ———, and beyond that distance it drew more to the westward, and even to the northward of west. It was a common thing, while at anchor under Diego Ramirez, or sealing on shore, to see a vessel pass in shore of the island heading up two points higher than another vessel off shore of them; and I have often started to go in to anchor, heading well up for the place I wanted to come to at, and found, as I drew in shore, the wind gradually headed me off. When bound to Shetlands from the cape, or from Staten Land (Shetland is our rendezvous, on account of getting wood there to last until our return), we always find, after passing the latitude 60° S., the weather much milder, fewer blows, but more fog. The currents as well as the winds are generally the reverse of what they are off Cape Horn. The prevailing wind at Shetland is N. E., while in the track generally taken by vessels, it is S. W. The current is similar, for it seems more like a gulf stream than a common current following the direction of the wind.

No navigator should be afraid to approach the coast. Soundings are found far out; the water is much discolored, as the land is neared; and we have another sign, which seldom fails in the daytime, *i. e.* the small gulls, which will always be found in forty or fifty miles of the coast, making their presence known by the noise they make as soon as a vessel is perceived. This seldom fails to be the case.

The navigator should not be backward in tacking as soon as he finds himself getting off shore, for the wind will often lead him along for two or three points, and then favor him for a short distance again, by which means vessels often get so far to the eastward as to lose much time. I would always recommend a ship to tack in shore, even if she could make no better than a W. N. W. course, in preference to going to the eastward; for by keeping well in, she will have smooth water, clear weather, and wind more off shore. While, on the other hand, when she nears the Falklands, she would begin to have fogs, rain, and sleet; and south of the islands the rain becomes hail-stones and snow. A short distance in these latitudes makes a great difference in wind, weather, and tides.

For comparison, take Santa Cruz harbor, on the coast of Patagonia, latitude 50° 8′ S.; longitude 68° 21′ W.; tide in spring, forty-eight feet. The Jasan Island, belonging to the Falklands, latitude 51° S., longitude 61° 20′ W.; tide but six feet. Here is a great difference in 7° of longitude, about 260 true miles. This will show the extraordinary difference made in tides by a short distance, and the weather in proportion to the tides; on the one it is seldom known to rain, at the other it rains half the time. At the Straits of Magellan, in a similar way; it seldom rains at the eastern entrance, and at the western it seldom stops; but this is owing more to the mountains leading from Cape Forward along the straits, and from thence to Cape Tres Montes, or Chili.

Hereabouts, we have but little thunder and lightning, but one may be on a hill above the rain, while those below have a heavy storm; I have seen this occur on Staten Land, also on Juan Fernandez and Massafuera.

Temperature in high southern latitudes differs greatly from temperature in northern; in southern latitudes there seems to be no extremes of heat and cold as at the north.

Newport, for instance, latitude 41° N., longitude 71° W., and Rio Negro, latitude 41° S., longitude 63° W., as a comparison.

In the former, the cattle have to be salted and fed during the winter, not being able to get along in the fields on account of snow and ice.

In the latter, the cattle feed in the fields all the winter, there being plenty of vegetation, and no use for hay.

On the Falkland Islands, thousands of bullocks, sheep, and horses, are running wild in the country, getting a living all through the winter. This could not be in similar northern latitudes.

On the other hand, in the latitude of 50° to 51° N., rye, barley, wheat, &c., can be raised during the summer, but in south latitude there is not sufficient heat in the summer to bring such things to maturity, for, even in the depth of summer, you would be liable to snow squalls. After passing the latitude of 40° S., the summer is not so warm, and the winter not so cold, as in northern latitudes.

You can see, by reference to the book published by Commodore Wilkes, that the extreme cold had but in one instance been as low as 5° below zero. This I ascertained from a self-regulating thermometer, in latitude 63°, and gave him. Since that time, it has never been so low. The heat I could not ascertain, as the index in the tube shifted while I was lifting the instrument up. I tried to procure one sometime ago in New York, but could not find one. I intended to have placed it in a much higher latitude, as very little is known about either extreme of temperature on the land. For instanee, many suppose that Palmer's Land is a continent, and connects with the land laid down by Wilkes; however, this is not the case, for I have sailed round Palmer's Land and far south of it. * * * * * * *

Owing partly to negligence and partly to disasters, I have no logs or books which will be of use to you. But I will try this cruise to send you some; and if you know of anything particular from the La Plata, to as far as 70° S., I may be able to give you some information, for to that place I have given most of my attention, as my business has been there during the greater part of the time.

While I was at this book, it occurred to me to send some leaves out of a scratch book, which might be of some use in showing tides, harbors, &c., so I tore them out and send them to you. I have done this very hastily and in a most bungling manner, but I did not know that I would have to go away so soon and would not be able to finish. So I have driven ahead and done what I could.

If you choose, I will distribute those Charts to men who I know will take care to return the journal to you, on their return home, for I consider them to be a benefit to all seafaring men.

I will write you again before I leave.

The opinions expressed by these two navigators—Captains Bryson and Smyley—as to the passage to the line, and the Cape Horn Route, are fully confirmed by the *Pilot Charts;* and though sometimes a vessel, by going to the east of the Falkland Islands, may have good luck, fine weather, good winds, and a

short passage, it should be considered as the exception, but by no means as the rule. The combined experience of all the Cape Horn navigators, whose journals have been consulted during the progress of my investigations, is against the eastern, and in favor of the western, or in-shore passage, as a general rule.

I find in the abstract log of the ship Defiance (Robt. McCerran), the following excellent remarks, concerning this passage:—

September 26, 1852. At 4 hours 30 min. A. M. hove to for daylight. At 8 hours 30 min. A. M. entered the Straits of Le Maire; wind at N. N. E. At 10 A. M. Cape St. Diego bore west per compass, and Staten Land S. E., entirely covered with snow. At 11 hours 30 min. clear of the strait. I am surprised that this strait is not passed by all ships in preference to passing east of Staten Land; Le Maire being free from shoals, and 14 miles wide. An experience of 21 years command in the Liverpool trade convinces me that the passage between Tuskar and the Smalls are trebly dangerous, and I can see no difficulty in this passage that is not much greater in the navigation of the Irish Channel, either north or south about.

I should certainly beat through in preference to going within 3 miles of the land. I have no doubt that an eddy from eastward—I found a current close in shore setting S. W., and by keeping the current from the S. W.—must prevail under any circumstances. Good Success Bay affords easy access and good anchorage. It may be said that heavy gales ahead, and thick weather, make the passage dangerous. In answer I say, that it cannot blow harder than it does in the Irish Channel, and the fog cannot be so dense as it is on the coast of Ireland, as the water is deeper and the air colder in Le Maire. Besides, the number of vessels on the Irish coast increases the danger by the chance of collision, and there is no other passage to approach.

Ship Defiance (Robert McCerran), bound from New York to San Francisco.

Aug. 3, 1852. Lat. 6° 14′ S.; long. 34° 39′ W. Current, 31 miles, S. W. ½ S. Barometer, 30.00; temperature of air, 78°; of water, 80°. Winds: S. S. E., S. E., S. by E. Made the land 60 miles south of St. Roque; too far E., 15 miles. I am satisfied that the *Sailing Directions* of Lieut. Maury have thus far shortened my passage, and this abstract proves that; though I was forced as far W. as 40° 30′, when in 11° 30′ N., yet, by watching chances, I was enabled to cross the line in 31° 55′ W. without making northing over 30 miles; and though under anxiety on account of the bugbear of westerly current, I did not find it but *one* day, and generally on the current track I found a S. E set.

Sept. 29. Lat. 56° 14′ S.; long. 71° 01′ W. Barometer, 29.8; temperature of air, 41°; of water, 44°. Winds: W. by S., W. S. W., W. Fresh gales and squally, with heavy sea.

Sept. 30. Lat. 56° 11′ S.; long. 71° 26′ W. Barometer, 29.7; temperature of air, 42°; of water, 44°. Winds: W. by N., W., W. by S. Fresh gales and head sea.

Oct. 1. Lat. 56° 51′ S.; long. 72° 58′ W. Barometer, 29.2; temperature of air, 40°; of water, 42°; Winds: W., W. S. W., W. N. W. Strong gales and heavy sea.

Oct. 2. Lat. 56° 35′ S.; long. 73° 15′ W. Barometer, 29.00; temperature of air, 39°; of water, 42°. Winds: W., W. S. W., S. W. Strong gales, rain, hail, and snow.

Oct. 3. Lat. 56° 34′ S.; long. 72° 42′ W. Barometer, 28.8; temperature of air, 39°; of water, 42°. Winds: W. S. W., W., W. S. W. Strong gales, rain, hail, and snow.

Oct. 4. Lat. 56° 39′ S.; long. 72° 48′ W. Barometer, 28.6; temperature of air, 40°; of water, 41°. Winds: S. W., W., S. W. Strong gales and heavy sea.

Oct. 5. Lat. 56° 19′ S.; long. 73° 01′ W. Barometer, 29.0; temperature of air, 41°; of water, 41°. Winds: W., W. S. W., W. by S. Fresh gales, sea subsiding.

Oct. 6. Lat. 56° 51′ S.; long. 73° 25′ W. Barometer, 29.7; temperature of air, 43°; of water, 42°. Winds: W., W. by S., W. Fresh gales and heavy sea.

Oct. 7. Lat. 56° 34′ S.; long. 76° 29′ W. Barometer, 29.5; temperature of air, 41°; of water, 42°. Winds: W. by N., W., N. W., N. W. by W. Fresh gales, long rolling swell.

Oct. 8. Lat. 57° 05′ S.; long. 78° 17′ W. Barometer, 29.6; temperature of air, 42°; of water, 42°. Wind: N. W. throughout. Fresh gales, rain and hail.

During the above ten days, from close reefs to top-gallant sails; tacking as occasion required, yet not so bad as a winter passage from Liverpool to New York.

Capt. Young, of the ship Venice, of Philadelphia, in his admirably kept abstract, makes also some judicious remarks upon the subject of the Cape Horn passage.

Capt. Young's log is deserving of special notice also, for the very excellent use he makes of the barometer.

His remark that the indications of the barometer will show when the navigator enters, and when he quits the trades, is perfectly philosophical.

In the calms, both of Cancer and Capricorn, the barometer ought to stand higher—say one-tenth of an inch (0.1) on the average—than it does either in the "variables" on the polar side of these belts, or in the "trades" on the equatorial side of them.

In the belt of the equatorial calms, it also ought to stand, on the average, a little lower than it does in the N. E. or S. E. trades on either side of those calms.

The close attention which Capt. Young gives his barometer, will, as a general rule, enable navigators in most cases to tell whether they have crossed the calms or the trade-wind belts, or not.

See also the log of the Great Britain, for Capt. Caldwell's remarks on his barometer during his Cape Horn passage.

Ship Venice (John H. Young), of Philadelphia, New York to California.

Jan. 29, 1850. No observations. Barometer, 29.4; temperature of air, 59°; of water, 68°. Winds: S. S. W., S. W., W. N. W. Discharged pilot at 3 hours 30 min. P. M. At 6 P. M. Neversink Lights bore W. I have determined, during the coming voyage, to keep the abstract log of Lieut. Maury, and thereby add my mite to the cause of science, in the hope that the day is not far distant when navigation shall be so simplified and reduced to "fixed principles," that all uncertainty may be removed. First and middle part,

variable and baffling; latter, fine breezes. Strong rippling, which I judge to be the counter current of the stream.

Jan. 30. Lat. 37° 50′ N.; long. 68° 12′ W. Current, one and a half knots, E. by N. Barometer, 29.00; temperature of air, 62°; of water, 73°. Winds: W. N. W., N. N. W., N. N. W. At 4 P. M. the water rose to 70°, and to 73° at 5; water remarkably smooth, with a fine breeze blowing; ship going fast.

Jan. 31. Lat. 36° 55′ N.; long. 63° 32′ W. Current, 19 E., and 5 W. S. W. Barometer, 29.4; temperature of air, 68°; of water, 72°. Wind: N. N. W. throughout. Fine breezes and water smooth; temperature, 73°, during the night fell to 72°. At 9 hours 30 min. water, 71°. Have paid particular attention to the log since entering the stream, and find that we began to leave the stream about 9 A. M.

Feb. 1. Lat. 35° 21′ N.; long. 60° 27′ W. Current, 15, S. W. Barometer, 29.6; temperature of air, 64°; of water, 71°. Wind: N. throughout. Strong breezes with considerable sea; barometer rising. I have determined to cross latitude 30° to the west of longitude 50°, if permitted by the wind.

Feb. 2. Lat. 34° 16′ N.; long. 58° 12′ W. Current, 8, S. W. Barometer, 29.8; temperature of air, 66°; of water, 71°. Winds: N., N. N. W., W. N. W. Fresh breezes and pleasant weather.

Feb. 3. Lat. 33° 32′ N.; long. 56° 55′ W. Current, 6 knots, S. W. Barometer, 29.7; temperature of air, 67°; of water, 71°. Winds: W., W. S. W., S. Fine, clear weather; barometer high and steady.

Feb. 4. Lat. 34° 05′ N.; long. 54° 04′ W. Barometer, 29.7; temperature of air, 69°; of water, 72°. Winds: S., S., S. S. E. Fine, clear weather, such as is rarely met with at this season of the year in the North Atlantic. I almost regret the wind hanging here, as I desire much keeping to the west, for the purpose of giving the "Theory" of Lieut. Maury a fair trial, having a "weatherly ship," and no fear of Cape St. Roque.

Feb. 5. Lat. 34° 42′ N.; long. 51° 30′ W. Barometer, 29.6; temperature of air, 68°; of water, 72°. Wind: S. S. E. throughout. Fine, clear weather; the horizon astonishingly clear. I scarcely recollect having more delightful weather—steady glass—smooth water—everything indicating midsummer, more than the last 48 hours.

Feb. 6. Lat. 34° 59′ N.; long. 49° 01′ W. Observed variation, 9° 40′ W. Barometer, 29.6; temperature of air, 68°; of water, 72°. Winds: S. S. E., S., S. First part, fine; middle, barometer falling fast; dirty appearances; observed variation at sunset, 9.40 W.

Feb. 7. No observations. Barometer, 29.00; temperature of air, 66°; of water, 72°. Winds: S. S. W., W., N. N. E. Cloudy, dirty weather; *not much wind;* barometer steadily falling; ship under short canvas; heavy appearances all round, and every appearance of a heavy gale.

Feb. 8. No observations. Barometer, 28.6; temperature of air, 64°; of water, 72°. Winds: N. N. E., N. E., S. W. Glass still falling; heavy appearances; everything "snug" for a "blow."

Feb. 9. No observations. Barometer, 28.4; temperature of air, 64°; of water, 72°. Winds: S. W., W., W. N. W. During the first and middle part, barometer fell to 28.2, with very bad-looking weather. At sunrise there was but little wind, but in less than half an hour, it blew furiously at S. W., veering to the west; the sea rose so rapidly I was obliged to "scud;" by 9 A. M., although the wind was blowing very heavy,

the glass began to rise. Owing to the ship being deep and steering badly, I was induced to try what I had frequently heard of; namely: paying a hawser out astern. I middled and payed out 45 fathoms of 11 inch hawser on each quarter, and found instant relief; so much so that I shall most assuredly adopt it hereafter in bad-steering ships.

Feb. 10. No observations. Barometer, 28.6; temperature of air, 68°. Wind: W. N. W. throughout. The gale still continuing, but every appearance of abating. I cannot forbear expressing the great benefit resulting from the trial with "hawser;" feel satisfied I could not have "scudded" without it. I regret being driven to the E.

Feb. 11. Lat. 27° 06′ N.; long. 38° 42′ W. Current, S. E. Barometer, 29.00; temperature of air, 70°; of water, 72°. Winds: W., W. S. W., S. W. First part, moderating and hauling to westward and southwest. Since observation of 6th, we have had 40 miles of S. E. set. In all my voyages across the equator, I have never been so far east in this parallel before; for although there can be no doubt that the westwardly route is best, yet I have had a great desire to give it a fair trial by keeping *farther than usual* to the westward.

Feb. 12. Lat. 25° 34′ N.; long. 36° 31′ W. Current, W. S. W., ½ knot. Variation, 11° W. Barometer, 29.6; temperature of air, 70°; of water, 72°. Winds: S. W., S., S. Throughout, moderate from southern board, with a heavy N. W. swell, for which I allow 15 *miles set;* during the 24 hours, everything apparently combines to capsize my calculations. Variation observed, 11° 5′ W.

Feb. 13. Lat. 25° 18′ N.; long. 35° 42′ W. Current, W. S. W., ¼ of a knot. Barometer, 29.8; temperature of air, 72°; of water, 72°. Winds: S. S. E., S. E., S. E. During these 24 hours tacked several times to avail of a point or two in the wind. My great object is to make southing when possible.

Feb. 14. Lat. 24° 34′ N.; long. 35° 56′ W. No current. Barometer, 29.7; temperature of air, 72°; of water, 72°. Winds: S. S. E., S. S. E., S. Wind still hanging to the southward as I have never known before. Of course, I fully expected the trades ere this, which perhaps increases the annoyance, as I shall almost entirely be deprived of availing of the *Pilot Chart*, which I approve of so much, that a trial thereof is imperative on me.

Feb. 15. Lat. 23° 30′ N.; long. 35° 12′ W. No current. Barometer, 29.6; temperature of air, 73°; of water, 72°. Wind: variable, from S. to W. throughout. I feel buoyed up, that I am really to have the "trades" soon; since the 12th, a heavy N. W. swell.

Feb. 16. Lat. 21° 40′ N.; long. 34° 00′ W. No current. Variation, 13° 20′ W. Barometer, 29.06; temperature of air, 73°; of water, 72°. Wind: west throughout. Wind breezing up again from westward.

Feb. 17. Lat. 20° 26′ N.; long. 32° 58′ W. Barometer, 29.9; temperature of air, 72°; of water, 72.° Wind: W. S. W. throughout. Wind light and steady from W. S. W., with a tremendous N. W. swell, giving strong assurance that a gale has prevailed in that quarter, which may have interrupted the "trades." I think this the only reasonable way of accounting for their absence; longitude per sun and moon 33° 3′, chronometer 32° 58′.

Feb. 18. Lat. 20° 00′ N.; long. 31° 44′ W. No current. Barometer, 30.10; temperature of air, 74°; of water, 73°. Winds: S. W., calm, N. N. W. Light airs from southward; middle, calm—heavy clouds with lightning to the N. W.; the only indication of "trades" is in the rise of the barometer, which I have generally paid some attention to. During 15 voyages across the equator, as master, I have never experienced anything like the present voyage; for at this season of the year we have every reason to expect the favorable winds of the "trades" after passing the parallel of 25°. It would be a matter of much satisfaction to know what influence has thus thwarted them.

Feb. 19. Lat. 17° 20′ N.; long. 32° 52′ W. Current, ¼ knot, W. S W. Barometer, 30.10; temperature of air, 75°; water, 74°. Winds: N., N. E., N. E. First part, light from northward; middle, inclining to eastward; latter, fine breezes and hazy appearances of these winds. The weather is really delightful, and quite a treat, after the annoyances of the last ten days. I hardly yet dare to congratulate myself that the long looked-for trades have come at last, but hope such will prove the case.

Feb. 20. Lat. 14° 32′ N.; long. 32° 20′ W. Current, ½ knot, W. S. W. Observed variation, 11° 15′. Barometer, 30.02; temperature of air, 76°; of water, 75°. Winds: N. E., E. N. E., E. N. E. Fine breezes; everything out, skysails, royal-steering sails, &c., going about 6 knots. The atmosphere extremely hazy; the remains of a new swell still perceptible; observations, sun and moon, 32° 17′; chron. 32° 20′. During these 24 hours, have observed *very great rippling*, resembling in some instances the "tide rips" of "Nantucket Shoals;" tried the temperature frequently without experiencing any change. I had intended to make the remark before, that we have not seen a bird or fish of any kind since crossing the tropic, which must be considered very unusual, particularly with regard to the birds.

Feb. 21. Lat. 12° 16′ N.; long. ——. Current, ¼ knot, W. Barometer, 30.02; temperature of air, 76°; of water, 75°. Winds: E. N. E., E., N. E. Light winds, and every indication of losing the "trades;" the *glass, however, keeps up*. It may not perhaps be amiss to pay some attention throughout this abstract to the barometer with reference to indicating the trade-winds. The rise and fall thereof, I have frequently noticed on entering and leaving the vicinity of trades. During these 24 hours, the ripplings have been very strong, without any apparent change in temperature.

Feb. 22. Lat. 9° 49′ N.; long. 30° 30′ W. Current, one knot, W. N. W. Variation, 10°. Barometer, 30.2; temperature of air, 77°; of water, 76°. Winds: N. E., E. N. E., E. Light winds and hazy atmosphere; very frequent ripplings, more apparent from the extreme smoothness of the water; during the night squalls, unattended with rain; sun and moon, 20° 31′; variation observed, 10°.

Feb. 23. Lat. 7° 13′ N.; long. 29° 45′ W. Current, one and a half knots, N. W. Barometer, 30.1; temperature of air, 78°; of water, 78°. Winds: E. by N., E. N. E., E. by N. Light breezes and hazy weather; water smooth, rippling very strong, indicating a strong N. W. current. These 24 hours the weather very fine, and, although the barometer has fallen $\frac{1}{10}$, there is no apparent indications of losing our present favorable wind.

Feb. 24. No observations. Current, one and a quarter knots, N. W. Barometer, 29.9; temperature of air, 79°; of water, 79°.5. Winds: E. N. E., N. E., E. S. E. First and middle parts, fine; midnight,

barometer 30.1, at 4 A. M. 29.9; daylight, heavy appearances to S. E.; from daylight to meridian, frequent squalls of wind and rain from S. E. Since 19th, the barometer has remained up until within two hours of change from N. E. to S. E. I here predict it will remain below 30° until we cross the equator, or get without the influence of the rainy latitude.

Feb. 25. Lat. 3° 10′ N.; long. 28° 40′ W. Current, one knot, N. W. Barometer, 29.9; temperature of air, 83°; of water, 81°. Wind: E. S. E. Heavy squalls during first part; middle, strong breezes and heavy head sea; latter part, squally. During these 24 hours, the barometer has fluctuated *a tenth* several times; weather very warm and sultry; the first "Mother Carey's chicken" of the voyage seen to-day. Thus far, the voyage has been extremely barren of incident, not having seen any vessels for 20 days, and scarcely a bird or fish of any kind.

Feb. 26. No observations. Current, three-quarters of a knot, N. W. Barometer, 29.9; temperature of air, 82°; of water, 82°. Winds: E. S. E., S. E. to S. S. E., S. E. to S. by E. Throughout, heavy squalls rising at south; working round to S. E., with frequent heavy rain; weather very murky and close, at times quite oppressive.

Feb. 27. Lat. 2° 24′ N.; long. 28° 57′ W. Half knot current, W. N. W. Barometer, 29.8; temperature of air, 82°; of water, 82°. Calm throughout, with much rain; a confused sea from S. S. E.

Feb. 28. No observations. Current, half knot, W. Barometer, 29.8; temperature of air, 82°; of water, 82°. Wind: E. S. E., calm. Throughout, light airs and calm; heavy looking squalls, but unattended with wind; considerable rain at times.

March 1. Lat. 0° 29′ N.; long. 29° 55′ W. Current, three-quarters of a knot, W. Barometer, 29.8; temperature of air, 84°; of water, 82°. Winds: E. S. E., E. S. E., S. E. First and middle part, heavy squalls of rain; barometer fell to 29.7 at 4 A. M., up again to 29.9; heavy head sea from S. by E.

March 2. Lat. 1° 27′ S.; long. 30° 49′ W. Current, one knot, W. Barometer, 29.7; temperature of air, 82°; of water, 82°. Winds: S. E., S. E., S. S. E. Throughout, fresh and squally from S. E., with rain; of course, ship "close hauled;" heavy head sea from S. by E.

March 3. Lat. 2° 44′ S.; long. 32° 04′ W. Current, one knot, W. Barometer, 29.8; temperature of air, 83°; of water, 82°. Winds: S. E. by S., S. S. E., S. S. E. Throughout, moderate weather, assuming the settled weather of the "trades," *only requiring a rise in the barometer to assure me of that fact*, and I confidently expect the coming 24 hours will so see it.

March 4. Lat. 1° 27′ S.; long. 33° 35′ W. Current, one and a half knots, W. N. W. Barometer, 29.9; temperature of air, 83°; of water, 82°. Winds: S. S. E., S. E., S. E. Throughout, moderate, fine weather; close hauled by the wind; Mer. Barometer, 30.*

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* "I have no doubt that, although for the last few days the wind has been scant, yet 2° or even 3° more to west would have enabled me to cross, say in 31½° or 32° without any fear, as, from the experience of many voyages to Pernambuco, I never found any difficulty in *getting past* 'Cape St. Roque,' *even in crossing in* 34° on one occasion. In the event of falling to leeward, I would recommend beating along shore, *inside the reef* always. There are no dangers but visible ones; at least I found such the case, in beating up from the 'Rio Amazonas,' a few years back."

March 5. Lat. 6° 8′ S.; long. 34° 37′ W. Current, 1 knot, W. N. W. Barometer, 30.1; temperature of air, 84°; of water, 82°. Winds: S. E., S. E. by E., S. E. Throughout, moderate, fine weather; every appearance of trades; barometer up; at 8 A. M. made the land.

March 6. Lat. 8° 8′ S.; long. 34° 30′ W. Current, 1 knot, N. W. Variation observed, 2° W. Barometer, 30.2; temperature of air, 84°; of water, 82°. Winds: S. E., E. by S., E. S. E. Throughout, moderate and fine weather; consider myself as fairly within the trades.

MEM.—Having, as I consider, got to the westward far enough to make sure of not being driven back, it may not be out of place to give my humble opinion with regard to the mooted point of making the passage around this bug-aboo, Cape Horn. I most distinctly *disagree* with those who recommend keeping to the eastward of the Falkland Islands; not conceiving the necessity of keeping so far to leeward, rendering the beating against a heavy head sea and strong current, necessary. The chances for S. E. winds do *not*, in my opinion, make up for the great difference in distance between eastern and western sides of those islands. My opinion is not predicated solely on the beautiful weather I experienced to the westward of those islands; but to the fact, that to the northward and westward of Staten Land, you are in a measure free from the heavy S. W. swell; which, by reference to *that* part of this *abstract*, it will be observed I had very smooth water, and so continued until I passed Staten Land. In Rio, I had frequent conversations with several whale captains, and their opinions are in conformity with my own. I do not hesitate to say the winter months (May, June, and July), are the best for doubling the cape, with more certainty of easterly winds; the only drawback being the interminable long nights. After all, I feel sure that masters in the European trade, who have, during the California fever, made the passage around the cape, will agree with me in saying, doubling Cape Horn is nothing in comparison with making the passage from Liverpool to New York, during our winter months.

June 2. Lat. 55° 09′ S.; long. 77° 30′ W. Barometer, 30.1; temperature of air, 36°; of water, 41°. Winds: S. W., S. W., S. W. by S. Throughout, heavy from S. W., frequent squalls of snow and rain.

June 3. No observations. Barometer, 29.7; temperature of air, 34°; of water, 42°. Winds: S. W. by W., and W. N. W. First part, strong; middle, more moderate with rain. Ends strong with constant rain; under short canvas heading to S. W.

June 4. No observations. Barometer, 29.5; temperature of air, 44°; of water, 42°. Winds: W. N. W., W., W. Throughout, heavy gales with constant rain; barometer rose to 30.2, but fell again towards daylight; weather very disagreeable; *filled all our empty casks with most excellent water;* this may be considered rather singular at this season and in this latitude.

June 5. Lat. 52° 13′ S.; long. 79° 15′ W. Barometer, 29.4; temperature of air, 46°; of water, 43°. Wind: W. throughout, strong from the westward.

June 6. Lat. 49° 49′ S.; long. 80° 05′ W. Current, two and three-quarter knots. Variation, 23° 10′. Barometer, 29.7; temperature of air, 44°; of water, 44°. Winds: W. by N., S. S. W., S. First part, moderate; middle, squally with rain from southward. Ends same.

June 7. Lat. 46° 28′ S.; long. 80° 47′ W. Current, N. N. E., half knot. Barometer, 29.7; temperature

of air, 45°; of water, 45°. Winds: S. S. W., S. W., S. W. Throughout, heavy with frequent squalls of wind and rain. The weather feels much colder than any we have yet had.

June 8. Lat. 43° 17′ S.; long. 82° 11′ W. Variation, 22° 15′. Barometer, 30.1; temperature of air, 49°; of water, 47°. Winds: S. W., S. S. W., S. Throughout, strong breezes, and frequent heavy rain squalls attended with much wind.

June 9. Lat. 42° 26′ S.; long. ——. Barometer, 30.3; temperature of air, 51°; of water, 48°. Wind: S. and variable. First part, light; middle, variable and calm.

June 10. No observations. Barometer, 30.0; temperature of air, 49°; of water, 49°. Wind: N. W. First part, light; middle, fresh; latter, strong, and dirty appearances.

June 11. No observations. Barometer, 29.8; temperature of air, 52°; of water, 53°. Winds: N. W., W. N. W., W. N. W. Throughout, dirty, drizzling weather; blowing strong at times.

June 12. Lat. 38° 53′ S.; long. 79° 30′ W. Barometer, 29.9; temperature of air, 54°; of water, 54°. Winds: W. N. W., N. W., N. W. Throughout, moderate; constant drizzling rain; very unpleasant.

June 13. No observations. Barometer, 29.4; temperature of air, 54°; of water, 54°. Wind: N. W. by N. throughout. Throughout, moderate; constant drizzling rain; heavy W. N. W. swell.

June 14. Lat. 38° 03′ S.; long. 80° 12′ W. Barometer, 29.4; temperature of air, 60°; of water, 54°. Winds: N. W., W. N. W., N. W. Throughout, a most shocking bad 24 hours; calm, heavy gales, torrents of rain, lightning, &c. This is the only *really bad* weather I have yet had, and altogether I have seen *very few* more decidedly unpleasant in my life. It is perhaps rendered more so from not expecting anything of the kind, presuming bad times had passed, with passing the cape.

June 15. No observations. Barometer, 29.3; temperature of air, 62°; of water, 55°. Winds: N. W., N. W., W. N. W. First part, strong; middle, moderate. Ends heavy gales and torrents of rain. The barometer (during the last four days) has fluctuated repeatedly from 30 to 29; several times in the course of eight hours, presenting the most remarkable fluctuations I ever witnessed. Since 10th, the weather has been very much like the month of March, north 34½° on the coast of United States.

June 16. Lat. 36° 28′ S.; long. 78° 38′ W. Barometer, 29.6; temperature of air, 64°; of water, 55°. Winds: N. W., W. N. W., W. First and middle, very heavy gale. Ends moderating; barometer down several times to 29.

June 17. Lat. 34° 28′ S.; long. 78° 59′ W. Barometer, 30.00; temperature of air, 65°; of water, 56°. Winds: W., W. S. W., S. Throughout, moderate. At 7 A. M. Juan Fernandez in sight, bearing north.

June 18. Lat. 34° 09′ S.; long. 80° 01′ W. Barometer, 29.8; temperature of air, 65°; of water, 56°. Winds: calm, N. N. W., N. W. First part, calm; middle, strong; latter, blowing hard, much rain. Barometer fluctuating $\frac{5}{10}$ several times during the 24 hours. At 8 A. M. Massafuera in sight, west per compass.

June 19. No observations. Barometer, 29.6; temperature of air, 65°; of water, 57°. Wind: N. W. throughout. Throughout, heavy weather, with almost constant rain. The fluctuations in barometer still continuing, causing a deal of uneasiness; I have never had anything like it before; and this, after being an attentive observer of that instrument for more than twenty-two years.

June 20. Lat. 32° 10′ S.; long. 78° 38′ W. Barometer, 29.6; temperature of air, 66°; of water, 58°. Winds: N. W., N. N. W., W. Throughout variable, but most remarkable; from calm to lying to, torrents of rain, clear, lightning, heavy sea, smooth as a mill-pond; and thus, during the 24 hours, every variety of weather under the sun, with the same fluctuations in the barometer. I am disposed to think *all this* is occasioned by, or a prelude to, some great change, perhaps an earthquake; who knows?

June 21. Lat. 29° 58′ S.; long. 79° 41′ W. Barometer, 29.9; temperature of air, 63°; of water, 59°. Winds: S. W., S., S. S. W. Throughout squally with rain; wind during squalls hauling far as W. N. W.

June 22. Lat. 28° 46′ S.; long. 79° 53′ W. Barometer, 30.00; temperature of air, 65°; of water, 59°. Winds: S. S. W., calm, N. W. First part, squally; middle, calm; latter part, moderate. By looking back, it will be seen I have been unable to get to the west, being desirous of crossing the equator about 115°, at the suggestions of many experienced "whalemen." My own judgment would have suggested 90°, but the above advisers recommend their crossing far west, on account of better winds.

June 23. Lat. 26° 50′ S.; long. 78° 45′ W. Variation observed, 13° 50′. Barometer, 29.9; temperature of air, 66°; of water, 62°. Wind: N. W. throughout. Throughout, light winds and smooth water; wind at times favoring, so as to lay north, but mostly N. N. E., which, with the variation, makes easting fast.

June 24. Lat. 25° 29′ S.; long. 79° 40′ W. Current, N. N. E., half knot. Barometer, 30.00; temperature of air, 66°; of water, 64°. Winds: W., W. S. W., S. W. Throughout, light winds and drizzling rain most of the time; but wind being so much better than of late, the change is quite acceptable.

In consideration of this very strong evidence in favor of the western or new route to the line, I quote an extract from the log-book of the brig Eolian, C. A. L. Blanchard, master.

The Eolian sailed from New York, May 3, 1851, with the Charts on board. She crossed the equator in 31° W., June the 9th—passed St. Roque, June 12 (40 days out), without going to the west of longitude 33°.

The captain, in compliance with my general request, that every navigator would state in his abstract whether he had a longer or shorter passage than vessels arriving about the same time without the Charts, says:—

"You will see by this abstract, my passage has been somewhat lengthy, but in comparison with many vessels which have arrived without your *Sailing Directions* it has been short. One barque from Boston having a passage of seventy-five days, and two Baltimore vessels (fast sailers) had a passage of sixty-eight and seventy days; also one from the same port of eighty-five days. The above vessels crossed the line far to the eastward."

I have also the abstract of the N. B. Palmer (Charles P. Low, master), that sailed from New York, April 7 (4 days after the Eolian), also with the Charts on board. She too took the new route—she passed the Eolian, May 10 (the third day out). Both vessels that day crossed the parallel of 37° N.; the Eolian in longitude 56°; but the N. B. Palmer 8° farther west. This ship crossed the line in 31° W., June 2, and the parallel of Rio, June 15, or two weeks ahead of the Eolian; and from 29 to 46 days ahead of the

vessels mentioned by Captain Blanchard, which had not the *Wind and Current Charts*, and which went the old route.

So, also, with Captain Caldwell, of the Great Britain. I quote his letter, and extract from his very valuable abstract log, because of the information which they give as to the Cape Horn passage.

"*June* 14, 1852 (SAN FRANCISCO). I herewith forward you the abstract log of ship Great Britain, of Boston, under my command from New York to this port. The ship is 25 years old, and *not a clipper*. The ship John Jay sailed in company, not yet arrived. The last I heard from her she was at Rio, leaky. I do not know whether she had your Charts. The clipper ship Aramingo left New York three days after we did, say 12th January, *without* your Charts, went nearly to the Western Islands, crossed the line in about 26° W., went east of Falkland Islands, I believe, and arrived here one day after I did, say 138 days, without stopping. On my Chart (Blunt's), I find St. Paul's Island placed in long. 28° 20′ W., and in some editions of Bowditch the same; while in other editions, and in Horsburgh's *Directory*, 29° 15′ to 29° 22′ W. As this island is directly in the track of outward-bound ships, it is important that *all charts and books* should be correct. I passed close to it, having had a good observation in the *morning*. It was cloudy when I passed it, about 4 or 5 P. M., but there is no doubt that it is in about 29° 20′* and *not* 28° 20′. With regard to your Charts, allow me to say I think very highly of them. I crossed the equator in about 30° in 26½ days from New York, after losing my tiller and being thereby detained 16 hours with a *strong fair gale*. I passed to the windward of Noronha, cleared St. Roque and St. Augustine, and the first time I tacked ship from New York was south of Rio, which I passed in less than 37 days, with a very deep ship. Passed through the Straits of Le Maire in 60 and Cape Horn in less than 61 days. After that, I had miserable chances. Having been nearly 20 years a shipmaster, and having, during my passage, given the subject much consideration, I will venture, at the risk of being thought presuming, to state my own views on the passage from Cape Horn to this port. Being up with Cape Horn, I would improve all opportunities of making *westing*, with very little regard to latitude, except to keep clear of the land, till in long. of 80° W., then, if wind permitted, edge off very gradually to the N. and shape my course so as to be in the long. of 110° W., in about 30° S. lat.; here you may expect to get the S. E. trades; and then make a due north course *till I took the N. E. trades*. My *reasons* are that you would thus make your westing where the degrees are short, and then cross the entire S. E. trades on a course that would let all your canvas draw, instead of running so much before the wind as to becalm your head sails. You would thus take the N. E. trades in about 110° W., which is as far east as desirable. You will see by the log that the doldrums did not detain me much on either side."

From Captain Sears of the Wild Ranger, San Francisco, October 25, 1853.

I followed your track to the equator for July, and had a passage of 28 days to the equator; crossed

* Its position was accurately determined by the officers of the U. S. ship Marion, in 1849, to be in long. 29° 18′ W., and it is accurately laid down on the *Wind and Current Charts*.—M. F. M.

in 32° 20′; just cleared Rocas, and then had a very hard chance to Cape Horn. I highly approve of your track from Boston to the equator, and have no doubt but that I gained by following your instructions. I found very little current near St. Roque. I intended to have gone through Straits of Le Maire, but the wind being S. W., I could not get far enough to westward, and thought it better to pass eastward of Staten Land. With regard to a passage around Cape Horn, I would say I have seen worse weather between Boston and Liverpool in September, than I have seen for this passage north of the equator. I had a long spell of calm weather, which prolonged my passage. But find, on arrival, that I was in company with four other clipper ships, and all arrived here same day.

Ship Huguenot (J. G. Stover), San Francisco.

May 24, 1853. The ship George Evans arrived here three days after we did, in, I believe, 151 days from Philadelphia; he crossed the equator on this side in 105°; has not your Charts on board.

The ship Astrea, which sailed from New York two days before us, has not yet arrived.

Cape Horn navigators should not forget that the prevailing winds encountered in doubling the cape are westerly winds; that the Andes, which, in fact, terminate only with the continent, stand up as a barrier to these winds; and consequently, these winds come around the cape in violent sweeps, puffs, and gales, as they do around the bluff point of land in a harbor, or the corner of a building on shore; and that the strength of these sweeping winds is probably felt with more force near the cape than it is at a considerable distance off, and out of the influence of the land upon the course and velocity of the wind.

Therefore, I would advise navigators in doubling the cape, first to pass through the Straits of Le Maire, if practicable, and if they can accomplish it by daylight, for the currents are unfrequently strong and conflicting there; to hug the cape as closely as the winds on one hand, and the rocks on the other, will allow, and so make westing down there when the degrees are short, as fast as without fighting adverse winds and weather they may do, until they cross, if bound to California, the parallel of 50° S., between the meridians of 80° and 90° west.

But, if after getting through the straits, and before doubling the cape, a westerly gale strike them in the teeth, then, instead of stopping there off the pitch of the cape to fight against it, with the intention of holding their own till the gale abates, or the wind slants so as to let them get round, I think the chances would be altogether in their favor, by sticking her away south, under the expectation that they would soon get out of the strength of the winds, which, eddy-like, come sweeping around Cape Horn, sometimes at one distance, sometimes at another, according to the direction of the gale. But even in doing this, the navigator who is desirous of making a quick passage, will not fail to take advantage of slants. He will always prefer, until he doubles the cape, the tack upon which he can make the most westing. Vessels intending to touch at Valparaiso, or any of the Intermedios, need not care to get so far west while they are south of the parallel of 50°, even when the winds are fair, as vessels that are bound farther north, as to California for example. Let these last make westing whenever they can, without making southing also. They cannot

well cross the parallel of 50° S. too far west, on their way to California, provided they keep to the east of 100° or 110°.

The Pilot Charts of the South Atlantic and Cape Horn, in addition to the Track Charts, leave but little more to be said with regard to the passages west, around Cape Horn, than may be gathered from the injunction: Study the Pilot Charts.

I think that I may now congratulate navigators, especially those who are co-operating with me, and whose labors have enabled me to bring about these results, upon the present complete state of our knowledge, with regard to the route to Rio.

From St. Roque to Rio is plain sailing, and as far as St. Roque, from the United States, the route is the same whatever be the destination of the vessel, whether Cape of Good Hope, Cape Horn, or Rio.

The route to the clearing of St. Roque, I think I may be permitted to say, without incurring the imputation of self-praise, is as well understood as it is possible for any route across the ocean to be, that is governed and controlled by the force of winds and currents.

From the parallel of St. Roque, the route around Cape Horn, for all vessels from Europe or the United States, is the same.

And from the parallel of St. Roque to the parallel of 50° S., all is also plain sailing, requiring, however, the most watchful vigilance as the price of a quick passage between these parallels, for much of the distance lies through a region of baffling winds.

The average of vessels under canvas from the parallel of St. Roque to 50° S. on the Cape Horn passage, is only about 100 miles a day. The intelligent seaman needs no other sailing directions here than simply: "Make the best of your way south." Of course, he will understand that this "best way" is not to be supposed to lay so close along with the land as to bring him within the influences of the land breezes and the calms of the coast.

Besides this injunction, there is but another simple caution to add, and that is, when you arrive at the calms of Capricorn, do your best to get south; for, by that course, it is easiest to clear them. As to the parallels between which, at the different seasons of the year, you may expect these calms, see the *Trade-Wind Chart.*

From 50° south, east of Cape Horn, to the same parallel west, lies the rub—so it is supposed. Along this part of the route the prevailing winds, it is true, have westing in them, and are, therefore, in a great measure, head winds. How to overcome them depends on the skill of the navigator. The grand object of this work is to let the navigator know how he may expect to find the winds, which way the currents; taking it for granted that, when he knows this, his own skill and intelligence will best guide him as to the rest.

The Pilot Charts will give this information as to winds in a general way. With the view of presenting it in a more special way, extracts have been made from various abstract logs, taken at random, showing the wind and weather encountered by each breeze. These are arranged according to the months, and may be regarded as practical illustrations of the Pilot Charts.

With such sources of information before him, the Cape Horn navigator, who studies them closely, can never, in changes of wind, feel at a loss either as to the best course to steer, or the best tack to put his ship upon, for the best passage.

CAPE HORN TRACKS.

Danube (C. H. Chase).

Jan. 4, 1853. Lat. 30° 36′ S.; long. 40° 36′ W. Barometer, 30.00; temperature of air, 73°; of water, 73°. Winds: N. W. to S. E., S. E. to N. E., S. First part, squally, with sudden changes in the breeze, say from very light airs to strong squalls; middle part, changes not so sudden, but variable and light; latter part, fine breeze from S., and beautiful weather. Four ships in company. Saw a black-colored bird resembling a cape goose.

We have now been at sea fifty-two days, forty-eight of which the wind has had more or less southing in it. I think the Danube has done well to be thus far on her passage. Thanks to Lieut. Maury, and those *hard workers* with him, who have given us such *invaluable* information.

Jan. 5. Lat. 31° 30′ S.; long. 42° 13′ W. Barometer, 30.15; temperature of air, 72°; of water, 71°. Winds: S., S. S. E., S. E. First part, fine breeze; middle part, very moderate and clear; latter part, hazy and light breezes, with long rolling swell from S. W. Two ships in company. This has been the most pleasant twenty-four hours since leaving New York. Long strings of jellies, such as are sometimes seen off the western islands. Cape hens and skipjacks around the ship.

Jan. 6. Lat. 33° 06′ S.; long. 44° 00′ W. Barometer, 30.00; temperature of air, 72°; of water, 70°. Winds: S. E., N. E., N. E. Pleasant breeze and fine weather these twenty-four hours, at times a long swell from S. W. At 12 M. dark-looking weather towards the W.

Jan. 7. Lat. 34° 36′ S.; long. 46° 00′ W. Barometer, 29.60; temperature of air, 72°; of water, 69°. Winds: N. E., N. W., S. W. First part, fresh breeze and light squalls, all sail set; middle part, strong squalls, single-reefed topsails; latter part, heavy squalls; close reefs; lost the foresail, and split main topmast staysail.

Jan. 8. Lat. 36° 22′ S.; long. 45° 30′ W. Barometer, 29.80; temperature of air, 62°; of water, 68°. Winds: S. W., W. S. W., W. S. W. Strong gales and violent squalls until 10 A. M. Close reefs.

Jan. 9. Lat. 37° 04′ S.; long. 45° 17′ W. Barometer, 29.80; temperature of air, 61°; of water, 63°. Winds: W. S. W., W., W.; hard gales, rough sea, and bad weather.

Jan. 10. Lat. 36° 51′ S.; long. 45° 00′ W. Barometer, 30.00; temperature of air, 62°; of water, 62°. Winds: W. S. W., S. W., S. W.; first part, strong gales, and very rough, cross sea, close reefs; middle part, more moderate, double reefs; latter part, squally, single reefs. Tacked to W. N. W.

Jan. 11. Lat. 36° 25′ S.; long. 46° 42′ W. Barometer, 30.15; temperature of air, 64°; of water, 66°. Winds: S. W., S. W., calm; first part, moderate and light squalls; royals set; middle part, long, smooth swell, and moderate; latter part, light airs from S. W., and calms.

Jan. 12. Lat. 37° 50′ S.; long. 49° 23′ W. Barometer, 30.00; temperature of air, 68°; of water, 66°. Winds: W., W. N. W., W. by N.; clear weather and royal breeze for the 24 hours; the greenish color of the water of yesterday, is not to be seen to-day; no albatrosses, nor sea-hens. Heavy S. W. swell leaving us; sea much more smooth at 12 M. than at 8 P. M. I think, if we could have got farther to the westward ere this, we should have been much farther on our voyage.

Jan. 13. Lat. 38° 09′ S.; long. 50° 33′ W. Barometer, 30.10; temperature of air, 68°; of water, 65°. Winds: S. W. to N. W.; calm, E. S. E. Throughout the 24 hours very light airs, and variable; smooth sea, and thousands of little sea-gulls on the water; hazy, damp weather, with flying fog from N. E.

Jan. 14. Lat. 39° 49′ S.; long. 53° 46′ W. Current, ¾ knot per hour, N. E. by E. Barometer, 29.90; temperature of air, 65°; of water, 60°. Winds: E. S. E. to S. E., S. E., S. E. by S. First part, moderate; middle and latter parts, fresh breeze and flying fog. Great quantities of birds, as albatrosses, &c.

Jan. 15. Lat. 40° 37′ S.; long. 56° 11′ W. Current, 1 knot per hour, N. E. Barometer, 29.95; temperature of air, 55°; of water, 50°. Winds: S. E. by S., S. S. E., S. First part very foggy, with fresh breeze; much kelp; middle part, more clear; water much discolored; latter part, clear weather, and water of greenish appearance, and strong rips like tide rips; large patches of kelp; sea at one time very smooth, and at another very rough. Sounded; no bottom with 110 fathoms; good sound.

Jan. 16. Lat. 40° 37′ S.; long. 56° 05′ W. Current, 1¼ knot per hour, N. E. Barometer, 29.95; temperature of air, 52°; of water, 48°. Wind: S., calm, calm. First part, very moderate. At 4 P. M. sounded in 60 fathoms; fine, dark sand; light air from W. S. W.; middle and latter parts, calm; much kelp; strong rips. At 8 A. M. sounded; *no bottom*, 115 fathoms.

Jan. 17. Lat. 42° 31′ S.; long. 57° 42′ W. Current, 1½ knot per hour, N. E. by N. Barometer, 29.60; temperature of air, 55°; of water, 48°. Winds: W. N. W., N. W., S., and variable. First part, gentle breeze; middle part, light breeze, and fine, clear weather; latter part, light rain squalls from S. W., and very moderate; very small, tired-looking land birds on board; also, flocks of small millers or moths; water much discolored; much kelp and floating weeds; sounded; no bottom, 115 fathoms.

Jan. 18. Lat. 42° 16′ S.; long. 58° 02′ W. Current, 1¾ knot per hour, N. E. by N. Barometer, 29.90; temperature of air, 51°; of water, 48°. Winds: S. by W., S. S. W., calm. Moderate for 24 hours; fogs and clear weather about every two hours. Kelp and feathers in large quantities.

Jan. 19. Lat. 43° 29′ S.; long. 58° 11′ W. Current, 1¾ knots per hour, N. E. by N. Barometer, 29.50; temperature of air, 51°; of water, 51°. Winds: calm, N., S. W. Middle part, squalls, rain, and calms, very changeable; latter part, thunder, lightning, hard squalls. Much kelp; water quite blue; wind from W. to S. W.

Jan. 20. Lat. 44° 36′ S.; long. 58° 36′ W. Current, 1½ knot per hour, N. E. by N. Barometer, 29.70; temperature of air, 54°; of water, 51°. Winds: S. S. W., N. W., S. Weather changeable, sometimes a gale and sometimes almost calm. Wind sudden in its changes, clear at times and then hard squalls. Kelp and numerous birds.

Jan. 21. Lat. 45° 05′ S.; long. 60° 21′ W. Current, 1 knot per hour, N. E. by N. Barometer, 29.70;

temperature of air, 52°; of water, 47°. Winds: calm, S., N. W. First and middle parts, calms and light airs; latter part, fine breeze and clear weather; long rolling swells from south. Kelps, strong rips like tide rips; at one time very smooth, at another very rough. Dark, heavy fog bank at south.

Jan. 22. Lat. 47° 25′ S.; long. 60° 44′ W. Current, 1 knot per hour, N. E. by N. Barometer, 29.70; temperature of air, 52°; of water, 49°. Winds: W. N. W., W. S. W., S. S. W. Fine clear weather for 24 hours, with steady breeze. All sail set. Barometer no use; varied in the 24 hours from 29.50 to 29.90. At 4 P. M. sounded in 60 fathoms, fine dark sand. Kelp, penguins, and numerous other birds. To-day, noon, water quite blue, having passed this morning strong tide rips. Sea smooth and rough at times.

Jan. 23. Lat. 47° 58′ S.; long. 60° 36′ W. Current, ½ knot per hour, N. N. E. Barometer, 29.90; temperature of air, 50°; of water, 49°. Winds: S. W., S. W. by S., S. W. by S. Unsteady winds, hard flams, and smoky looking weather. Kelps and seaweed. Tacked to the westward. Heavy rolling sea from S. W. Split maintop-gallant sail.

Jan. 24. Lat. 48° 01′ S.; long. 60° 45′ W. Barometer, 30.00; temperature of air, 50°; of water, 49°. Calm throughout the day. A heavy rolling sea from S. W.

Jan. 25. Lat. 49° 57′ S.; long. 62° 30′ W. Barometer, 29.70; temperature of air, 50°; of water, 50°. Winds: N. N. W., N. W., N. W. First part, calms and light airs; middle part, moderate breezes; latter part, thick and rainy, fresh breeze. Water much discolored.

Jan. 26. Lat. 50° 06′ S.; long. 63° 06′ W. Barometer, 29.60; temperature of air, 50°; of water, 50°. Winds: W. N. W., S. W., S. S. W. First part, fine breezes; all sail set. At 8 P. M. wind hauled in a squall to S. S. W., strong gale; double reefs. Latter part, heavy sea and hard gale from S. W. to S. S. W.; close reefs. Water much discolored. No doubt soundings extend from about lat. 40° 40′ S., and long. 57° W. On a S. S. W. line per Chart to Tierra del Fuego.

Jan. 27. Lat. 50° 27′ S.; long. 63° 02′ W. Barometer, 29.60; temperature of air, 50°; of water, 49°. Winds: S. S. W., S. W. by W., S. S. W. Gales, squalls, and variable winds, always from the southward. Wore ship about six times during the 24 hours.

Jan. 28. Lat. 50° 7′ S.; long. 63° 35′ W. Barometer, 29.70; temperature of air, 49°; of water, 46°. Winds: S. W., W., S. S. W. Through this 24 hours, strong gales, and very heavy sea. At 4 A. M. wind hauled in a squall from S. W. by W., to S. S. E.; wore ship. At 5 A. M. wind in the usual quarter, S. S. W.; brig in company, and has been for the last three days.

Jan. 29. Lat. 50° 39′ S.; long. 63° 57′ W. Barometer, 29.80; temperature of air, 50°; of water, 48°. Winds: S. S. W., W. S. W., S. W. Fresh gales, and squally; from top-gallant sails to close reefs; latter part, hard hail squalls; large quantities of kelp; water much discolored; very rough sea at times, and then smooth; four sail in sight.

Jan. 30. Lat. 51° 23′ S.; long. 64° 11′ W. Barometer, 29.70; temperature of air, 50°; of water, 48°. Winds: S. W., S., N. N. E. First part, fresh breezes, squalls; middle part, light airs and calms; latter part, gentle breeze from N. N. E., and thick weather; heavy rolling sea from south, and water much

discolored; kelps; white stormy petrels, the first I have ever seen; if not white petrels, they have the same *motions*, are of same form and size, and follow in the wake, same as all others; two sail in company.

Jan. 31. Lat. 53° 26′ S.; long. 63° 32′ W. Barometer, 29.50; temperature of air, 50°; of water, 48°. Winds: N. E., S. W., E. S. E. First and middle parts, strong breezes, hard hail squalls, and steady rain; latter part, squalls and rain from E. S. E to S.; water quite blue; much kelp and many birds.

Feb. 1. Lat. 54° 29′ S.; long. 63° 39′ W. Barometer, 29.70; temperature of air, 46°; of water, 45°. Winds: E. S. E., calm, calm. First part, moderate; middle and latter parts, calm; saw the land, Cape St. John, S. S. E. per compass; am satisfied that soundings extend *much* farther eastward from the River La Plata towards the Falkland Islands, than laid down on any chart I have seen; to-day much kelp, and strong tide rips.

Feb. 2. Lat. 54° 04′ S. long. 63° 38′ W. Barometer, 29.60; temperature of air, 46°; of water, 45°. Winds: calm, calm, S. E. Latter part, light airs from S. E. Throughout the 24 hours, long, rolling swell from S. E.; Cape St. John, S. S. E. by compass, distant about 30 miles.

Feb. 3. Lat. ——; long. ——. Barometer, 29.50; temperature of air, 44°; of water, 44°. Winds: S. E., N. E., N. E. First part, very light, strong N. N. W. current; middle and latter parts, fresh from N. E., and fine weather; have had several opportunities to test the correctness of chronometer; find it perfect. At noon, west end of Staten Land, N. W. by W., ½ W. by compass; east end, N. by E.

Feb. 4. Lat. 56° 18′ S.; long. ——. Current, 2 knots per hour, N. E. Barometer, 29.50; temperature of air, 45°; of water, 46°. Winds: N. E., N. E., S. S. E. First and middle parts, fresh gale and thick rainy weather; latter part, very pleasant. At noon, Cape Horn, W. N. W., ½ W. by compass.

Feb. 5. Lat. 56° 37′ S.; long. 69° 38′ W. Current, 0.7 of a knot per hour, N. E. by E. Barometer, 29.40; temperature of air, 46°; of water, 41°. Wind: N. E. throughout. Steady gentle breeze for 24 hours, from 3 to 6 knots per hour. At — A. M., Diego Ramirez, N. W. by compass, distant 3 miles; long. —; rolling swell both from east to west.

Feb. 6. Lat. 56° 29′ S.; long. 71° 30′ W. Barometer, 29.65; temperature of air, 48°; of water, 46°. Winds: S., S. W., calm. First and middle parts, very light airs, and pleasant; latter part, calm, and light rain squalls from N. W.; no kelp; whales and penguins in plenty.

Feb. 7. Lat. 56° 31′ S.; long. 72° 28′ W. Barometer, 29.65; temperature of air, 46°; of water, 46°. Winds: W. S. W., W. N. W., W. S. W. First and middle parts, very light breeze; latter part, hard hail squalls with strong breeze.

Feb. 8. Lat. 56° 30′ S.; long. 74° 00′ W. Barometer, 29.70; temperature of air, 46°; of water, 44°. Winds: W. S. W., variable, N. W. by W. First part, squally; middle part, calms and light variable winds; latter part, good breeze from N. W. by W., and squally.

Feb. 9. Lat. 56° 49′ S.; long. 77° 03′ W. Barometer, 29.40; temperature of air, 44°; of water, 44°. Winds: N. W. by W., W. N. W., W. Rain, hail, and squalls; sea in heaps, very thick for 24 hours.

Feb. 10. Lat. 55° 11′ S.; long. 77° 17′ W. Barometer, 29.60; temperature of air, 44°; of water, 44°. Winds: W., W. S. W., W. N. W. Fresh breeze for 24 hours; bad sea, and rough weather.

Feb. 11. Lat. 55° 50′ S.; long. 79° 55′ W. Barometer, 29.25; temperature of air, 45°; of water, 44°. Wind: N. W. by W. throughout. Strong gales, hard squalls, and rough sea, for the 24 hours, with just rain enough to keep one uncomfortable.

Feb. 12. Lat. 55° 46′ S.; long. 80° 20′ W. Barometer, 29.20; temperature of air, 43°; of water, 44°. Winds: W. N. W. and W. S. W., W., N. W. by W. Same as yesterday, only that the hailstones are larger, and squalls more violent. Lat. (D. R). 55° 36′; long. (D. R.) 80° 49′.

Feb. 13. Lat. 56° 13′ S.; long. 80° 35′ W. Barometer, 29.20; temperature of air, 44°; of water, 44°. Winds: N. W. by W., W. N. W., W. N. W. Strong gales, hard squalls, heavy sea and close reefs. Lat. (D. R.) 56°; long. (D. R.) 81° 05′.

Feb. 14. Lat. 56° 37′ S.; long. 80° 52′ W. (D. R.) Barometer, 29.20; temperature of air, 44°; of water, 44°. Wind: W. N. W. throughout. Hard gales, hard squalls, and a hard time; close reefs and very bad sea.

Feb. 15. Lat. 55° 25′ S.; long. 80° 02′ W. Barometer, 29.20; temperature of air, 46; of water, 44°. Winds: W. N. W., W. N. W., S. W. Strong gales and hard squalls up to 4 A. M. At meridian all reefs out; squally. Lat. (D. R.) 55° 23′; long. (D. R.) 80° 30′ W.

Feb. 16. Lat. 53° 54′ S. (D. R.); long. 80° 15′ W. (D. R). Barometer, 29.10; temperature of air, 43°; of water, 44°. Winds: W. N. W., calm, S. E. by E. First part, squally and variable; middle part, calm; latter part, thick and rainy. Very heavy swell from the west; many small gulls around the ship.

Feb. 17. Lat. 52° 38′ S.; long. 80° 15′ W. Barometer, 29.20; temperature of air, 44°; of water, 44°; Winds: S. S. E., S. W., W. by S. First part, fine breeze; middle part, almost calm; and latter part squally. Lat. (D. R.) 52° 03′; long. (D. R.) 80° 50′. If our indefatigable Lieut. Maury can find a passage of same length of time, with as *much* head-wind in it as this, I shall believe I am not alone. Shall give you the true *log* distance when we strike the S. E. trades.

Feb. 18. Lat. 50° 15′ S.; long. 80° 20′ W. Barometer, 29.50; temperature of air, 44°; of water, 46°. Winds: W. by S., W. S. W., W. S. W. Through the 24 hours, hard squalls and very large hail-stones. Lat. (D. R.) 49° 56′; long. (D. R.) 80° 37′.

N. B.—In all cases the longitude and latitude (D. R.) are brought forward last observations; log regularly hove every two hours during the passage.

Feb. 19. Lat. 47° 45′ S.; long. 80° 46′ W. Barometer, 30.00; temperature of air, 45°; of water, 47°. Wind: W. S. W. throughout. First part, hard squalls, and the largest hailstones I ever saw; middle part, more moderate; latter part, light squalls. All canvas set. Large flocks of birds. Lat. (D. R.) 47° 34′; long. (D. R.) 80.37.

Contest, fifty-three days out.

Jan. 8, 1853. Lat. 50° 46′ S.; long. 60° 55′ W. Winds: S. W. by S., S. W. First part, brisk breeze, and cloudy; middle part, moderate; latter, fresh. Single reefs.

Jan. 9. Lat. 50° 32′ S.; long. 63° W. Winds: S. S. W., S. S. W., N. W.; comes in fresh and squally. A strong current setting to the S. E. Middle and latter parts, light.

Jan. 10. Lat. 53° 30′ S.; long. 64° 41′ W. Winds: N. W., S. W., S. W. by W. First part, light airs, and pleasant; middle, light breezes; latter, moderate and fine. Have had a large swell heaving from E. N. E. since 6 this morning.

Jan. 11. Lat. 56° 14′ S.; long. 66° 34′ W. Winds: W. N. W., W., S. First part, pleasant breezes. At 7 P. M. saw Cape St. Diego, bearing S. by W., distant ten miles. At 9 P. M. passed through the straits, Cape Bartholomew bearing per compass east, distant ten miles. Latter part, strong gales from south. At meridian, Cape Horn bore W. ½ N., twelve miles distant.

Jan. 12. Lat. 57° 4′ S.; long. 65° 38′ W. Winds: S. W., S. W. by S., S. W. All these twenty-four hours, strong gales, with hail and sleet in squalls.

Jan. 13. Lat. 58° 46′ S.; long. 66° 2′ W. Winds: S. W., calm, W. First part, fresh breezes; middle, calm; latter, light and rainy.

Jan. 14. Lat. 58° 33′ S.; long. 68° 44′ W. Winds: W. S. W., W. S. W., W. First and latter parts, fresh breezes; middle part, moderate.

Jan. 15. Lat. 59° 26′ S.; long. 70° 25′ W. Winds: W., W. S. W., calm. First part, fresh winds; middle, light, and thick weather; latter, calm and thick.

Jan. 16. Lat. 57° 31′ S.; long. 74° 2′ W. Winds: calm, S. E., S. W.; begins calm; ends fresh, with a rugged cross sea.

Jan. 17. Lat. 56° 8′ S.; long. 76° 22′ W. Winds: W. S. W., W. First part, fresh and cloudy; middle, moderate; latter part, strong, with thick rainy weather.

Jan. 18. Lat. 54° 27′ S.; long. 79° 52′ W. Winds: W., S. W., S. W. First part, fresh, and cloudy weather; middle, rainy; latter, strong and squally.

Jan. 19. Lat. 50° 23′ S.; long. 81° 9′ W. Winds: S. W., W. S. W., W. S. W.; brisk breezes all these twenty-four hours, with cloudy, misty weather.

F. W. Brune (D. C. Landis).

Jan. 10, 1853. Lat. 49° 19′ S.; long. 64° 5′ W. Barometer, 29.8; temperature of air, 56°; of water, 54°. Winds: N. N. W., S. E., S. S. E. First part fine breeze and pleasant; middle, light and baffling; large swell from east; latter part, light and pleasant.

Jan. 11. Lat. 51° 25′ S.; long. 64° 50′ W. Barometer, 29.25; temperature of air, 56°; of water, 53°. Winds: E. N. E., N., W. S. W. First part, light and pleasant; barometer falling; middle part, fresh gales and rising sea; barometer still falling; latter part, hard gales and heavy sea. I notice that the sea rises fast in this neighborhood.

Jan. 12. Lat. 53° S.; long. 64° 14′ W. Current, E. N. E., ¾ knot per hour. Barometer, 29.6; temperature of air, 54°; of water, 46. Wind: W. S. W. First part, strong breezes; middle, strong gales, large sea; ship laboring very much; very cold; barometer gradually rising; latter part, pleasant.

Jan. 13. Lat. by the land 54° 45′ S.; long. by the land 63° 42′ W. Current, 2 knots per hour, N. N. W. Barometer, 29.4; temperature of air, 54°; of water, 45°. Winds: W. S. W., W. N. W., W. by N. First part, moderate and pleasant; smooth sea; middle, strong breezes. The sea has the appearance of a strong current tumbling about like breakers. At 9 A. M. east end of Staten Land bearing south by compass. Ends strong breezes and misty.

Jan. 14. Lat. 56° 16′ S.; long. 62° 54′ W. Current, 2 knots per hour, E. N. E. Barometer, 29.55; temperature of air, 52°; of water, 44°. Winds: W. S. W., S. W., S. W. First part, fresh breezes; appearance of strong current; middle, fresh gales; water smooth; latter part, fresh gales and squally.

Jan. 15. Lat. (D. R.) 57° 7′ S.; long. (D. R.) 63° 4′ W. Barometer, 29.15; temperature of air, 52°; of water, 44°. Winds: N. by W., W., N. by W. Fresh breezes and smooth; middle part, moderate and misty; latter, light and foggy; heavy swell.

Jan. 16. Lat. (D. R.) 57° 10′ S.; long. (D. R.) 63° 30′ W. Barometer, 29.15; temperature of air, 48°; of water, 44°. Winds: W., S. S. W., S. S. W. First part, moderate and rainy; S. W. swell; barometer falling; middle, fresh and rainy; barometer continues to fall until 11 P. M., then 28.75. After midnight, it rose again without much increase of wind; latter part, light breeze; tremendous heavy swell from W. S. W. Can this have been a gale to the westward of us which caused the fall of the barometer? It certainly has been blowing hard to cause all this sea.

Jan. 17. Lat. 57° 57′ S.; long. 63° 50′ W. Current, 90 miles, easterly since last observation. Barometer, 29.48; temperature of air, 49°; of water, 43°; Winds: S., S., S. W. Moderate and cloudy, with heavy sea from S. W.; cold; middle part, light and baffling; ends pleasant.

Jan. 18. Lat. 58° 50′ S.; long. 66° 33′ W. Current, ¾ knot, east. Barometer, 28.9; temperature of air, 52°; of water, 43°; Winds: N. W., N. N. W., calm. First part, moderate and pleasant; heavy swell from the westward; middle part, fresh, thick, and rainy; ends light airs and calms; foggy.

Jan. 19. Lat. (D. R.) 59° 10′ S.; long. 66° 31′ W. Current, 1 knot east, per hour. Barometer, 28.9; temperature of air, 50°; of water, 43°. Winds: calm, calm, N. N. W. First and middle parts calm, heavy swell from westward; ends light breezes. The barometer has remained nearly stationary.

Jan. 20. Lat. 59° 46′ S.; long. 67° 08′ W. Current, 1 knot per hour, east. Barometer, 28.9; temperature of air, 48°; of water, 42°. Winds: N. N. W., S. W., W. S. W. First part, moderate breezes and rainy—very cold; ends light breeze and pleasant. A heavy swell from the westward. Barometer remains low all the time; it appears to be of no use here, though I will continue to use it for your gratification.

Jan. 21. Lat. (D. R.) 59° 56′ S.; long. (D. R.) 69° 28′ W. Barometer, 28.75; temperature of air, 48°; of water, 41°. Winds: W., N., E. First and middle parts, light winds and pleasant; latter part, strong breezes and rainy; not so much westerly swell. Barometer all the time very low.

Jan. 22. Lat. 59° 36′ S.; long. 73° 52′ W. Barometer, 29.3; temperature of air, 53°; of water, 43°. Winds: S. E., S., S. S. W. Throughout moderate breezes; quite smooth.

Jan. 23. Lat. 59° 18′ S.; long. 75° 00′ W. Current, ¾ knot, E. N. E. Barometer, 29.5; temperature of air, 56°; of water, 43°. Winds: S. W., calm, N. W. Light breezes and pleasant.

Jan. 24. Lat. 59° 32′ S.; long. 78° 48′ W. Current, 1 knot, E. S. E. Barometer, 29.4; temperature of air, 48°; of air, 43°. Winds: N. W., N. W., N. N. W. Moderate breezes and pleasant. Heavy westerly swell.

Jan. 25. Lat. (D. R.) 59° 14′ S.; long. (D. R.) 82° 10′ W. Barometer, 28.8; temperature of air, 48°; of water, 43°. Winds: N. N. W., N., S. W. First part, strong breezes; middle, quite moderate, squally; ends, blowing hard gales; cold, rainy weather.

Jan. 26. Lat. (D. R.) 58° 23′ S.; long. (D. R.) 82° 53′ W. Barometer, 29.05; temperature of air, 48°; of water, 43. Winds: S. W., calm, N. N. W. First part, gales and high sea; but moderating towards the last. Middle part, light, westerly airs; latter part, moderate breezes, thick and rainy.

Jan. 27. Lat. 57° 40′ S.; long. 83° 54′ W. Current, 30 miles, E. S. E. since last observations. Barometer, 29.3; temperature of air, 48°; of water, 44°. Wind: W. S. W. Fresh breezes, thick and rainy; blowing in flaws quite strong; a westerly swell.

Jan. 28. Lat. 55° 52′ S.; long. 84° 41′ W. Current, 1 knot, east. Barometer, 29.65; temperature of air, 48°; of water, 44°. Winds: S. W., W. S. W., S. W. by W. First part, strong gales and squally; heavy westerly swell. Middle part, more moderate; latter part, fresh breezes and squally. You will observe that the barometer is gradually ranging higher as we decrease our latitude.

Jan. 29. Lat. 54° 34′ S.; long. 86° 13′ W. Current, none. Barometer, 29.6; temperature of air, 48°; of water, 46°. Winds, S. W., calm, N. N. E. First part, fresh breezes and pleasant; middle part, light airs and calms; latter part, fresh and cloudy.

Jan. 30. Lat. 52° 11′ S.; long. 89° 08′ W. Current, none. Barometer, 29.8; temperature of air, 51°; of water, 47°. Winds: N. N. E., E. S. E., S. S. W. Strong breezes; high sea; close reefs; middle part, blowing heavy in squalls; ends more moderate; barometer rising.

Jan. 31. Lat. (D. R.) 50° 46′ S.; long. (D. R.) 89° 09′ W. Barometer, 29.8; temperature of air, 50°; of water, 47°. Winds: W. by S., W., N. N. W. First part, fresh and squally; heavy swell from S. W.; middle part, moderate; latter, fresh and squally.

Feb. 1. Lat. 50° 15′ S.; long. no observation. Current, 36 miles, E. N. E. since last observation. Barometer, 29.3; temperature of air, 52°; of water, 48°. Winds: N., N. W., and W. First part, strong gales and disagreeable weather; turbulent sea from N. W.; appearance of a strong current; middle part, the same; latter, strong breezes and hazy.

Feb. 2. Lat. 48° 50′ S.; long. 90° 00′ W. Current, E., one knot per hour. Barometer, 29.4; temperature of air, 52°; of water, 50°. Winds: W. S. W., W., W. S. W. First and middle parts, fresh breezes with heavy sea from N. W.; latter part, strong breezes with large swell from S. W. We have had a constant current from the westward, amounting to 530 miles since leaving this latitude on the other side. The barometer does not appear to act yet. I think a ship in this part of the world is much better without one, for it causes a deal of anxiety, and uneasiness of mind to the master.

Ship Tingqua (S. D. Whitmore).

Jan. 15, 1853. Lat. 55° 20′ S.; long. 65° 35′ W. Barometer, 29.50; temperature of air, 58°; of water, 46°. Winds: First part, baffling; middle part, calm; latter part, W. N. W. Commences with light airs from N. W.; middle part, calm; latter part, fresh breezes and pleasant. At 4 P. M. made Cape St. Inez, S. W. by W., 30 miles. At 4 A. M. passed within one cable's length of Cape St. Diego, low water. No rip off the capes as I have found heretofore, owing to the tide being with the wind. At 5 A. M. passed close to Good Success Bay. The American barque Virginian getting under way, standing out. He reports leaving New York five days before me; by the papers, it is near twenty-five; he got a good supply of wood and water at Good Success Bay. At 10 A. M. clear of the straits; met the tide wind dying away; at noon calm, with light rains; Cape Good Success, N. by E., N. I. Islands W. by S.; strong flood tide; appearances of wind from the S. W.; barometer falling fast; sent down skysail yards and royal studding-sail booms. This gives us fifty-two days out. With an ordinary chance since leaving the river, it might have been forty-five days; but, since then, our latitude has been a hard one, and I think, at this season of the year, there is no need of keeping so close to the land after leaving Cape St. Augustine to the River Plata; but, since then, I found, as I increased my distance from the land, the winds are less favorable and not so strong. If there is any advantage in keeping in shore, I am sure I have had it this passage; however, I shall compare logs with other vessels on my arrival at San Francisco, and inform you.

Jan. 16. Lat. 56° 37′ S.; long. 64° 20′ W. Temperature of air, 58°; of water, 44°. Variation, 29° 40′. Commences calm; barometer falling; at 6, a light breeze from the S. W.; middle part, strong breezes and a heavy sea; ship laboring heavily; latter part, fresh gales from the S. W.; sea more regular.

Jan. 17. Lat. 55° 35′ S.; long. 65° 15′ W. Temperature of air, 48°; of water, 46°. Variation, 29° 40′. Wind: first part, fresh gales from the S. W.; exchanged colors with an American whale ship; middle part, wind, south; latter part, more moderate; wind, S. S. W.; saw a large school of sperm whales.

Jan. 18. Lat. 56° 38′ S.; long. 68° 00′ W. Barometer, 29°; temperature of air, 50°; of water, 46°. Commences with light winds from the N. W., and ends with light winds from S. W.; north point of land, S. S. W.; sugar-loaf on Terra del Fuego, N. by W.; current having set us to the northward and eastward 40 miles during the last twenty-four hours. At 10 P. M., Hermit's Isle bore west five miles; steered S. ½ E. for Barnevelt's Rocks, going eight knots; thick weather; saw nothing; presume passed to the eastward of them.

Jan. 19. Lat. 56° 52′ S.; long. 67° 30′ W. Barometer, 28.5; temperature of air, 44°; of water, 43°. Winds: first part, S. W. light; middle and latter parts W. Boarded by the Captain of an American whaler, who reports light west winds, and thick rainy weather during the last ten days. Preparing for a S. W. blow.

Jan. 20. Lat. 56° 52′ S.; long. 68° 15′ W. Barometer, 29.00 falling; temperature of air, 43°; of water, 47°. Wind: moderate, from the westward all day. At 10 A. M. saw Diego Ramirez, S. W. by S. by compass, distant 20 miles. Standing close in, to take advantage of slants.

Jan. 21. Lat. 57° 07′ S.; long. 70° 00′ W. Barometer, 28.60; temperature of air, 46°; of water, 43°.

First part, a moderate W. N. W. wind, heading as we draw near the land. At 2 P. M. made the land, distant 15 miles; very hazy; indications of a northerly wind. At 4 P. M. tacked 4 miles from the land. At 5 P. M. calm. Current setting to the eastward about ½ a knot. Middle part, N. N. W. At 6 P. M. breeze sprung up at N., increased, hauled to N. E., and back to N. N. W. Latter part, wind W. N. W.; first of it a double-reefed topsail breeze; latter, light breezes and fine weather; tacked ship, all sail. Barometer, 28.60; for my part, I put more confidence in the temperature of the water, than in anything else in these latitudes, as I have not been deceived as yet, especially as regards shifts, rising previous to south and wes winds, and *vice versâ*.

Jan. 22. Lat. 55° 23′ S.; long. 74° 15′ W. Barometer, 29; temperature of air, 44°; of water, 45°. First part. Winds: S. S. W.; middle and latter parts, S. W. Fresh gales and a heavy sea; carrying top-gallant-sail over single reefs.

Jan. 23. Lat. 55° 37′ S.; long. 74° 12′ W. Barometer, 29.30; temperature of air, 53°; of water, 44°. Winds: first part, west and fresh; middle and latter parts, baffling; quite a change in the weather. Spoke the brig Mars, 24 days from Valparaiso; a long passage; land in sight to leeward; tacked ship to southward; Cape Gloucester bearing E. N. E. 10 miles.

Jan. 24. Lat. 55° 07′ S.; long. 77° 25′ W. Barometer, 29.10; temperature of air, 52°; of water, 42°. Winds: first, N.; middle, N. W; latter, N. N. E. Baffling winds and cloudy; saw sperm whales in schools. Ends rainy.

Jan. 25. Lat. 55° 00′ S.; long. 80° 24′ W. Barometer, 29; temperature of air, 54°; of water, 43°. Winds: first part, N. N. W.; middle, N. W.; latter, W. N. W. Strong winds, and dark cloudy weather. At 8 P. M. wind heading; appearances of a change. At 4 A. M. wore ship to the N.; think I am clear of Cape Horn; heavy irregular sea; wind heading us to N. N. E. 2 hours, when it came back to its old quarter.

Jan. 26. Lat. 52° 30′ S.; long. 80° 30′ W. Barometer, 29.30; temperature of air, 48°; of water, 44°. Wind: strong from W. N. W. during the day, with dark cloudy weather.

Jan. 27. Lat. 49° 15′ S.; long. 80° 32′ W. Barometer, 29.75; temperature of air, 54°; of water, 50°. Wind and weather, same as yesterday.

Jan. 28. Lat. 46° 20′ S.; long. 80° 30′ W. Barometer, 29.80; temperature of air, 60°; of water, 58°. Dark cloudy weather, with a W. N. W. wind. Barometer rose until 2 P. M. and there stopped.

Alboni (N. R. Littlefield).

Jan. 18, 1853. Lat. 54° 37′ S.; long. 64° 55′ W. Barometer, 28.20; temperature of air, 40°; of water, 41°. Winds: west, W. S. W., south. First part, light; middle, fresh gales, very thick. At 11 A. M. entered the Straits of Le Maire; very heavy squalls from the south, and thick, which ended in a heavy gale.

Jan. 19. Lat. 54° 33′ S.; long. 63° 40′ W. Current, 28 miles, east. Barometer, 28.10; temperature of air, 39°; of water, 40°. Winds: S. S. W., S. W., S. W. First part, heavy gale, with much rain; the

land entirely shut in; middle and latter, thick and rainy. At 9 P. M. Cape St. John in sight, bearing S. W., 19 miles distant.

Jan. 20. Lat. 55° 10′ S.; long. 62° 52′ W. Current, 20 miles, east. Barometer, 28.30; temperature of air, 40°; of water, 41°. Wind: S. W. Fresh gales, with much rain.

Jan. 21. Lat. 56° 20′ S.; long. 63° 35′ W. Current, 10 miles, east, for the day. Barometer, 28.40; temperature of air, 41°; of water, 41°. Winds: S. W., calm, W. N. W. First part, fresh; ends, fresh and squally.

Jan. 22. Lat. 57° 20′ S.; long. 65° 20′ W. Barometer, 28.60; temperature of air, 41°; of water, 40°. Winds: W., S. W., S. S. W. First part, fresh; middle, very heavy squalls; latter, fresh; large sea from S. W.

Jan. 23. Lat. 56° 36′ S.; long. 65° 20′ W. Barometer, 28.00; temperature of air, 40°; of water, 41°. Winds: S. W. by W., S. W., S. S. W. First part, fresh gales; middle, heavy gales; latter, fresh rain squalls.

Jan. 24. Lat. 56° 36′ S.; long. 65° 20′ W. Barometer, 29.00; temperature of air, 38°; of water, 40°. Winds: S. W., calm, N. E. First part, fresh and clear; latter, very light and cloudy.

Jan. 25. Lat. 57° 27′ S.; long. 71° 26′ W. Barometer, 29.10; temperature of air, 42°; of water, 40°. Winds: N. N. E., W. N. W., S. W. All day, light and pleasant; all sail set to main skysail; Cape Horn in sight.

Jan. 26. Lat. 57° 07′ S.; long. 73° W. Barometer, 28.30; temperature of air, 40°; of water, 42°. Winds: W. S. W., S. W., S. W. Fresh and squally.

Jan. 27. Lat. 57° 00′ S.; long. 74° 15′ W. Barometer, 29.00; temperature of air, 42; of water, 41°. Winds: S. W. by W., W. S. W., S. W. Fresh, with rain squalls.

Jan. 28. Lat. 55° 39′ S.; long. 75° 48′ W. Barometer, 28.50; temperature of air, 42°; of water, 40°. Winds: W. S. W., W. S. W., S. W. Fresh gales and rain squalls.

Jan. 29. Lat. 54° 44′ S.; long. 76° 35′ W. Barometer, 28.40; temperature of air, 43°; of water, 41°. Wind: N. E., south, south. First part, light; middle, wind canted suddenly to south, and blew a furious gale. Lost the foretopsail.

Jan. 30. Lat. 52° 49′ S.; long. 82° 00′ W. Barometer, 28.00; temperature of air, 58°; water, 40°. Winds: S. S. W., south, W. S. W. First part, heavy gale; middle, fresh gale; latter, strong gale, with rain. I now consider that we are fairly past Cape Horn, and never, in one instance, has my barometer deceived me.

Jan. 31. Lat. 50° 36′ S.; long. 83° 45′ W. Barometer, 29.15; temperature of air, 51°; of water, 42°. Winds: W., W. S. W., W. S. W. First part, fresh gales; middle and latter, strong gales, thick and cloudy.

Feb. 1. Lat. 50° 00′ S.; long. 85° 13′ W. Barometer, 29.00; temperature of air, 52°; of water, 47°. Winds: W. by N., N. N. W., W. S. W. First part, light; middle and latter, fresh, thick, and rainy.

Capt. Phinney, of the Kentucky, to Lieut. Maury.

Herewith inclosed you have an abstract of my passage—ship Kentucky. It will be seen that I had good N. E. trades, and lost them in about 5° N., 30° 20′ W.; 19 days from Boston; an old-fashioned ship, and very deep; that I had very little calm or rain, but almost immediately took the S. E. trades, light and baffling, crossed the equator in 32° 40′, 24 days out; wind, S. E.; made two short tacks to eastward in the vicinity of Rocas; passed 17 miles west of same, and cleared St. Roque in 27 days, running all one day near the land, in about 10 fathoms water; crossed the parallel of Rio in 36 days, and from thence to Cape Horn I had a very poor chance. Entered the Straits of Le Maire in 65 days, and in 70 was west of the cape, with but little bad weather, and no easterly current; neither did I feel that strong westerly set, between the line and St. Roque, so much spoken of and feared.

From Cape Horn till I took the S. E. trades, in 35° S., 105° W., I was 36 days, with almost a constant succession of N. W. gales.

I crossed the line in 113° 10′ W., 122 days out; took the N. E. trades in 5° N., and lost them in 26° 00′; after which, my prevailing wind was farther southward, but light and baffling, and soon calms; arrived in port this day, making my passage in 147 days.

In conclusion, I cannot refrain from expressing my sense of the benefit I feel that your labors have already conferred upon the commercial world; and also, my hope that you may be permitted to follow up these researches and investigations, by which, I believe, navigation will in a few years become quite a different matter from what it has been in times past.

Ship Kentucky.

Jan. 28, 1853. Off Cape San Diego, Straits of Le Maire. Barometer, 29.30. Wind: S. W.; squally, variable, and bad weather. At daylight, made the land; Cape St. Vincent bearing S. S. E. Entered the Straits of Le Maire as far as Cape San Diego; the wind veering to S., and blowing violently in squalls; wore ship and stood out; two barques in company—all under close reefs; bad weather.

Jan. 29. Off Cape Good Success. Barometer, 29.40. Winds: S. W., S. W., W. S. W. Hard gales and violent squalls. At daylight, run through as far as Cape Good Success, when the wind veering to S. W., blowing violently, and a heavy sea, wore ship, and stood back again.

Jan. 30. Off Cape San Diego. Winds: W. S. W., S. S. W., S. S. W.; laying under lee of Cape St. Vincent; violent squalls and hard gales. In the morning, calm, with light airs from N. E. Made all sail, and entered the straits. Spoke barque Gold Hunter, of and from Bath, *ninety days out;* we are *sixty-seven.* Ends off San Diego.

Jan. 31. Cape Horn bearing W. S. W., 40 miles distant. Winds: E., E. S. E., calm. Light airs from the eastward, and fine. At 8 A. M. made Cape Horn. Ends calm.

Feb. 1. Cape Horn bearing W. by S. ½ S., distant 20 miles. Winds: W. N. W., W. S. W., W. S. W.; moderate, baffling winds during the night; latter part, squally, with hail.

Feb. 2. Cape Horn bearing N. by W., distant 25 miles. Barometer, 29.40. Winds: calm, calm, N. E., baffling; calm, baffling, squally weather; latter part, light breeze from N. E. I have experienced no easterly current off the cape, yet. Barometer, useless.

Feb. 3. Lat. 56° 24′ S.; long. 71° 10′ W. Barometer, 28.96; Winds: N.E., N.E. by E., N.N.W. Good breezes; latter part, moderate and baffling; calm, showery, light weather.

Feb. 4. Lat. 56° 24′ S.; long. 72° 43′ W. Barometer, 28.94. Winds: N.N.W., S.W., N.N.W. Fine weather; middle and latter parts, calm, baffling, and rainy. Ends fine.

Feb. 5. Lat. 56° 07′ S.; long. 73° 55′ W. Barometer, 29.10. Winds: N., calm, calm. Calms and light baffling airs. Large swell from N. W.

Feb. 6. Lat. 55° 49′ S.; long. 75° 02′ W. Barometer, 29.50. Winds: S.W., W.S.W., W. Light airs throughout; heavy swell from N. W.

Feb. 7. Lat. 55° 04′ S. (D.R.); long. 77° 01′ W. (D.R.) Barometer, 29.55. Winds: W., S.W. by W., W.S.W. Moderate, cloudy, and squally. Tacked to north at midnight.

Feb. 8. Lat. 53° 35′ S.; long. 77° 24′ W. Current, 1 knot per hour, E. Barometer, 29.52. Winds: W., W. by N., W.N.W. Moderate and rainy. In the morning brisk gale, and large sea from N. W.

Feb. 9. Lat. 54° 11′ S.; long. 78° 56′ W. Barometer, 29.30. Winds: W.N.W., W., W.S.W. Hard gales and high sea. Ends moderate, and *thick fog*.

Feb. 10. Lat. 53° 05′ S. (D.R.); long. 80° 26′ W. (D. R.) Barometer, 29.20. Winds: N.W., N.W., N.W. by W. Strong gales, and thick rainy weather.

Feb. 11. Lat. 53° 55′ S.; long. 82° 00′ W. Barometer, 28.90. Wind: N.W. Hard gales and squally. Two ships in company.

Feb. 12. Lat. 53° 15′ S.; long. 82° 00′ W. Current, 1 knot per hour, E. Barometer, 29.30. Winds: W.N.W., W., W.N.W. Hard gales and squally. Latter part, nearly calm.

Feb. 13. Lat. 53° 53′ S.; long. 83° 10′ W. Current, ½ knot per hour, E. by S. Barometer, 29.10. Winds: W.N.W., W.N.W., W. by N. Tremendous gales and very bad sea.

Feb. 14. Lat. 52° 55′; long. 82° 30′ W. Current, ½ knot, E. Barometer, 29.20. Wind: W. by N. Violent gales, and hard squalls of rain and hail all day.

Feb. 15. Lat. 52° 05′ S.; long. 82° 45′ W. Current, 1 knot, E.S.E. Barometer, 29.10. Winds: W.N.W., calm, W.S.W. Hard gales. At 6 P.M. calm. Latter part, hard gales from same old quarter.

Feb. 16. Lat. 51° 31′ S.; long. 82° 30′ W. Current, ½ knot, E. Winds: W.S.W., W., W.N.W. Hard gales and bad sea all day.

Feb. 17. Lat. 50° 48′ S.; long. 82° 30′ W. Current, ½ knot, E.S.E. Winds: W. by S., W.S.W., W.S.W. Hard gales and bad sea.

SAN FRANCISCO, *April* 11, 1853.

LIEUT. MAURY: I herewith send my abstract log of my passage to this port, and I am happy to say, that I feel indebted to your Charts and Directions for my short passage. I crossed the line in 35° 30′ in

less than 18 days from New York, and had no difficulty in beating past Cape St. Roque the 25th day out, and I have beaten everything that sailed about the time I did. It was my intention to go inside the Falkland Islands, but the weather prevented me, and I find, since my arrival, that, by going outside, I gained considerably on other vessels.

I expect to leave here for Manilla; and I regret that I have not similar means of knowing the winds and phenomena of the Pacific, that your Charts give of the Atlantic. I shall forward my next abstract, and think it a slight testimonial for the benefit received.

Clipper Barque Storm (John P. Roberts), New York to San Francisco.

Jan. 31, 1853. Lat. 40° 49′ S.; long. 44° 09′ W. Barometer, 29.90; temperature of air, 59°; of water, 61°. Winds: S. W. during first part; middle and latter part, S. S. W., and N. E. First part, moderate winds and a heavy sea. At 6 P. M. wore ship to the W. by N.; middle part, calm; latter part, moderate breezes from the northeast. Observation, S. 67° W. Distance, 63 miles. I think I have missed it by not running close to Cape Frio, and running the coast down, as it appears to be a dead beat to windward from where we are now. The Pilot Charts give me the chance for fair winds against head ones, in the proportion of about 3 to 2, for making a course from W. S. W. to S. S. W. The results will show how near it comes to the mark. Forty-one days out.

Feb. 1. Lat. 42° 40′ S.; long. 46° 53′ W. Barometer, 29.17; temperature of air, 65°; of water, 56°. Winds: during first and middle part, N. E. by E.; latter part, W. S. W. First and middle parts, fair and all sail set; latter part, heavy gales; ship under double reefs. Although various navigators agree in saying that the barometer is not to be relied on in these latitudes, mine, thus far, has been an unfailing guide. Observation, S. 48° W. Distance, 166 miles.

Feb. 2. Lat. 44° 27′ S.; long. 47° 38′ W. Barometer, 29.85; temperature of air, 56. Winds: W. S. W., W. N. W., W. S. W. Blowing heavy and a high sea running. Wore ship to N. W. Distance, by observation, 112 miles S., 17° W.

Feb. 3. Lat. 43° 08′ S.; long. 48° 20′ W. Wind: W. S. W. throughout. Heavy gales first and middle parts; latter part, moderate. At 8 A. M. tacked to the south. Distance, by observation, 84 miles N., 20° W.

Feb. 4. Lat. 44° 27′ S.; long. 50° 17′ W. Barometer, 29.30. Winds: N. E., N. W., S. S. W. First part, moderate; middle, heavy thunder squalls, with most vivid lightning; latter part, fair, moderate wind. Tacked at 4 A. M. to west; water dark green. Distance, by observation, 116 miles S., 47° W.

Feb. 5. Lat. 46° 28′ S.; long. 52° 20′ W. Barometer, 29.00. Winds: N. W., W., W. S. W. First and middle parts, fine; latter part, heavy gales; weather clear and cold. Distance, by observation, 166 miles S., 31° 30′ W.

Feb. 6. Lat. 48° 47′ S.; long. 53° 00′ W. Barometer, 29.50. Wind: W. S. W. throughout. First and middle parts, strong gale; latter part, moderate. Distance, by observation, 122 miles S., 13° W.

Feb. 7. Lat. 49° 25′ S.; long. 53° 40′ Barometer, 29.60. First and middle parts, calm; latter part,

wind all round the compass; morning rainy, and wind east two hours; at noon, a fresh west wind, with a dense fog. Distance, by observation, 47 miles S., 36° W.

Feb. 8. Lat. 51° 00′ S.; long. 56° 45′ W. Barometer, 29.70. Winds: W. to S. E., S., W. Commences with foggy weather and fresh breeze. At 4 P. M. wind changed to S. E.; at midnight, tacked to S. S. E. Morning, fresh breeze and hazy weather. Passed some kelp. Distance, by observation, 152 miles S., 41° W.

Feb. 9. Lat. 52° 05′ S.; long. 57° 45′ W. Barometer, 29.70. First part, fine breeze from S. by W., and pleasant; at 4 P. M. tacked to W. by S.; at 8 P. M. to S. S. E.; daylight, made the land west, ten miles; saw numerous whales, penguins, and kelp. Middle part, calm; latter part, west; hauled to N. E. at noon, with fine weather. Distance, by observation, 75 miles S., 30° W.

Feb. 10. Lat. 54° 18′ S.; long. 61° 30′ W. Current, 1½ knot per hour, N. E. Barometer, 29.37. Winds: N. N. W., N. W., W.; fine weather and moderate breeze. At 11 P. M. passed within five miles of Beauchure Island to the S. Morning, thick fog; saw whales. Distance, by observation, 190 miles S., 45° 30′ W.; by log, 190 miles.

Feb. 11. Lat. 55° 01′ S.; long. 63° 14′ W. Barometer, 29.40. Winds: S. S. W., calm, W. N. W.; fair weather, moderate breeze. At 2 P. M. tacked to the westward; at daylight, saw Staten Land, bearing W. S. W. 30 miles; at 10 A. M. passed through a strong tide rip, running N. W. and S. E. Distance, by observation, 74 miles S., 54° W.

Feb. 12. Lat. 56° 44′ S.; long. 67° 03′ W. Barometer, 29.04. Winds: W. N. W., W. N. W., W. to S. W. First and middle parts, fine; at 8 A. M. Cape Horn bore W. N. W. fifteen miles. Latter part, strong gale; a heavy swell from the westward. Distance, by observation, 164 miles S., 51° W.; by log, 230 miles.

Feb. 13. Lat. 56° 50′ S.; long. 68° 35′ W. Barometer, 29.36. Winds: W., W. S. W., N. W. by W. First part, strong gales from west; spoke the brig Alfonso, 85 days from Boston for San Francisco; at 8 P. M. tacked to N. W.; at 4 A. M. tacked to S. W. Ends with strong breeze, rainy weather, and heavy sea. Distance, by observation, 50 miles W., 7° S. Fifty-four days out.

Feb. 14. Lat. 58° 08′ S.; long. 71° 11′ W. Barometer, 29.00. Winds: N. W., W. by N., W. N. W. First part, a heavy squall; middle part, more moderate. Spoke the barque A. F. Jenness, 138 days from Philadelphia, *via* Rio Janeiro, 46 days, bound to San Francisco. Ends with fine weather. Distance, by observation, 116 miles S., 47° W.

Feb. 15. Lat. 59° 07′ S.; long. 74° 15′ W. Barometer, 28.80. Winds: W. N. W., W. N. W., baffling from W. N. W. to W. First and middle parts, cloudy weather and moderate breeze. Latter part, light, changeable airs, and hail squalls. Ends calm. Barometer, low, and falling. Distance, by observation, 114 miles S., 58° W.

Feb. 16. Lat. 57° 43′ S.; long. 74° 55′ W. Barometer, 28.73. Winds: calm, S., W. First part, calm; middle part, strong gale. Morning, light airs, and cloudy. Distance, by observation, 114 miles S., 59° W.

Feb. 17. Lat. 56° 24 S.; long. 76° 32′ W. Barometer, 28.70. Winds: S. W., S. W., N. W. First and middle parts moderate breezes, and thick, threatening weather. Morning, light wind; at 10 A. M. tacked W. S. W. Ends with strong breeze. Distance, by observation, 95 miles N., 33° W.

Feb. 18. Lat. 55° 05′ S.; long. 77° 20′ W. Barometer, 29. Winds: W., N. W., W. S. W. First and middle parts, fresh breeze; tacked twice; latter part, squally. Spoke the Chilian ship Jesus Ramos. She reported speaking the Jacob Bell (clipper) on the 16th. She left New York nine days before us. Distance, by observation, 84 miles N., 19° W.

Feb. 19. Lat. 52° 9′ S.; long. 78° 18′ W. Barometer, 29.50. Winds: W. S. W., W., W. S. W. Heavy and frequent squalls and a high sea. Weather cold and cloudy. Distance, by observation, 220 miles N., 23° W.

A. F. Jenness (S. B. Horton).

Feb. 3, 1853. Lat. 51° 30′ S.; long. 67° 4′ W. Barometer, 29.15. Winds: E. N. E., N., N. N. W.

Feb. 5. Lat. 53° 52′ S.; long. 66° 30′ W. Barometer, 29.20. Winds: N. E., E., and E. S. E. Wind light: weather variable.

Feb. 7. Lat. 55° 18′ S.; long. 63° 30′ W. Barometer, 29.40. Winds: N. E., N., and N. W.

Feb. 9. Lat. 56° 34′ S.; long. 65° 40′ W. Current, 24 miles, easterly. Barometer, 29.20. Winds: W., S. W., and N. W.

Feb. 11. Lat. 57° 8′ S.; long. 68° W. Barometer, 29.05. Winds: N. W., W., and S. W.

Feb. 13. Lat. 57° 50′ S.; long. 70° 10′ W. Barometer, 29.08. Winds: N. W., W. S. W., and W. N. W. Moderate breezes.

Feb. 15. Lat. 58° 42′ S.; long. 72° 50′ W. Barometer, 28.78. Winds: N. W., W., and N. W.

Feb. 17. Lat. 57° 7′ S.; long. 75° 40′ W. Barometer, 28.80. Winds: E., W. N. W., and S. W. Light and baffling.

Feb. 19. Lat. 56° 2′ S.; long. 75° 50′ W. Barometer, 29.15. Winds: N. W., S. W., and W.

Feb. 21. Lat. 53° 54′ S.; long. 78° 40′ W. Barometer, 29.85. Winds: E. N. E., S. S. E., and W. S. W.

Feb. 23. Lat. 51° 40′ S.; long. 80° W. Barometer, 29.30. Winds: W. S. W., N. W., and N. N. W.

Feb. 25. Lat. 49° 55′ S.; long. 80° 5′ W. Barometer, 29.60. Winds: N., W. N. W., and N. W.

Flying Childers (J. D. White).

Feb. 7. Lat. 48° 55′ S.; long. 64° 10′ W. Temperature of air, 50°; of water, 48°. Winds: N. E., N. E., S. Throughout this day moderate.

Feb. 8. Lat. 51° 44′ S.; long. 65° 22′ W. Temperature of air, 50°; of water, 48°. Winds: W., W., W. Moderate throughout.

Feb. 9. Lat. 54° 15′ S.; long. 65° 10′ W. Temperature of air, 51°; of water, 48°. Winds: W., W., W. Moderate throughout.

Feb. 10. Lat. 56° 30′ S.; long. 65° 15′ W. Temperature of air, 48°; of water, 45°. Winds: W., W. to S. and to E., W. S. W. Passed through the Straits of Le Maire.

Feb. 11. Lat. 58° 5′ S.; long. 67° 1′ W. Temperature of air, 43°; of water, 45°. Winds: S. W., N. W., S. W. Moderate; smooth sea.

Feb. 12. Lat. 58° 26′ S.; long. 71° 20′ W. Temperature of air, 42°; of water, 43°. Winds: N. W., N. W., N. W. Moderate, with a smooth sea.

Feb. 13. Lat. 58° 35′ S.; long. 75° 20′ W. Temperature of air, 43°; of water, 42°. Winds: W., N. W., N. N. W. Moderate breezes.

Feb. 14. Lat. 59° 27′ S.; long. 77° 1′ W. Temperature of air, 42°; of water, 42°. Winds: N. N. W., N. W., W. Moderate breezes.

Feb. 15. Lat. 58° 57′ S.; long. 77° 44′ W. Temperature of air, 42°; of water, 42°. Winds: W., W., W. Strong breezes, with hail squalls.

Feb. 16. Lat. 58° 8′ S.; long. 77° 44′ W. Temperature of air, 42°; of water, 42. Winds: W., W., W. Light airs and calm.

Feb. 17. Lat. 56° 55′ S.; long. 78° 35′ W. Temperature of air, 43°; of water, 42. Winds: W., W., W. Light airs and calm.

Feb. 18. Lat. 55° 7′ S.; long. 79° 30′ W. Temperature of air, 43°; of water, 44°. Winds: W., W., W. Light airs and calm.

Feb. 19. Lat. 51° 34′ S.; long. 80° 20′ W. Temperature of air, 41°; of water, 46°. Winds: W. S. W., W. S. W., W. S. W. Fresh breezes and squally.

Feb. 20. Lat. 47° 40′ S.; long. 82° 30′ W. Temperature of air, 46°; of water, 50°. Winds: S. W., S. W., S. W. Strong breezes and squally until 8 A. M. Ends calm.

Winged Racer (Wm. Homans), Boston to San Francisco.

Jan. 30, 1853. Lat. 49° 37′ S.; long. 65° 46′ W. Barometer, 28.9; temperature of air, 52°; of water, 50°. Winds: S., W., N.

Jan. 31. Lat. 51° 12′ S.; long. 66° 8′ W. Barometer, 28.6; temperature of air, 50°; of water, 48°. Winds: N., S. W., S.

Feb. 1. Lat. 52° 16′ S.; long. 65° 10′ W. Barometer, 28.6; temperature of air, 50°; of water, 48°. Winds: S., S., S.

Feb. 2. Lat. 53° 12′ S.; long. 65° 12′ W. Barometer, 29.1; temperature of air, 46°; of water, 47°. Winds: S. W., calm, calm.

Feb. 3. Lat. 55° 23′ S.; long. 66° 1′ W. Barometer, 28.7; temperature of air, 46°; of water, 47°. Winds: E., N. N. E., N. At 5 A. M. made the land west side Straits of Le Maire, bearing S. by W. by compass. The Bell Mountain twenty-five miles distant; strong breezes at north, and west end Staten Land plain in sight. Two barques, bound through the straits to southward, in sight. At 8 A. M. Cape Good Success, bearing N. W. by N. five miles; a very strong tide setting to northward.

Feb. 4. Lat. 56° 43′ S.; long. 68° 35′ W. Barometer, 28.6; temperature of air, 52°; of water, 49°. Winds: N.N.E., W., N.E. At 8 P.M. Cape Horn in sight, bearing W.N.W. fifteen miles; distant 53 days from New York, and run a distance, by log, of 8,420 miles from New York to Cape Horn.

Feb. 5. Lat. 56° 50′ S.; long. 71° 20′ W. Barometer, 28.7; temperature of air, 50°; of water, 49°. Winds: N., N.W., N.W.

Feb. 6. Lat. 56° 32′ S.; long. 73° 2′ W. Barometer, 29.0; temperature of air, 47°; of water, 49°. Winds: S.S.E., S.S.E., W.

Feb. 7. Lat. 56° 7′ S.; long. 76° W. Barometer, 29.02; temperature of air, 46°; of water, 48°. Winds: W., S.W., W.S.W.

Feb. 8. Lat. 56° 11′ S.; long. 78° 30′ W. Barometer, 28.8; temperature of air, 46°; of water, 48°. Winds: W. by S., W.N.W., N.W. by N.

Feb. 9. Lat. 55° 46′ S.; long. 82° 46′ W. Barometer, 28.9; temperature of air, 46°; of water, 48°. Winds: N.W. by N., W.N.W., S.

Feb. 10. Lat. 54° S.; long. 82° W. Barometer, 29.8; temperature of air, 46°; of water, 48°. Winds: S., S.W., N.W.

Feb. 11. Lat. 53° 3′ S.; long. 82° 47′ W. Barometer, 28.7; temperature of air, 46°; of water, 48°. Wind: N.W. throughout.

Feb. 12. Lat. 51° 3′ S.; long. 82° W. Barometer, 28.6; temperature of air, 46°; of water, 48°. Wind: N.W. throughout.

Feb. 13. Lat. 50° S.; long. 82° W. Barometer, 29.0; temperature of air, 52°; of water, 48°. Wind: N.W. throughout.

On leaving New York, I followed your Directions as near as the wind and weather would allow, and crossed the equator in the Atlantic in long. 31° 16′, and found no difficulty in getting past the Brazil coast. Time to equator 21 days, 21 hours, and passed through the Straits of Le Maire; and off Cape Horn had light fine weather. Off the Horn, I tried to follow your Directions in getting west; but the wind prevented me, hanging to N.W. after around the Horn; and I passed about three degrees to west of Juan Fernandez. The S.E. trades I had far to the eastward, sometimes E.N.E., and from that to E.S.E.

Crossed the equator 7th of March, 1853, 85 days out, in long. 106° 24′ west. Took N.E. trades in about 3 or 4, wind N.N.E. to N., and arrived off this bar, Sunday, 27th of March, in a thick fog, which continued until Wednesday, 30th, when it cleared up and I run in.

I should follow your Directions again if I was coming round the Horn, as near as the wind and weather would permit me. Although I am of opinion that, with the wind I had in the South Atlantic, after passing lat. 38° south, had I gone to east of Falkland Islands, I think I should have gained some 5 days in the passage, and should have got in in 100 days. I was 105 days to the bar.

I am going from this to Manilla and thence to New York; on my arrival at the latter port, I shall send an abstract from this to that port.

I take this opportunity to acknowledge the great benefit I have derived from your Charts and Directions, and shall most readily contribute what little I can to aid you in the great and good undertaking. We have been sadly in want of what you are now so happily doing in the way of *Sailing Directions* and *Charts* for this navigation, say from U. S. A. round the Horn into North Pacific.

Ship John Bertram (F. Lindholm).

Feb. 8, 1852. Lat. 54° 53′ S.; long. 62° 24′ W. Current, north, 22 miles. Barometer, 29.67. Winds: S. W., variable, variable. First part, moderate breezes and rainy weather; no prospects of clearing up, so as to get hold of the land; kept off to the eastward, and gave up the idea of going through the straits, which I was very sorry to do. In my opinion, every vessel bound around the cape, should endeavor to go through the Straits of Le Maire [a good opinion], provided they can get a sure bearing of the land, to know their true position. I have been through three different times and found no difficulty, but gained a great advantage of being so much farther to windward; I have also strong reasons to think that there is better weather generally under the land, than off from it. At sundown, the weather clearing up, saw Staten Land, bearing S. W. ½ W. 5 leagues. Middle part, variable winds and squally weather, with rain; latter part, pleasant weather; a strong current setting to the north.

Feb. 9. Lat. 57° 24′ S.; long. 62° 28′ W. Current, E. by N., 37 miles. Barometer, 29.82. Winds: S. W. by W., W. S. W., and S. W. by W. Throughout these 24 hours, fresh breezes and passing rain squalls.

Feb. 10. Lat. 55° 58′ S.; long. 64° 26′ W. Current, N. by E., 21 miles. Barometer, 29.80. Winds: S. W. by W., S. W. by W., and N. W. by W. First part, strong breezes and squally weather; under single reefs; middle part, gentle breezes and squally, with hail; morning, calm for three hours. At 6 A. M. a breeze sprang up from the N. W. by N., tacked to the S. W., and made all sail; latter part, light breezes and pleasant.

Feb. 11. Lat. 56° 09′ S.; long. 70° 20′ W. Current, east, 49 miles. Barometer, 29.62. Winds: N., N. by W., and N. by W. First part, fine breezes from the north, and pleasant weather; middle part, brisk breezes. At 1 A. M. Cape Horn bore per compass N. N. W., distant 5 miles. A strong current, by the appearance of the water, which I found to have set me 49 miles to the eastward, by meridian observation. At 4 A. M. saw Diego Ramirez Island, bearing S. W. by W. Latter part, fine breezes and heavy weather. At meridian, Island of St. Ildefonso bore per compass, due north.

Feb. 12. Lat. 57° 00′ S.; long. 75° 17′ W. Current, east, 25 miles. Barometer, 29.70. Winds: N. N. W., N. N. W., W. Fine breezes and pleasant weather; evening, squally; middle part, strong breezes and squally, with hail, snow, and a head beat sea; latter part, strong breezes and squally, with a heavy head sea.

Feb. 13. Lat. 57° 42′ S.; long. 79° 08′ W. Current, east, 20 miles. Barometer, 29.82. Winds: W. N. W., N. W. by W., and N. W. First part, strong breezes and pleasant; middle part, moderate

breezes and squally; wind variable, veering five or six points for several hours; latter part, fresh breezes and squally rainy weather.

Feb. 14. Lat. 55° 18′ S.; long. 81° 23′ W. Current, E. ½ N., 33 miles. Barometer, 30.10. Winds: N. N. W., S. W., and W. by S. Strong breezes, and rainy, squally weather. At 9 P. M. wind hauled suddenly to the S. W.; middle part, strong breezes and squally, with a heavy head sea; latter part, brisk breezes; wind inclining more to the westward, with an increasing sea from that quarter.

Feb. 15. Lat. 52° 59′ S.; long. 81° 12′ W. Current, E. by S., 18 miles. Barometer, 30.27. Winds: W. N. W., W. by S., and W. by S. First part, fine breezes and cloudy; middle and latter parts, moderate and pleasant, a heavy sea running from the west.

Feb. 16. Lat. 51° 12′ S.; long. 82° 20′ W. Current, none. Barometer, 30.53. Winds: S. W. by W., W. S. W., calm. First part, fine breezes and fine weather; middle part, light winds; latter part, calm and cloudy; little or no current; the log has probably not been strictly attended to.

Feb. 17. Lat. 50° 16 S.; long. 84° 10′ W. Current, E. S. E., 31 miles. Barometer, 30.60. Winds: N. by W., N. W. by N., W. N. W. Light breezes from the N., and pleasant weather; middle part, moderate, with light rain; morning, foggy; latter part, light breezes and foggy weather; at meridian, fog lifted and got observations.

Feb. 18. Lat. 46° 32′ S.; long. 85° 17′ W. No current. Barometer, 30.35. Winds: W. by N., W. S. W., and S. W. First part, brisk breezes and cloudy; middle part, strong breezes and squally, with a heavy head sea; latter part, strong breezes, with cloudy hazy weather.

Ship Golden West (Samuel R. Curwen).

Feb. 10. Lat. 49° 41′ S.; long. 63° 01′ W. Barometer, 29.40; temperature of air, 49°. Winds: N. N. W., N. N. W. to N., S. S. E. First part, brisk breezes and pleasant; middle part, moderate and thick foggy weather. Sharp lightning at S. E. and S. W.; latter part, brisk breezes from S. S. E. and cloudy. Distance, 157 miles. Appearance of soundings.

Feb. 11. Lat. 50° 38′ S.; long. 65° 31′ W. Barometer, 29.55; temperature of air, 56°. Winds: S. S. W., W. by S., W. N. W. Commences with brisk breezes and cloudy; middle part, light airs and pleasant; latter part, gentle breezes, and passing clouds. Distance, per log, 125 miles. Water much discolored.

Feb. 12. Lat. 52° 58′ S.; long. 66° 13′ W. Barometer, 29.45; temperature of air, 54°. Winds: W. N. W., N. W. to N., S. W. by W. First part, gentle breezes, and pleasant; middle part, light baffling airs, and cloudy. Ends with brisk breezes and clear weather. Sounded in 65 fathoms; gray sand. Distance, 146 miles.

Feb. 13. Lat. 54° 48′ S.; long. 63° 44′ W. Barometer, 29.55; temperature of air, 51°. Winds: S. W. by W., S. S. W. to N. W., W. Commences with fine breezes and pleasant. During the night, light airs from S. S. W. to N. W. and cloudy, at times. At 9 P. M. sounded in 60 fathoms; white and gray sand, and gravel. At 3 hours 30 min. A. M. saw Staten Land, bearing from S. E. to S. Ends with brisk breezes

from the westward and passing clouds. Passed several large tide rips having every appearance of heavy breakers. At noon, Cape St. John, Staten Land, bore N. W. per compass, distant 2 miles. Distance run, 151 miles.

Feb. 14. Lat. 56° 09′ S.; long. 66° 01′ W. Barometer, 29.20; temperature of air, 44°. Winds: W. N. W., S. W. to S., N. to W. S. W. First part, brisk breezes and cloudy; midnight, light airs and cloudy; 2 A. M. calm; 5 A. M. light northerly airs, and thick rainy weather. Ends with light airs from W. S. W., and passing clouds. Very large swell from S. W. Land in sight bearing from W. by S. to W. by N. Experienced 40 miles current, setting N. 72° E. Distance run, 143 miles.

Feb. 15. Lat. 57° 06′ S.; long. 67° 16′ W. Barometer, 29.05; temperature of air, 50°. Winds: S. W. by W., W. to S. W., N. N. W. First part, strong breezes and cloudy; middle part, moderate and baffling; squally at times; latter part, light airs and pleasant. Current of no consequence. Distance run, 67 miles.

Feb. 16. Lat 57° 15′ S.; long. 68° 36′ W. Barometer, 28.90; temperature of air, 45°. Winds: N. W., W., N. N. W. First part, brisk breezes, and pleasant; middle part, heavy gales, blowing violently, in squalls; latter part more moderate, large sea, 32 miles easterly current. Distance, by log, 91 miles.

Feb. 17. Lat. 57° 07′ S.; long. 70° 12′ W. Barometer, 28.80; temperature of air, 42°. Winds: N. W. by N., W., S. W. First part, strong gales, and squally, with rain; midnight, heavy squalls. Barometer, 28.70; latter part, brisk breezes, and passing clouds. Distance, 87 miles.

Feb. 18. Lat. 57° 32′ S.; long. 72° 06′ W. Barometer, 28.95; temperature of air, 45°. Winds: W. S. W., W. by S. to W. N. W., calm. First part, brisk breezes and pleasant; middle part, light and baffling passing clouds; latter part, calm and pleasant. Distance, per log, 107 miles.

Feb. 19. Lat. 57° 42′ S.; long. 73° 00′ W. Barometer, 29.25; temperature of air, 47°. Wind: baffling, from S. W. to N. W.; very light baffling airs, and calm; at intervals squally appearances; tacked several times. Distance, 29 miles.

Feb. 20. Lat. 57° 18′ S.; long. 74° 26′ W. Barometer, 29.70; temperature of air, 44°. Winds: calm, calm, S. S. W.; first and middle parts, calm and clear; latter part, light airs and pleasant. Distance, 42 miles.

Feb. 21. Lat. 54° 34′ S.; long. 77° 00′ W. Barometer, 29.95; temperature of air, 43°. Winds: S. S. W., S. S. W. to W. S. W., W. S. W.; first part, light winds and pleasant; middle part, strong breezes, and equally, and continues the same throughout, with thick cloudy weather. Distance, 191 miles.

Feb. 22. Lat. 51° 57′ S.; long. 77° 45′ W. Barometer, 30.10; temperature of air, 49°. Winds: W. S. W., W. S. W. to W., W. to N. W. by N.; first and middle parts, strong breezes, squally and cloudy; latter part, light and baffling, passing clouds. Distance, 174 miles.

Feb. 23. Lat. 51° 29′ S.; long. 81° 02′ W. Barometer, 29.65; temperature of air, 47°. Winds: W. N. W., N. W. to N. N. W., N. by W. Commences moderate and pleasant; middle part, strong gales and cloudy; large swell from S. W.; latter part, strong gales, and thick foggy weather. Distance run, 142 miles.

Feb. 24. Lat. 50° 28′ S.; long. 80° 53′ W. Barometer, 29.80; temperature of air, 48°. Winds: N. N. W., W. N. W., N. W.; first part, strong gales and squally with rain; middle and latter parts, strong gales, passing clouds, and rough sea. Distance, 112 miles.

Feb. 25. Lat. 48° 39′ S.; long. 78° 09. W. Barometer, 29.95; temperature of air, 50°. Winds: N. W. by N., to N. by W., N. by W., N. W. by N.; brisk breezes and puffy, cloudy at times; weather looking squally; heavy swell from south. Distance, 190 miles.

Ship Bald Eagle (P. Dumaresq), New York to San Francisco.

Feb. 13, 1853. Lat. 49° 26′ S.; long. 64° 20′ W. Barometer, 29.72; temperature of air, 56°; of water, 52°. Winds: S. W., N. N. E., N. N. W; moderate and pleasant.

Feb. 14. Lat. 52° 14′ S.; long. 65° 40′ W. Barometer, 29.33; temperature of air, 54°; of water, 50°. Winds: W., N. N. W., W. S. W.; light breezes, and pleasant; barometer falling.

Feb. 15. Lat. 54° 50′ S.; long. 64° 51′ W. Barometer, 29.00; temperature of air, 56°; of water, 50°. Winds: N. W., W. N. W., N. E.; light breezes, and pleasant; barometer indicating a heavy gale; in the Straits of Le Maire.

Feb. 16. Lat. 56° 8′ S.; long. 67° 20′ W. Barometer, 28.90; temperature of air, 48°; of water, 46°. Winds: N. E., S. W., N.; strong breezes; night squally, with rain; vivid lightning. Ends fresh gales; passed Cape Horn.

Feb. 17. Lat. 56° 36′ S.; long. 70° 41′ W. Barometer, 28.82; temperature of air, 44°; of water, 43°. Winds: N., W., S. W. by S.; fresh gales; passed inside of Diego Ramirez; light and squally.

Feb. 18. Lat. 57° 1′ S.; long. 72° 30′ W. Barometer, 28.94; temperature of air, 42°; of water, 44°. Winds: S. W., W. by N., W.; fresh breezes; middle part, light and squally. Ends with light airs.

Feb. 19. Lat. 57° 14′ S.; long. 73° 34′ W. Barometer, 29.17; temperature of air, 43°; of water, 43°. Winds: westerly, westerly, W. N. W.; light airs throughout.

Feb. 20. Lat. 56° 46′ S.; long. 75° 18′ W. Barometer, 29.66; temperature of air, 42°; of water, 45°. Winds: N. W., E., S. S. E.; light airs throughout.

Feb. 21. Lat. 53° 50′ S.; long. 79° W. Barometer, 29.60; temperature of air, 44°; of water, 44°. Winds: S. by W., S. W., W. S. W.; light breezes; middle and latter parts, fresh and cloudy.

Feb. 22. Lat. 51° 29′ S.; long. 80° 46′ W. Barometer, 29.92; temperature of air, 47°; of water, 47°. Winds: W. S. W., W. by N., N. N. W.; fresh gales; middle part, moderate. Ends fresh and pleasant.

Feb. 23. Lat. 50° 6′ S.; long. 84° 43′ W. Barometer, 28.36; temperature of air, 46°; of water, 47°. Winds: N. by W., N. W., N. by W.; fresh breezes; middle part, rainy. Ends strong gales.

Ship Phantom (A. J. Hallett), Boston to San Francisco.

Feb. 25, 1853. Lat. 49° 03′ S.; long. 65° 07′ W. Variation observed, 22° E. Barometer, 29.09;

temperature of air, 58°; of water, 50°. Winds: N. N. W., S., S. Moderate breezes and clear weather. At 4 P. M. made Cape Blanco, bearing S. W., distant 15 miles; tacking during the night and forenoon.

Feb. 26. Lat. 53° 14′ S.; long. 65° 59′ W. Ripples. Variation observed, 22° E. Barometer, 29.8; temperature of air, 65°. Winds: S. S. E., N. E., N. N. W. First part, moderate and fine weather, with a smooth sea; midnight, fresh breezes and cloudy, with a thick scud flying from the N. E.; latter part, fresh breezes, and a heavy sea running; no observation. Distance run, 264 miles.

Feb. 27. Lat. 55° 05′ S.; long. 62° 30′ W. Heavy ripples. Variation observed, 22° E. Barometer, 29.7; temperature of air, 59°; of water, 52°. Winds: N. N. W., N. W., S. W. First and middle parts, fresh breezes with rain, and thick weather; latter, moderate and fine; hard luck.

Feb. 28. Lat. 56° 55′ S.; long. 64° 05′ W. Variation observed, 17° E. Barometer, 29.7; temperature of air, 54°; of water, 50°. Winds: W. S. W., W. S. W., N. W. Moderate breezes throughout the day; latter, thick and drizzly, with rain.

March 1. Lat. 56° 45′ S.; long. 67° 02′ W. Ripples. Variation observed, 19° E. Barometer, 29.5; temperature of air, 54°; of water, 50. Winds: W. by N., W. N. W., S. W. First and middle parts, squally, with rain; latter, heavy gales from the S. W., and a heavy sea running; ship laboring hard; water making a clear breach over her; close-reefed topsail.

March 2. Lat. 57° 07′ S.; long. 67° 32′ W. Variation observed, 19° E. Barometer, 29.7; temperature of air, 60°; of water, 53°. Winds: S. W., W. S. W., W. S. W. Heavy gales throughout the day. At 4 P. M. Cape Horn bore by compass N. by W. ½ W., distant 25 miles; wore ship.

March 3. Lat. 58° 23′ S.; long. 69° 45′ W. Variation observed, 20° E. Barometer, 29.2; temperature of air, 64°; of water, 54°. Winds: W. by N., W., S. W. by W. Comes in with fresh breezes and squally, with rain; middle, still raining; the weather looking bad, double reefed the topsails. At 4 A. M. heavy gales; put the ship under storm canvas; heavy sea.

March 4. Lat. 58° 42′ S.; long. 72° 35′ W. Variation observed, 22° E. Barometer, 29.2; temperature of air, 56°; of water, 50°. Wind: S. W., N. W., N. W. Fresh breezes and squally throughout the day; heavy sea running.

March 5. Lat. 59° 21′ S.; long. 73° 10′ W. Variation observed, 22° E. Barometer, 28.8; temperature of air, 56°; of water, 44°. Wind: N. W. throughout. Fresh gales and squally during 24 hours; very heavy sea running; ship laboring hard.

March 6. Lat. 59° 36′ S.; long. 75° 50′ W. Variation observed, 22° E. Barometer, 28.9; temperature of air, 54°; of water, 45°. Winds: N. W., N. W., S. W. Fresh gales, with a heavy sea running. At 6 A. M. took the wind from S. W.; wore ship.

March 7. Lat. 58° 57′ S.; long. 77° 36′ W. Variation observed, 22° E. Barometer, 29.2; temperature of air, 55°; of water, 46°. Winds: S. W., W., N. W. First part, moderate breezes and cloudy; middle, light airs and thick hazy weather; latter, calm, and thick hazy weather.

March 8. Lat. 57° 48′ S.; long. 80° 80′ W. Variation observed, 22° E. Barometer, 28.8; temper-

ature of air, 60°; of water, 49°. Winds: N. W., N. N. E., S. W. Comes in with light breezes and thick hazy weather. At 7 P. M. tacked ship; at 11 P. M. fresh gales; a heavy sea from W. N. W., making a clear breach over the ship, and filling her with water; latter part, fresh gales and heavy squalls at times; passed near an American ship bound to California.

March 9. Lat. 55° 08′ S.; long. 80° 25′ W. Variation observed, 22° E. Barometer, 29.3; temperature of air, 58°; of water, 48°. Winds: W. S. W., W., W. Moderate breezes and squally, with a heavy sea running; middle and latter part, moderate breezes; no observations; this is a hard wind to get along with.

March 10. Lat. 53° 16′ S.; long. 79° 08′ W. Variation observed, 22° E. Barometer, 29.5; temperature of air, 60°; of water, 49°. Winds: W., calm, E. S. E. First part, light airs and thick weather; middle, calm, and thick weather with heavy clouds hanging around; latter, moderate breezes and fine weather.

March 11. Lat. 50° 46′ S.; long. 81° 47′ W. Variation observed, 23° E. Barometer, 29.5; temperature of air, 58°; of water, 50°. Winds: S. E., calm, N. N. E. First part, moderate; middle, calm; latter part, fresh gales. The sea making a clear breach over the ship fore and aft; heavy squalls, with rain.

March 12. Lat. 51° 17′ S.; long. 83° 45′ W. Variation observed, 22° E. Barometer, 29.3; temperature of air, 60°; of water, 52°. Winds: N. N. E., N. W., N. W. Fresh gales and heavy sea running. Pitched away flying jib-boom and drew away a good many bolts from the bows. Laboring very hard, and men much used up by the sea breaking over the ship.

March 13. Lat. 50° 43′ S.; long. 84° 10′ W. Variation observed, 22° E. Barometer, 29.6; temperature of air, 60°; of water, 48°. Winds: N. W., W. S. W., W. by N. First part, fresh gales; lying to. At 5 P. M. wore ship and made sail. Middle part, squally, and bad sea running. At 8 A. M. tacked to the S. W., and at noon to north; latter part, fresh breezes and thick, hazy, rainy weather. No observation to-day. Saw a ship to leeward, standing to the northward and eastward.

March 14. Lat. 47° 35′ S.; long. 83° 10′ W. Variation observed, 22° E. Barometer, 29.7; temperature of air, 62°; of water, 49°. Winds: W. N. W., S. W., S. by W. First part moderate, and thick, hazy weather; middle part, squally, with heavy rain. At midnight, a wind shifted suddenly from N. W. to S. W., and blowing fresh; continued so up to noon with a clear sky; ship going 15 knots per hour from 1 A. M. to noon. At 5 P. M. spoke and passed clipper ship Toronto, bound same way, sixty-nine days out. Latter part, fresh breezes and fine weather, with passing clouds. Got a good observation to-day.

March 15. Lat. 44° 27′ S.; long. 85° 24′ W. Variation observed, 22° E. Barometer, 30.00; temperature of air, 61°; of water, 48°. Winds: S. S. W., S. S. W., S. W. First and middle parts, fine breezes and fine weather; latter part, light airs and cloudy; smooth sea. Rate, from 14 to 3 knots per hour.

March 16. Lat. 43° 37′ S.; long. 88° 29′ W. Variation observed, 22° E. Barometer, 30.20; temperature of air, 63°; of water, 49°. Winds: W. S. W., N. N. W., S. E. Comes in with light breezes and cloudy. Middle, squally, with rain. At 6 A. M. took a squall of wind from the south, which soon cleared

the weather. Latter part, gentle breezes and fine weather. Ship going 14 knots with light sails. Now shall make a straight course for 115° longitude, in parallel of 37° south, as per your valuable *Sailing Directions*, which I think much of.

John S. Farran to Lieut. Maury.

I have the pleasure of forwarding you the abstract log of the clipper ship Eagle, under my command, from New York to this port, where I arrived on the 30th ult. You will perceive by it that, from the latter part of the 18th to the 23d January, I had the wind from S. by W., and south, which obliged me to go farther to the eastward than you recommended, and that I crossed the equator also a little to the eastward of your route for that month—on the 24th day. On the 1st February, at noon, during a squall from N. N. E., a whirlwind, veering on its axis from right to left, and moving with an unequal and unsteady motion from E. N. E. to W. S. W., passed within twenty yards of the ship's stern, the ship going 6 knots; when right astern, we were taken aback by the eddy for about two minutes, or until it had passed on our quarter; it moved at the rate of about five miles per hour, and raised the water as if boiling, and seemed to increase as it progressed; but the rain that succeeded shortly after, obscured it from our view. I did not take the S. E. trades until in the latitude of 3° 30′ S., and had a fair run of 40 days to the River Plata, and, passing through the Straits of Le Maire, I made Cape Horn on the fifty-fourth day. I had to go as far south as 50° 20′ S.; and had bad weather until I reached the parallel of 30°, and found no trade until in 22°, and then on the average at E. N. E., which made me regret striving so much to get to the westward. However, I crossed the equator on the ninety-first day, in 115° 30′. I would call your attention to the great fall in the temperature of both air and water, immediately on passing the line; which, taken in connection with the variableness of the wind for some days, the overcast appearance of the weather, and heavy swell coming from the W. N. W., inclines me to think that it has been blowing heavily from the N. W. at some distance in that direction from us, so as to change the direction and interrupt the regular trade, which I think we ought to have carried farther than the parallel of 19° N.

You will observe, also, with respect to the currents in the Pacific, that I found none observable after the 15th March, the observations and the dead reckoning agreeing very nearly, excepting on the 18th, when there was a rise in the temperature of 7°, and a great difference in the latitudes by observation and D. R., which would intimate a current nearly south; but after that there was no indication of any.

I am bound home from this port, *via* Rio de Janeiro, but I have not yet made up my mind what track I shall pursue, and have no data to guide me; however, I incline to the opinion of not going too far to the eastward. Trusting I shall be able to give you a good report, I remain, dear sir, yours, &c.

Eagle (Jno. S. Farran).

Feb. 26. Lat. 49° 36′ S.; long. 58° 54′ W. Barometer, 30.10; temperature of air, 46°; of water, 46°. Winds: N. to E., E., N. to E. Throughout, winds very variable with cloudy weather.

Feb. 27. Lat. 50° 19′ S.; long. 64° 47′ W. Current, ½ knot per hour. Barometer, 29.90; tempera-

ture of air, 51°; of water, 48°. Winds: strong N., N. W., S. S. W. First part, hazy; middle, flawy, cloudy, and hazy; latter, clear. At 7 A. M. 8 fathoms, dark gray sand.

Feb. 28. Lat. 51° 20′ S.; long. 65° 56′ W. Barometer, 29.81; temperature of air, 52°; of water, 48°. Winds: S. S. W., N. W., N. First part, clear; from 8 to 12, calm; middle part, clear; latter, cloudy. At 8 A. M. 65 fathoms, with the same bottom.

March 1. Lat. 54° 21′ S.; long. 65° 45′ W. Barometer, 29.48; temperature of air, 50°; of water, 46°. Winds: N. N. W., N. W., W. S. W. First and middle parts, hazy; latter, threatening appearances. At 7 A. M. saw the coast of Terra del Fuego.

March 2. Lat. 55° 25′ S.; long. 65° 30′ W. Barometer, 29.55; temperature of air, 50°; of water, 46°. Winds: S., W. S. W., N. W. First part, cloudy; middle, cloudy with calms; latter, cloudy and hazy, with strong tide rips throughout. At 7 hour 30 min. P. M. Cape Diego bore S. by E. 5 leagues distant. At noon, east end of Staten Land bore N. E. by N.; Cape Good Success, N. by W.

March 3. Lat. 57° 01′ S.; long. 67° 00′ W. Current, E. N. E., 1 knot per hour. Barometer, 29.27; temperature of air, 51°; of water, 44°. Winds: N., W. N. W., W. S. W. First part, clear; middle, squally with drizzling rain; latter, heavy gales with hard squalls of rain. At 7 P. M. Cape Horn bore S. W. ½ S.

March 4. Lat. 57° 39′ S.; long. 68° 18′ W. Current, E. N. E., 1 knot per hour. Barometer, 29.10; temperature of air, 48°; of water, 42°. Winds: decreasing, W. S. W., W. N. W., N. N. W. First part, passing clouds; middle, clear; latter, cloudy and foggy with drizzling rain.

March 5. Lat. 58° 47′ S.; long. 71° 40′ W. Barometer, 29.00; temperature of air, 46°; of water, 42°. Winds: W. S. W., W. N. W., W. N. W. First part, fresh winds, cloudy, and hazy; middle, fresh squalls and rainy; latter, gales; cloudy, and squally.

March 6. Lat. 59° 20′ S.; long. 74° 20′ W. Barometer, 28.85; temperature of air, 42°; of water, 41°. Winds: W. N. W., W. N. W., N. W. by W. First part, fresh gales and squally; middle and latter moderate, hazy, and foggy, with drizzling rain throughout. At 9 A. M. the wind shifted to S. W. and cleared off.

March 7. Lat. 58° 05′ S.; long. 75° 51′ W. Barometer, 29.00; temperature of air, 42°; of water, 42°. Winds: S. W. by W., W. N. W., and W. S. W. to N. N. E. Moderate and cloudy, with drizzling rain throughout.

March 8. Lat. 57° 14′ S.; long. 77° 17′ W. Current, E., 1 knot per hour. Barometer, at 4 A. M., 28.08; at noon, 28.66; temperature of air, 40°; of water, 42°. Winds: W., N. W., S. W. by S. First part, light winds and cloudy; at 8 A. M. wind hauled to north, squally with rain; middle, heavy gales, with heavy squalls, sleet, and rain; latter part, heavy gales, hard squalls, and cloudy. A heavy sea running.

March 9. Lat. 55° 27′ S.; long. 78° 12′ W. Current, 1 knot per hour, E. Barometer, 29.25; temperature of air, 42°; of water, 44°. Winds: S. W. by W., W. S. W., and S. W. First part, strong gales, with hard squalls and hail; middle, fresh gales, cloudy, and squally with hail; latter, moderate, with passing clouds.

March 10. Lat. 54° 30′ S.; long. 79° 10′ W. Current, E., twenty knots during the day. Barom-

eter, 29.43; temperature of air, 42°; of water, 44°. Winds: S. W. by W., S. W. by S., and S. S. E. to S. W. First part, moderate; middle and latter, light; calm, from 10 P. M. to 8 A. M.; a heavy swell from W. N. W.

March 11. Lat. 53° 12′ S.; long. 83° 24′ W. Current, half a knot per hour, E. Barometer, 29.50; temperature of air, 45°; of water, 45°. Winds: S. S. W., variable, N. N. E. First part, fresh winds and passing clouds; middle, light variable airs and calms; latter part, gales, with thick cloudy weather; a heavy sea from N. W.

March 12. Lat. 53° 17′ S.; long. 85° 30′ W. No perceptible current. Barometer, 28.90; temperature of air, 46°; of water, 44°. Winds: N. N. E., N. W. by N., N. W. by W. Begins hazy, with threatening weather; middle and latter parts, heavy gales, with hard hail squalls; cloudy, misty weather.

March 13. Lat. 51° 48′ S.; long. 85° 39′ W. No perceptible current. Barometer, 29.56; temperature of air, 45°; of water, 45°. Winds: W., S. W. by W., W. First part, strong gales and heavy squalls, with thick weather; middle, wind decreasing; overcast with drizzling rain; latter part, moderate, with drizzling rain; a very heavy N. W. sea.

March 14. Lat. 49° 02′ S.; long. 87° 19′ W. No perceptible current. Barometer, 30.06; temperature of air, 47°; of water, 46°. Winds: S. W., S. S. W., S. W. by S. First part, light airs, calm, cloudy and rainy; middle, fresh gales and cloudy; latter, strong breezes and fair; a heavy westerly sea on throughout.

Tornado (O. R. Mumford), New York to San Francisco.

Feb. 28, 1853. Lat. 47° 52′ S.; long. 64° 44′ W. Barometer, 29.95; temperature of air, 57°; of water, 52°. Winds: S. S. E., E., and N. E. Sounded with patent lead in 57½ fathoms, gray sand; light breezes and calms. At 4 A. M. sounded in 56 fathoms, gray sand; lat. 47° 16′ S.; long. 64° 30′ W. Distance sailed, by observation, 3,897 miles this month.

March 1. Lat. 51° 31′ S.; long. 65° 06′ W. Barometer, 29.50; temperature of air, 52°; of water, 49°. Winds: N., N. N. E., and N. Fine breezes and hazy weather; distance run, 220 miles.

March 2. Lat. 54° 19′ S.; long. 65° 05′ W. Barometer, 29.55; temperature of air, 50°; of water, 47°. Winds: S. W., S. W., and W. S. W. Moderate breezes and hazy weather; the land about Cape St. Diego could be seen through the haze; spoke the barque Golden Age from Monte Video, bound to San Francisco; distance run, 168 miles.

March 3. Lat. 56° 00′ S.; long. 65° 10′ W. Barometer, 28.90; temperature of air, 50°; of water, 45°. Winds: W. S. W., W. N. W., and N. W. by W. Found it useless to attempt the straits with this wind, the ebb tide just having made; at 7 P. M. Cape St. John's W. ¾ N., distant 6 miles, I noticed a natural bridge, from the first high peak west of the cape to the land to the south of it. When Cape St. John's bears S. 7° W., the peak will bear S. 20° W. when 6 miles from the land. Distance run, 146 miles.

March 4. Lat. 56° 34′ S.; long. 67° 40′ W. Current, E., 1 mile per hour. Barometer, 28.81; temperature of air, 50°; of water, 46°. Winds: S. W., S. W. and calm, and N. W. by N. Moderate breezes

and pleasant; at noon, Cape Horn N. 4° W. by compass, distant 38 miles, and clearly seen. The islands west of it plain in sight, distant 90 miles; strong current rips.

March 5. Lat. 58° 00′ S.; long. 70° 24′ W. Current, E., ¾ mile per hour. Barometer, 28.62; temperature of air, 49°; of water, 44°. Winds: N. W., W. by S., and W. by N. ½ N. At 1 hour 30 min. P. M. the Islands of Diego Ramirez bearing W. S. W., distant 30 miles; at 2 hours 15 min. P. M. Diego Ramirez bore W ½ N. true, and Cape Horn N. E. by N., just seen on the horizon. Latter part, a heavy head sea, and squally; took in two reefs. Distance run, 124 miles.

March 6. Lat. 58° 40′ S.; long. 73° 27′ W. Current, E., ¾ mile per hour. Barometer, 28.56; temperature of air, 48°; of water, 43°. Winds: W. by N., W. by N. ½ N., and N. W. Moderate gale, and a very heavy head sea, with frequent squalls. At 11 hours 30 min. A. M. wind suddenly shifted to the S. W. Distance run, 104 miles.

March 7. Lat. 58° 02′ S.; long. 74° 58′ W. Current, E., ½ mile per hour. Barometer, 28.60; temperature of air, 46°; of water, 44°. Winds: S. W., W. by S., and N. W. by N. Light breezes from the S. W., and foggy, with rain. At 4 A. M. tacked to the southward; at noon, struck aback with a wind from the S. W. Distance run, 62 miles.

March 8. Lat. 57° 17′ S.; long. 76° 22′ W. Current, E., 1¼ mile per hour. Barometer, 27.60; temperature of air, 46°; of water, 45°. Winds: W. by S., N. W. by W., and S. W. At 2 P. M. a clipper ship on our lee quarter. Dist. 8 miles. At 10 P. M. wind backing to the N. Barometer falling fast; latter part, hard rain, wind increasing and hauling to the westward, in heavy squalls. Distance run, 64 miles; clipper ship bears S. S. W. 14 miles.

March 9. Lat. 55° 19′ S.; long. 77° 25′ W. Current, 31 miles, S., 71° E. Barometer, 28.72; temperature of air, 43°; of water, 44°. Winds: S. W. by W., W. S. W., and S. W. Strong breezes and a heavy irregular sea; squalls heavy for two reefs. Distance run, 124 miles; clipper ship S. by W. distant 14 miles.

March 10. Lat. 54° 22′; long. 78° 52′ W. Barometer, 28.90; temperature of air, 46°; of water, 45°. Winds: S. W., calm, and south. Light breezes and fine weather; clipper ship S. W. by S. distant 13 miles.

March 11. Lat. 52° 55′ S.; long. 83° 00′ W. Barometer, 29.00; temperature of air, 44°; of water, 45°. Winds: S., S. and E., and N. N. E. Moderate breezes and pleasant weather. Latter part, fresh breezes. Distance run, 173 miles.

March 12. Lat. 52° 32′ S.; long. 84° 38′ W. Current, east, 18 miles. Barometer, 28.40; temperature of air, 50°; of water, 46°. Winds: N., N. W. by N., N. W. by N. ½ N. Heavy gales; ship under close reef; heavy rain; at 6 P. M. wore ship; a strong gale blowing, and an ugly sea. Distance run, 82 miles.

March 13. Lat. 50° 25′ S.; long. 84° 00′ W. Current, east, 18 miles. Barometer, 29.00; temperature of air, 48°; of water, 47°. Winds: W. S. W., N. W. by N., and N. W. Strong gales, and squally until 7 A. M.; shook out all reefs; clipper ship five miles to windward, on the western tack. Latter part, foggy. Spoke the ship Phantom, from Boston, sailed January 6. Ends with light rain. Distance run, 170 miles.

O. R. Mumford to Lieut Maury.

You will please note that I was compelled, by baffling winds, to make several tacks each day, between the parallel of 35° and 30° S., long. 95° to 100° W. Had I been a few degrees farther east, I have no doubt but that I should have made a better passage; and I have reason to think that if I could have got farther west, such would have been the case; for it appears we were between two winds, not far distant from us either way. We crossed the equator in 118° W., and were 22 days into port, having light winds after passing 28° N. I was very particular about the current, from 30° N. and 135 W. into port; and my observations confirmed those of my other passages. If I ever should come this way again, I will never cross the equator east of 118° W., which I think is about the right spot.

Masconoma (A. D. Cobb), Boston to San Francisco.

March 19, 1853. Lat. 51° 03′ S.; long. 65° 39′ W. Barometer, 30.03; temperature of air, 50°; of water, 48°. Winds: W. N. W., N. W., S. W. First part, light wind and fine weather; middle, moderate and hazy; latter, fresh breezes and fine weather.

March 20. Lat. 53° 37′ S.; long. 65° 18′ W. Current, 1 knot, N. E. Barometer, 29.94; temperature of air, 47°; of water, 45°. Winds: W. S. W. throughout; fine breezes, and pleasant. Barometer falling.

March 21. Lat. 55° 04′ S.; long. 65° 13′ W. Current, the same. Barometer, 29.57; temperature of air, 48°; of water, 44°. Winds: N. N. W., N. N. W., N. W. First part, light winds, and clear; at 6 P. M. hauled up to go outside of Staten Land; midnight, strong winds, and foggy; morning, more moderate; at 8 A. M. hauled up to westward to double Cape St. John. Ends foggy.

March 22. Lat. 55° 25′ S.; long. 64° 20′ W. Barometer, 29.53; temperature of air, 46°; of water, 43°. Winds: N. N. W., S. W., S. E. First part, light airs, and foggy; middle part, very thick, with variable winds, and light rain; latter part, variable airs, and clear. At noon, Cape St. John bore (per comp.) N. N. E. 45 miles distant.

March 23. Lat. 56° 07′ S.; long. 66° 20′ W. Current, 1 knot, N. E. Barometer, 29.50; temperature of air, 47°; of water, 46°. Winds: W., N. W., N. W. by W. First part, light and fine; midnight, strong winds. Ends with light airs from the N. W., with a heavy S. W. swell. Barometer falling slowly.

March 24. Lat. 56° 39′ S.; long. 66° 49′. Barometer, 29.25; temperature of air, 47°; of water, 45°. Winds: N. N. W., W., W. Commences light winds, and cloudy; midnight, squally and rainy. Ends with strong gales. Barometer, steady.

March 25. Lat. 57° 32′ S.; long. 67° 21′ W. Current, 1 knot, N. E. Barometer, 28.90; temperature of air, 41°; of water, 44°. Winds: W. by N., N. W., W. First part, strong gales, with heavy rain; moderated during the afternoon; midnight, the wind increased to a hard gale, which continued throughout. At noon, barometer 28.84.

March 26. Lat. 58° 03′ S.; long. 67° 26′ W. Barometer, 28.84; temperature of air, 41°; of water, 42°. Wind: west; hard gales, with snow squalls.

March 27. Lat. 57° 45′ S.; long. 68° 17′ W. Current, 1 knot, E. N. E. Barometer, 28.90; temperature of air, 40°; of water, 42°. Winds: W., S. S. W., E. First part, hard gales, with severe hail squalls; middle, light, variable winds; at 10 A. M. wind canted to S. S. W. in a snow squall, and increased to a hard gale.

March 28. Lat. 57° 10′ S.; long. 68° 20′ W. Current, the same. Barometer, 28.80; temperature of air, 37°; of water, 45°. Winds: S. W., W., S. by W. First part, strong gales, with heavy squalls, hail, and snow; middle, the same. Ends with moderate winds, and snow squalls.

March 29. Lat. 56° 35′ S.; long. 69° 47′ W. Barometer, 29.60; temperature of air, 36°; of water, 46°. Winds: S. by W., S. by W., S. Commences with strong gales and heavy squalls, and much snow; at 10 A. M. more moderate. Ends with fresh gales and light squalls.

March 30. Lat. 56° 30′ S.; long. 71° 21′ W. Current, 2 knots, E. N. E. Barometer, 29.10; temperature of air, 36°; of water, 43°. Winds: S., S. by E., S. Commences fresh gales and fine weather; middle, light, variable winds, with light snow squalls. Ends fine; with good observations find a 2 knot current (easterly) for the last three days.

March 31. Lat. 56° 07′ S.; long. 73° 26′ W. Current, 1 knot, E. N. E. Barometer, 29.00; temperature of air, 36°; of water, 43°. Winds: S. S. E., S. by E., S. S. E. First part, strong winds, with light snow squalls; middle, light and variable, with heavy clouds; latter, moderate and fine.

April 1. Lat. 55° 36′ S.; long. 78° 18′ W. Barometer, 29.45; temperature of air, 38°; of water, 43°. Winds: S. E., S., S. S. E. First part, moderate; middle and latter parts, strong gales, with snow squalls.

April 2. No observation. Barometer, 29.64; temperature of air, 43°; of water, 45°. Winds: S. S. W., S. S. W., S. W. Commences with strong winds, rain, and snow; middle, strong winds and cloudy; latter, strong gales, with snow and rain.

April 3. No observation. Barometer, 29.64; temperature of air, 45°; of water, 46°. Winds: S. W., S. S. W., S. Commences with strong gales and thick weather, which continue throughout the day.

April 4. No observation. Barometer, 29.85; temperature of air, 47°; of water, 50°. Winds: S. S. W., S. W. by S., S. W. Commences with strong winds, and rainy appearances; midnight, strong gales, and thick cloudy weather. Ends with fresh breezes, and cloudy. Lat. (D. R.) supposed to be about 50° S.

A. Chiseborough (R. C. Chiseborough), New York to San Francisco.

March 19, 1853. Lat. 50° 57′ S.; long. 65° 46′ W. Barometer, 30.00; temperature of air, 56°; of water, 52°. Winds: N., W., S. W. First part, wind light and pleasant; middle and latter parts, moderate breezes and pleasant. Barometer varying from 29.55 to 30.20, without any change.

March 20. Lat. 53° 24′ S.; long. 65° 17 W. Barometer, 29.90; temperature of air, 58°; of water, 54°. Winds: S. W., W., N. First and middle parts, moderate and pleasant; latter part, light.

March 21. No observation. Barometer, 29.70; temperature of air, 58°; of water, 48°. Wind north. First and middle parts, pleasant; latter, foggy; wind variable.

March 22. No observation. Barometer, 29.50; temperature of air, 56°; of water, 49°. Winds: variable throughout. Begins with light winds and a thick fog. At noon, sounded in 40 fathoms; wore ship to the westward; at 3 P. M. saw N. W. point of Staten Land bearing E., distant 3 miles; wore ship to the southward; strong tide setting E. N. E.; tacked ship to N. E.; 8 P. M. fell calm; 9 P. M., light southerly breeze; saw the land, bearing east, 8 miles distant; midnight, rain; 2 A. M. calm; 6 A. M. St. Diego bearing W., 10 miles distant; Cape St. Bartholomew, S. by E., 14 miles; being in 45 fathoms water, and finding a strong tide setting to the eastward, concluded not to go through the Straits of Le Maire; ends with light winds; at 11 hours 30 min. Cape St. John, E. S. E., 15 miles distant.

March 23. No observation. Barometer, 29.50; temperature of air, 53°; of water, 48°. Winds: W., N. N. E., N. First part, light wind, with fine weather. At 6 P. M. calm; 8 P. M. light N. N. E. breeze; at 10 moderate; strong current W. S. W., and finding we could not clear Cape St. John, tacked to the westward, and stood again for the Straits of Le Maire; at 7 hours 30 min. entered with a strong favorable tide and light north wind; at 9 A. M. passed Cape Good Success; ends clear.

March 24. Lat. 56° 29′ S.; long. 66° 40 W. (D. R.) Barometer, 29.30; temperature of air, 49°; of water, 48°. Winds: N. N. E., calm, W. Begins with light winds and fine weather; middle part, calm; at 2 A. M. strong gales from the westward, with rain and hard squalls; ends moderate, with the sun out at times.

March 25. Lat. (D. R.) 57° 10′ S.; long. (D. R.) 68° 50′ W. Barometer, 29.00; temperature of air, 44°; of water, 48°. Winds: W., N., N. W. Begins moderate; at 3 P. M. Cape Horn in sight, bearing N. W., 40 miles distant; 8 P. M. wind light from the northward; midnight, strong gales; 4 A. M. squally, with hail; ends strong gales and heavy sea.

March 26. Lat. 58° 15′ S.; long. ——. Barometer, 28.85; temperature of air, 40°; of water, 44°, Winds: W., W., W. S. W. Commences with hard gales and heavy squalls; at 1 P. M. barometer, 28.85; wind increasing; at 2 barometer, 29.10; squalls not so heavy; middle and latter parts, strong gales and hard squalls of hail and rain.

March 27. Lat. 57° 40′ S.; long. 70° 10 W. Barometer, 28.80; temperature of air, 40°; of water, 44°. Winds: W. S. W., calm, S. W. First part, moderate; middle, calm; at 2 A. M. light from S. E.; 4 A. M. south; 8 A. M. S. W.; strong gales and squalls; ends same; barometer, 29.10.

March 28. Lat. 56° 30′ S.; long. 71° 30′ W. Barometer, 28.90; temperature of air, 36; of water, 42°. Winds: W., calm, S. W. First part, strong gales; at 9 P. M. calm; 11 P. M. east; 1 A. M. S. E.; Barometer, 28.70; 8 A. M. hard gales, and squalls, and high sea; ends the same; barometer, 29.15.

March 29. Lat. 55° 40 S.; long. 73° 10′ W. Barometer, 29.10; temperature of air, 38°; of water. 42°. Winds: S. W., S. W., S. E. First part, hard squalls and calms; middle part, light; at 8 A. M. light from the eastward; barometer, 29.20.

March 30. Lat. 53° 57′ S.; long. 75° 30′ W. Barometer, 29.20; temperature of air, 40°; of water, 43°.

Winds: S. E., S. S. W., S. S. W. First part, light from the southward, with light snow squalls; at 3 P. M. pleasant; middle and latter parts, moderate, with light snow squalls; at 11 hours 30 min. A. M. passed through strong tide rips.

March 31. Lat. 52° 48′ S.; long. 77° 37′ W. Barometer, 29. Temperature of air, 42°; of water, 46°. Wind: variable throughout. Frequent squalls of snow, and sometimes calm.

April 1. Lat. 49° 41′ S.; long. 78° 30′ W. Barometer, 29.20. Temperature of air, 45°; of water, 47°. Winds: variable, S., S. First part, variable, with light squalls of rain and snow. At 6 P. M. strong gales and hard squalls from the southward; middle and latter parts the same; at noon barometer, 29.70.

Lucknow (S. Plumer), Boston to California.

March 7, 1853. Lat. 47° 51′ S.; long. 63° W. Current, slight, N. Barometer, 29.68. Temperature of air, 54°; of water, 53°. Winds: N. W., S. S. W., W. S. W. Begins with a fine N. W. wind and pleasant weather; at evening, it hauled to the westward. During the night, wind baffling from W. to S. At 8 A. M. sounded in 65 fathoms; black and yellow fine sand. Latter part, fine breezes and pleasant. Barometer rather low for such weather, 29.60 to 29.70. Much kelp and sea-weed. 2 A. M. tacked to W., and at 8 A. M. to S.

March 8. Lat. 50° 26′ S.; long. 65° 33′ W. Barometer, 28.88. Temperature of air, 58°; of water, 53°. Winds: W. S. W., N. W., W. Begins with light breezes and fine weather; evening, wind hauling to N. W., and increasing; middle, fresh gales; barometer falling, 29.40; latter part, hard gales and cloudy; barometer at a stand, 28.88; wind hauling to S. W.

March 9. Lat. 51° 22′ S.; long. 64° 36′ W. Slight northerly current. Barometer, 29.25. Temperature of air, 52°; of water, 48°. Winds: W. S. W., S. W., S. S. W. First part, hard gales and furious squalls; middle and latter parts, hard gales. Barometer rising very slowly.

March 10. Lat. 51° 51′ S.; long. 64° 56′ W. Current (per hour), 1 knot, N. N. W. Barometer, 29.30. Temperature of air, 50°; of water, 48°. Winds: S. W. by S., S. W. by W., S. W. Unsteady winds and dark cloudy weather, with showers of rain. At 1 P. M. wore ship to the westward, and at 8, to the southward.

March 11. Lat. 51° 53′ S.; long. 65° 26′ W. Current (per hour), $\frac{3}{4}$ knot, N. Barometer, 29.55. Temperature of air, 49°; of water, 48°. Winds: S. W., S. S. E. to S., S. S. W. Begins with unsteady, gloomy, rainy, and squally weather. Barometer falling. 11 P. M. wind hauled S. S. E. suddenly in a squall; wore to the westward; barometer rose $\frac{5}{10}$ with this change of wind. Ends with hard gale, rough sea, and clear sky.

March 12. Lat. 52° 34′ S.; long. 66° 28′ W. Current (per hour), $\frac{3}{4}$ knot, N. N. W. Barometer, 29.60. Temperature of air, 53°; of water, 49°. Winds: S. S. W. to S. E., S. E. to N. E., N. E. to N. N. W. Moderating; sea going down; during the night, a light air hauling to the northward. Ends with a moderate N. N. W. wind and cloudy weather. Barometer from 29.90 to 29.60.

March 13. Lat. 54° 50′ S.; long. 65° W. Barometer, 29.18. Temperature of air, 51°; of water,

49°. Winds: N. N. W., N. W., N. W. to W. Begins with light breezes and cloudy. Sounded in from 47 to 54 fathoms. At daylight saw the land. At 10 hours 15 min. entered the Straits of Le Maire with a fine N. W. wind, which hauled to W. in the straits. Found a six knot-current setting through, and of course quite a turbulent sea. At noon, Cape Good Success bore S. W. ½ W., and Cape St. Bartholomew (Staten Land) E. ½ N. (per compass). Clear in the straits, but cloudy over the land. Barometer falling gradually, with a continued light breeze and pleasant weather.

March 14. Lat. 55° 56′ S.; long. 64° 18′ W. Current (per hour), ½ knot, N. E. Barometer, 29.25. Temperature of air, 46°; of water, 44°. Winds: W., W. S. W., S. W. by W. Begins with light airs and calms. At 4 P. M. a fresh breeze sprung up at W. S. W., which soon became a gale. Middle, hard gales and harder squalls. Latter, more moderate. Saw cape pigeons and other birds.

March 15. Lat. 56° 05′ S.; long. 63° 34′ W. Barometer, 29.60; temperature of air, 42°; of water, 44°. Winds: S. S. W., S. S. W. Hard gales and heavy squalls; wind from S. S. W. to S.; wore ship twice; wind and sea gradually increasing; no observation. Barometer rising slowly all day.

March 16. Lat. 55° 25′ S.; long. 63° 35′ W. Barometer, 29.76; temperature of air, 44°; of water, 43°. Winds: S. by W., S., S. by W. Commences with hard gales and squalls, with snow and hail—weather same during the night. At 6 A. M. saw Staten Land bearing from N. W. to N.; wore ship to the S. E.; latter part, moderating, but squally; found 40 miles northward in the last two days.

March 17. Lat. (bearings) 55° 18′ S.; long. (do.) 63° 35′ W. Current (per hour) 1 knot, N., 42° E. Barometer, 29.82; temperature of air, 43°; of water, 43°. Wind: S.; unsteady winds, and cloudy, with hail, snow, and rain, during first and middle parts; latter part, light winds and cloudy. Tacked twice, and laid up well on both tacks.

March 18. Lat. 57° 08′ S.; long. 63° 34′ W. (D. R.) Barometer, 29.40; temperature of air, 45°; of water, 44°. Winds: S. S. W., W. Begins with light breezes; during the night, unsteady; morning, freshening. Ends with a settled gale from W.; cloudy during the day, with rain the latter part; barometer falling slowly; no observation.

March 19. Lat. 58° 31′ S.; long. 63° 04′ W. (D. R.) Barometer, 29.45; temperature of air, 47°; of water, 43°. Winds: W. S. W., W. by S., W. Hard gales and foggy, with rain squalls; barometer stationary; a rough, irregular sea running.

March 20. Lat. 58° 48′ S.; long. 62° 10′ W. Current (three last days), 52 miles, N. by E. Barometer, 29.55; temperature of air, 45°; of water, 39°. Winds: W. by S., W. S. W., S. W. by W. Hard gales and rainy, with a bad sea running. 4 A. M. moderated for a short time, a little; barometer fell to 28.25.

March 21. Lat. 59° 25° S. (D. R.); long. 64° 10′ W. (D. R.) Barometer, 29.40; temperature of air, 44°; of water, 40°. Winds: S. W. by W., W., N. W. First, unsteady breezes and foggy, with a heavy sea from S. W.; middle, light N. W. wind; latter, fine N. W. wind and foggy; ship pitching heavily into a head sea.

March 22. Lat. 60° 19′ S.; long. 67° 23′ W. Current, E., 20 miles in two days. Barometer, 29.20;

temperature of air, 44°; of water, 41°. Winds: N. W. by W., N. W. by W., W. N. W. Unsteady breezes from W. N. W. to N. W., and foggy throughout.

March 23. Lat. 60° 15′ S.; long. 68° 41′ W. Current, $\frac{3}{4}$ knot per hour, E. N. E. Barometer, 29.02; temperature of air, 44°; of water, 43°. Winds: W. N. W., W., N. N. W. to W. N. W. Begins with brisk breezes, and foggy. 6 P. M. tacked to the northward; middle, light airs, and calm, pleasant. 3 A. M. brisk breeze from N. N. W., tacked to W. Ends squally; plenty of porpoises, penguins, &c. in sight about the ship.

March 24. Lat. 60° 50′ S.; long. 70° 21′ W. Current, 1 knot per hour, E. N. E. Barometer, 28.82; temperature of air, 45°; of water, 41°. Winds: N. W., W. N. W., N. W.; winds unsteady, from N. W. to W. N. W., with squalls, fog, and rain; from a calm to a gale, with some very pleasant weather. Tacked ship twice; a heavy swell from W. S. W.

March 25. Lat. 60° 37′ S.; long. 70° 42′ W. (D. R.) Barometer, 28.26; temperature of air, 43°; of water, 41°. Winds: N. W. by N., W. by N., W. by N. Begins with brisk breezes, rainy, and squally, which gradually increased to a gale with heavy squalls and torrents of rain. 8 P. M. a sudden shift of wind to west: wore to the N. Ends with hard gales and heavy sea running.

March 26. Lat. 59° 27′ S.; long. 70° 14′ W. Barometer, 28.75; temperature of air, 42; of water, 43°. Winds: W. N. W., W., W. by S. First part, hard gales and squally, with a high sea; middle, hard squalls with rain, sleet, hail, and snow; latter part, unsteady, but moderating; snow squalls; heavy sea from W. S. W.

March 27. Lat. 58° 03′ S.; long. 71° 06′ W. Barometer, 29.00; temperature of air, 42°; of water, 43°. Winds: W. by N., W. S. W. First part, unsteady breezes with snow squalls; middle, calm; morning, hard gale and hard squalls, from S. W. to W. S. W. Ends with snow and rain; heavy sea running; no current the last two days.

March 28. Lat. 57° 04′ S.; long. 72° 40′ W. Barometer, 29.00; temperature of air, 38°; of water, 44°. Winds: W. by S., baffling, S. by W. First part, hard gales from westward, and squally; 8 P. M. fell calm; barometer, 28.60; light snow falling; middle, light breeze from east, which soon hauled to the south, and increased to a gale; clear weather; passing snow squalls. Barometer rose at 4 A. M. Ends with a hard gale, hard and long snow squalls, and a heavy sea.

March 29. Lat. 56° 08′ S.; long. 74° 42′ W. Current, $\frac{3}{4}$ knot per hour, E. N. E. Barometer, 29.12; temperature of air, 40°; of water, 44°. Winds: S. by W., S. W., S. First part, hard gales and hard snow squalls; middle part, moderate but squally; latter part, strong gales and cloudy.

March 30. Lat. 55° 14′ S.; long. 78° 38′ W. Barometer, 29.25; temperature of air, 42°; of water, 45°. Winds: S. by W., S. W., S. Unsteady gales and cloudy with snow squalls and a high sea. Barometer fell $\frac{3}{10}$ or $\frac{4}{10}$; rose again. Many birds about.

March 31. Lat. 53° 40′ S.; long. 81° 19′ W. A slight westerly current. Barometer, 29.10; temperature of air, 44°; of water, 46°. Winds: S. W., S. W. by W., S. S. W. to S. First part, light winds and cloudy with light snow squalls; middle part, fresh gales and cloudy; latter part, wind hauling to southward; heavy gale and heavy sea.

April 1. Lat. 51° 42′ S.; long. 85° 09′ W. (D. R). Barometer, 29.85; temperature of air, 45°; of water, 47°. Winds: S. by E., S., S. by W. First part, hard gales and squally with hail, and a bad sea. Running with wind and sea on the quarter, and shipping much water. Middle, moderating, sea more regular. Ends unsteady gales, cloudy and squally. Barometer rising all day.

April 2. Lat. 49° 58′ S.; long. 88° 22′ W. Barometer, 30.00; temperature of air, 48°; of water, 48°. Winds: S. W. by S., S. W., S. W. Fresh and cloudy.

Ship Esther.

March 7, 1853. Lat. 49° 48′ S.; long. 64° 05′ W. Barometer, 29.20; temperature of air, 51°; Winds: N. W., S. S. W., W. S. W. First part, strong; middle and latter parts, pleasant breezes.

March 8. Lat. 52° 15′ S.; long. 64° 35′ W. Barometer, 28.40. Winds: W. S. W., W. N. W., W. S. W. First part, strong breezes; latter part, moderate.

March 9. Lat. 51° 54′ S.; long. 63° 55′ W. Barometer, 28.20. Winds: W. S. W., W. S. W., S. W. by S. At 9, commenced blowing a hurricane, with a heavy sea. Ship under main spencer, lying to. At 7, shipped a sea breaking adrift water-casks, &c.; barometer ceased to fall. At 3 P.M. began to rise; wind abated a little.

March 10. Lat. 52° 50′ S.; long. 63° 50′ W. Barometer, 29.90; temperature of air, 45°; of water, 46°. Winds: S. W., W. S. W., W. S. W. Strong gale; latter part, heavy squalls of hail and rain.

March 11. Lat. 53° 53′ S.; long. 62° 55′ W. Barometer, 29.90; temperature of air, 45°; of water, 46°. Winds: W. S. W., S. W., S. W.; fresh gales.

March 12. Lat. 54° 20′ S.; long. 63° 25′ W. Barometer, 29.30; temperature of air, 45°; of water, 46°. Winds: S. W., S. S. E., W.; heavy gales and squalls, first part; latter, fresh breeze; made Staten Land at 2 hours 10 min. A. M.

March 13. Lat. 55° 30′ S.; long. 65° 20′ W. Barometer, 28.90; temperature of air, 49°; of water, 45°. Winds: N. W., calm, N. W.; first part, strong breezes and squally looking weather; middle, calm; latter, strong breezes; passed Staten Land at 5 P. M.

March 14. Lat. 56° 23′ S.; long. 65° 00′ W. Current, E., 1 knot per hour. Barometer, 29.00; temperature of air, 44°; of water, 43°. Winds: W. S. W., W. S. W., W. S. W.; first part, light and baffling; at 6 P. M. wind increased suddenly to a very hard gale, with a heavy hard sea from south.

March 15. Lat. 55° 55′ S.; long. 66° 12′ W. Current, N. N. E., 1½ knot per hour. Barometer, 29.40; temperature of air, 42°; of water, 45. Winds: S., S., S.; heavy gales and squalls.

March 16. Lat. 55° 38′ S.; long. 65° 45′ W. Barometer, 29.50; temperature of air, 42°; of water, 45°. Winds: S., S., S.; heavy gales and squalls.

March 17. Lat. 55° 30′ S.; long. 65° 00′ W. Current, N. E., 2 knots per hour. Barometer, 29.50; temperature of air, 50°; of water, 43°. Winds: baffling throughout. We have had 130 miles current, this last 4 days, setting to N. N. E.

March 18. Lat. 57° 10′ S.; long. 65° 30′ W. Barometer, 29.10; temperature of air, 51°; of water, 43°. Winds: S. S. E., W., W. by S.; first part, light and pleasant, latter, heavy gales.

March 19. Lat. 58° 00′ S.; long. 65° 30′ W. Barometer, 29.00; temperature of air, 52°; of water, 41°. Winds: W. S. W., calm, W. S. W.; first and last part heavy gales with rain, middle part calm.

March 20. Lat. 58° 06′ S.; long. 65° 00′ W. Current, E. N. E., 1 knot per hour. Barometer, 29.30; temperature of air, 50°; of water, 41. Winds: W. S. W., W. S. W., W. S. W.; heavy gales and heavy sea.

March 21. Lat 58° 30′ S.; long. 66° 10′ W. Barometer, 29.10; temperature of air, 50°; water, 43°. Winds: W. S. W., W. N. W., W.; light breezes, and thick weather.

March 22. Lat. 59° 30′ S.; long. 68° 30′ W. Barometer, 28.90; temperature of air, 50°; water, 43°. Winds: W. by N., W. N. W., W. by N.; first part, light; latter, good breezes.

March 23. Lat. 60° 17′ S.; long. 72° 15′ W. Current, S. E., ¼ knot per hour. Variation, 23° E. Barometer, 28.70; temperature of air, 50°; of water, 42. Winds: W. N. W., W. N. W., N. W. Fresh breezes.

March 24. Lat. 60° 40′ S.; long. 74° 40′ W. Barometer, 28.2; temperature of air, 49°; of water, 41°. Winds: N. W., W. S. W., N. W. Strong breezes at 4 A. M., for an hour. Latter part, strong gale.

March 25. Lat. 60° 40′ S.; long. 74° 45′ W. Barometer, 27.90; temperature of air, 49°; of water, 41°. Winds: W. N. W., W. N. W., W. Very heavy gales.

March 26. Lat. 59° 28′ S.; long. 74° 00′ W. Current, east, ½ knot per hour. Barometer, 28.40; temperature of air, 50°; of water, 42°. Winds: W. S. W., W., W. Last part, fresh breezes with squalls.

March 27. Lat. 57° 45′ S.; long. 74° 00′ W. Barometer, 28.50; temperature of air, 47°; of water, 43°. Winds: W., S. W., W. S. W. First part, strong breezes; calm, from 6 P. M. to 10 P. M. Latter part, strong from W. S. W.

March 28. Lat. 56° 28′ S.; long. 75° 15′ W. Barometer, 28.90; temperature of air, 45°; of water, 43°. Winds: W., baffling, S. by W. First part, strong breezes and squalls at 6 P. M. to 10 P. M.; baffling from N. to N. E.; at midnight, took heavy squall from south. Latter part, strong gales.

March 29. Lat. 55° 00′ S.; long. 77° 00′ W. Current, east, ½ knot per hour. Barometer, 28.90; temperature of air, 45°; of water, 44°. Winds: S. by W., W. S. W., S. E. First part, strong gales; middle part, moderate; latter part, strong and squally.

March 30. Lat. 52° 56′ S.; long. 80° 00′ W. Barometer, 28.90; temperature of air, 47°; of water, 46°. Winds: S. S. E., S. W., S. S. E. First part, strong breezes, with squalls; middle, light; latter part, strong.

March 31. Lat. 50° 30′ S.; long. 81° 00′ W. Barometer, 28.80; temperature of air, 47°; of water, 46°. Winds: S. W., S. S. W., S. S. W. First part, moderate; latter part, strong gale.

Ship Aldebaran.

March 4, 1853. Lat. 50° 13′ S.; long. 66° 27′ W. Barometer, 29.50; temperature of air, 62°; of

water, 56°. Winds: variable, N. N. E., N. N. W. First and middle, pleasant; latter part, thunder and lightning.

March 5. Lat. 51° 28′ S.; long. 66° 15′ W. Barometer, 29.90. Winds: S. W., W., N. W. From 4 P. M. to 4 A. M. heavy gales.

March 6. Lat. 53° 18′ S.; long. 65° 11′ W. Barometer, 29.50; temperature of air, 65°; of water, 58°. Wind: variable from north to west. Moderate breezes and pleasant.

March 7. Lat. 54° 26′ S.; long. ——— W. Barometer, 29.20; temperature of air, 54°; of water, 60°. Wind: N. W. Comes in fresh breezes from W. N. W., and cloudy; middle part, same. Lay head to the northward during the night; morning stood to the southward; 9 A. M. clouds lifting; saw the land. At noon, Cape St. John (Staten Land) bore, per compass, S. E. by E., 20 miles.

March 8. No observation. Barometer, 28.70; temperature of air, 56°; of water, 52°. Winds: W. N. W., W. N. W., N. W. Fresh breezes and pleasant. Passed the land about eight miles off. From 8 to to meridian, faint airs. Ends pleasant. Barometer falling.

March 9. Lat. 55° 11′ S.; long. ——— W. Barometer, 29.00; temperature of air, 54°; of water, 50°. Winds: N. W., S. W. by W., S. W. by S. Commences with strong gales, with rain, thunder, and lightning; from 5 P. M. to 4 A. M., I think as hard a gale as I ever experienced, and as bad a sea. Barometer, 28.65. At 9 A. M. wind and sea going down; wore ship to the N. W.; ends strong gales, but sea falling, and barometer rising.

March 10. Lat. 55° 33′ S.; long. 62° 38′ W. Barometer, 29.50; temperature of air, 52°; of water, 50°. Winds: S. S. W., W. S. W., S. W. Strong breezes, and pleasant; ends squally.

March 11. Lat. 55° 27′ S., long. 62° 40′ W. Barometer, 29.50; temperature of air, 45°; of water, 45°. Wind: S. W. Strong gales, and heavy sea.

March 12. No observation. Barometer, 29.45; temperature of air, 48°; of water, 46°. Winds: S. S. E., S. W., N. W. Strong gales, and rough sea.

March 13. No observation. Barometer, 29.40; temperature of air, 44°; of water, 44°. Winds: W. N. W., W., W. Moderate; saw land about Cape Horn.

March 14. No observation. Barometer, 29.85; temperature of air, 45°; of water, 42°. Winds: W., S. W., S. W. by S. Heavy gales, and dirty weather.

March 15. No observation. Barometer, 29.90; temperature of air, 46°; of water, 44°. Winds: S., S., S. S. W. Strong gales, and cloudy.

March 16. Lat. 56° 30′ S.; long. 66° 17′ W. Barometer, 30.00; temperature of air, 48°; of water, 46°. Winds: S., S. S. W., S. S. W. Begins with strong gales; ends more moderate.

March 17. Lat. 56° 31′ S.; long. 67° 16′ W. Barometer, 30.05. Winds: S., S. S. E., S. S. E. Light breezes, and cloudy. At noon, Cape Horn bore N. N. W.

March 18. Lat. 57° 54′ S.; long. 68° 37′ W. Barometer, 29.80; temperature of air, 45°; of water, 44°. Winds: W. S. W., W., W. S. W. Begins faint; ends strong gales, and bad sea.

March 19. No observation. Barometer, 29.80; temperature of air, 50°; of water, 56°. Wind: S. W. Very heavy gales, and bad sea.

March 20. Lat. 57° 51′ S.; long. 66° 26′ W. Barometer, 29.95; temperature of air, 55°; of water, 46°. Winds: W. by S., W. S. W., W. S. W. Strong decreasing gales.

March 21. Lat. 57° 58′ S.; long. 69° 31′ W. Barometer, 29.75; temperature of air, 46°; of water, 42°. Winds: W. S. W., N. W., W. N. W. Light breezes; foggy during the night.

March 22. Lat. 58° 34′ S.; long. 69° 34′ W. Barometer, 29.60; temperature of air, 48°; of water, 44°. Wind: W. N. W. Begins moderate; ends with strong breezes and passing clouds.

March 23. Lat. 59° 02′ S.; long. 71° 25′ W. Barometer, 29.65; temperature of air, 48°; of water, 44°. Wind: W. N. W. Strong breezes, and cloudy.

March 24. Lat. 59° 32′ S.; long. 73° 28′ W. Barometer, 29.50; temperature of air, 48°; of water, 44°. Winds: W. N. W., N. W. by N., N. W. Barometer falling, and other indications of a blow.

March 25. Lat. ——; long. ——. Barometer, 28.75; temperature of air, 44°; of water, 42°. Wind: W. N. W., and variable. Very heavy gale, and tremendous sea.

March 26. Lat. 59° 47′ S.; long. 73° 36′ W. Barometer, 29.30; temperature of air, 45°; of water, 43°. Wind: W. N. W., and variable. Begins heavy gale; ends more moderate.

March 27. No observation. Barometer, 29.40; temperature of air, 46°; of water, 44°. Winds: W. by S., S. S. W., S. W. Strong breezes, and snow squalls.

March 28. Lat. 57° 30′ S.; long. 75° 30′ W. Barometer, 29.60; temperature of air, 50°; of water, 46°. Winds: W. S. W., W. S. W., S. S. W. Strong breezes, and snow squalls.

March 29. Lat. 56° 07′ S.; long. 76° 52′ W. Barometer, 29.50; temperature of air, 56°; of water, 54°. Winds: S. S. W., S. W., S. S. E. Begins with snow; ends fine rain.

March 30. Lat. 54° 24′ S.; long. 79° 52′ W. Barometer, 29.50; temperature of air, 50°; of water, 48°. Winds: S. S. W., S. S. W., S. Moderate, with snow squalls; ends pleasant.

March 31. Lat. 52° 10′ S.; long. 81° 52′ W. Barometer, 29.40; temperature of air, 50°; of water, 46°. Wind: S. S. E. Latter part, heavy gale of wind; lying to.

April 1. Lat. 50° 28′ S.; long. 84° 40′ W. Barometer, 29.90; temperature of air, 54°; of water, 52°. Wind: S. S. E. Begins with a heavy gale; ends with fine breezes.

Sea Serpent (Howland), New York to San Francisco, forty-one days out.

March 26, 1853. Lat. 49° 2′ S.; long. 64° 36′ W. Barometer, 29.60; temperature of air, 62°; of water, 55°; water, 18 feet below the surface, 56°. Winds: N., N. W., S. to S. W. First and middle parts, brisk and pleasant; latter, light and fine weather; forty-one days out.

March 27. Lat. 51° 32′ S.; long. 65° 20′ W. Barometer, 29.60; temperature of air, 52°; of water, 54°; water, depth 18 feet, 54°. Winds: N. N. W., N. W., W. S. W. Moderate and clear first part; middle, brisk, unsteady, and gusty; latter, a hard gale and squally.

March 28. Lat. 52° 24′ S.; long. 66° 00′ W. Barometer, 29.10; temperature of air, 45°; of water, 49°; water, depth 18 feet, 48½°. Winds: W. S. W., W., S. W. Moderate gale and unsettled, first part; middle, unsteady; latter, strong gale and passing clouds.

March 29. Lat. 44° 06′ S.; long. 65° 26′ W. Barometer, 29.10; temperature of air, 43°; of water, 45°. Winds: W. S. W. throughout. First part, strong gale and passing clouds; middle, more moderate and squally. Ends light. At noon, Cape St. Diego, N. N. W. 32 miles. The whole land covered with snow.

March 30. Lat. 54° 46′ S.; long. 65° 12′ W. Barometer, 29.10; temperature of air, 45°; of water, 47°. Winds: W. S. W., S. W. to S. S. E., S. W. to S. S. E. Moderate breezes, all night; light baffling winds and snow squalls. Ends same. At noon, Diego N. N. W. 6 miles; S. W. point Staten Land, S. E. ½ E. true.

March 31. Lat. 55° 00′ S.; long. 65° 20′ W. Barometer, 29.10; temperature of air, 45°; of water, 46°. Wind: variable from S. S. E. to S. W. Variable squalls of snow; the tide set through the straits until 5 P. M.; being in mid passage got into a strong rip, and although we had a five-knot breeze, our vessel was unmanageable for an hour, until we cleared it. The current then set us back, but the wind coming off the land light, we kept our ground until the morning's tide. I have my doubts, if it is always advisable to attempt this strait; it has detained us full three days; we could have reached the east of Staten Land much sooner with a free sail; at any rate, our detention in rounding the island could not have been more. After passing the strait the wind inclined south, so that we could not make a W. S. W. course to have cleared the land on the starboard tack. At noon, Cape Good Success bore N. W. 6 miles.

[Let us see how the case really was, and if the Sea Serpent really did lose "full three days" by going through the Straits of Le Maire.

The Golden Racer, at the same time, was on the same voyage, and she was directly east of the Sea Serpent, March 28. March 29, the Sea Serpent was 68 miles farther to the south; on the 30th, she was 86; 31st, she was 74; and April 1, she was 80 miles farther south, and 6° farther west than her competitor.

The Sea Serpent got clear of the cape, crossing the parallel of 50° in the Pacific two days ahead of the Racer. This, I am sure, does not look like a loss of three days in the straits, but more like a gain of two.

March 30, the Simoom (Smith), beat through Straits of Le Maire. On the 31st, she was just 34 miles south of the Sea Serpent. She hugged the land close, and, on April 13, was in 49° 32′, and 90° 10′ W., which was nearly a degree ahead in latitude, and in a much better position in longitude.

I quote the abstract log of the Golden Racer, that those who choose may compare the two. It will be perceived that she passed east of the Falklands.

The Sword-Fish (Collins), was also along there at the same time. She was forced east of the Falklands, March 29, lat. 51° 23′, long. 57°. April 2, she had only got as far as 55° S., and 63° W.]

April 1. Lat. 55° 50′ S.; long. 66° 14′ W. Barometer, 29.20; temperature of air, 45°; of water, 43°. Winds: N. W. to W. N. W.; variable, E. to S. S. E.; light and unsteady; fine weather; variable and squally; at noon, cape in sight 35 miles distant; 48 days out.

April 2. Lat. 56° 37′ S.; long. 67° 16′ W. Barometer, 29; temperature of air, 46°; of water, 44°. Winds: all round the compass, calm, N. W.; variable four times round the compass, and snow squalls

all night; calm, and hail, sleet, and snow; at 7 A. M. a breeze from N. W.; at noon W. S. W.; at noon cape bore N. 38 miles; saw it at 10 hours 30 min. A. M.; land entirely covered with snow.

April 3. Lat. 57° 08′ S.; long. 67° 10′ W. Barometer, 28.50; temperature of air, 40°; of water, 41°. Winds: W., W. S. W., S. W.; strong breezes, hail, snow, and rain all night; strong gales, and squally; latter, more pleasant, with an occasional snow squall.

April 4. Lat. 56° 37′ S.; long. 67° 40′ W. Barometer, 28.70; temperature of air, 39°; of water, 40°. Winds: S. W. by W., S. S. W., W. S. W., and variable; strong and squally; middle, moderate; latter, variable, all round the compass.

April 5. Lat. 58° 17′ S.; long. 68° 08′ W. Barometer, 28.60; temperature of air, 40°; of water, 40°. Winds: W. S. W., W., N. W. to N. E.; strong and squally; middle, more moderate; latter, light snow and hail.

April 6. Lat. 58° 04′ S.; long. 69° 00′ W. Barometer, 28.30; temperature of air, 44°; of water, 42°. Winds: S. W., W., W. N. W.; strong squalls, hail, and snow; middle, same; latter, more pleasant.

April 7. Lat. 57° 48′ S.; long. 71° 02′ W. Barometer, 29; temperature of air, 39°; of water, 41°. Winds: N. W., W. N. W., W. S. W.; light and variable; middle, rain, strong winds. Ends squally.

April 8. Lat. 57° 18′ S.; long. 73° 11′ W. Barometer, 29; temperature of air, 40°; of water, 41°. Winds: W., W. S. W., N. N. W.; brisk gale; middle, moderate; latter, strong gales, heavy head sea.

April 9. Lat. 57° 28′ S.; long. 75° 00′ W. Barometer, 29; temperature of air, 42°; of water, 42°. Winds: N. N. W., calm, calm. Commences strong; calm from 9 P. M. to noon, with a cross swell and light rain.

April 10. Lat. 55° 13′ S.; long. 77° 10′ W. Barometer, 29.30; temperature of air, 42°; of water, 42°. Winds: W. N. W., W. S. W., W. S. W.; light and steady; middle and latter, brisk, and fine weather.

April 11. Lat. 53° 13′ S.; long. 79° 20′ W. Barometer, 30. Temperature of air, 43°; of water, 43°. Winds: S. W., W. S. W., calm. Moderate breezes and fine weather; middle part, hazy.

April 13. Lat. 52° 35′ S.; long. 81° W. Barometer, 29.70. Temperature of air, 48°; of water, 44°. Winds: N. W., and N. N. W. Moderate breezes and fine weather; middle part, strong breezes and rainy hazy weather.

April 13. Lat. 50° 34′ S.; long. 81° 25′ W. Barometer, 30; temperature of air, 50°; of water, 47°. Winds: W., S. W., and calm. Weather light and misty; latter part calm; a heavy head sea.

May 7. Lat. 5° N.; long. 106° 43′ W. Barometer, 29.70. Current, 50 miles, N. W. Temperature of air, 78°; of water, 82°. Winds: S. E. by S., S. E., S. by E. Moderate breezes and unsteady faint lightning in the N. E.; we have experienced a strong current, which is uncommon in these parts, and only encountered off the Cape of Good Hope.

May 8. Lat. 7° 55′ N.; long. 108° 10′ W. Current, 12 miles, N. E. Barometer, 29.70; temperature of air, 80°; of water, 82°. Winds: S. S. E., S. by W., S. W. Moderate breezes and pleasant; middle part, variable breezes and squally appearances, with rain.

May 9. Lat. 9° 52′ N.; long. 109° W. Current, 20 miles, W. N. W. Barometer, 29.70; tempera-

ture of air, 83°; of water, 85°. Winds: W.S.W., W.S.W., W. Moderate breezes and squally, with rain; latter part, calm.

May 10. Lat. 11° N.; long. 109° 23′ W. Barometer, 29.70; temperature of air, 83°; of water, 84°. Winds: W., variable, N.W. Moderate breezes and squally; latter part, steady and pleasant. At 5 P.M. Clifferton Rock bore N.N.W. ¼ W., just visible from the deck, 15 miles distant. This island, in the track of outward-bound vessels, is about one hundred and fifty feet high, of a conical shape. Care should be taken when approaching it at night. We passed to the northward of it in moderate clear weather, when the roar of the surf warned us of our near proximity. We could not see the island distinctly, but what we supposed to be a white cloud, proved in the morning to be the island, bearing E.N.E., 7 miles distant.

May 11. Lat. 11° 53′ N.; long. 109° 20′ W. Barometer, 29.75; temperature of air, 78°; of water, 84°. Winds: N.W., N.E. and calm, N.E. Light baffling winds and calm; throughout the night thunder and lightning; latter part, moderate breeze and pleasant; appearances of a trade-wind.

May 12. Lat. 14° 04′ N.; long. 111° 21′ W. Barometer, 29.75; temperature of air, 83°; of water, 85°. Winds: N.E., N.E. by E., and N.E. First part, light breezes and squally; middle part, moderate and unsteady, with rain; ends, pleasant.

Golden Racer (B. M. Melcher), Boston to San Francisco.

March 26, 1853. Lat. 48° 49′ S.; long. 54° 05′ W. Barometer, 29.80; temperature of air, 55°; of water, 47°. Winds: E.S.E., E., N.W. First and middle, moderate breezes; latter part, fresh breezes.

March 27. Lat. 51° 30′ S.; long. 55° 50′ W. Barometer, 29.40; temperature of air, 44°; of water, 44. Winds: N.W. to S.W., S.W., N.W. Commences with strong breezes; middle part, moderate. Ends with strong breezes and heavy squalls.

March 28. Lat. 52° 27′ S.; long. 56° 37′ W. (D. R.) Barometer, 29.20; temperature of air, 44°; of water, 44°. Winds: W. by S., W. by S., W. by N. First part, strong gales with hail squalls, lying to; middle and latter parts, more moderate. Barometer fell $\frac{2}{10}$ in four hours.

March 29. Lat. 52° 58′ S.; long. 56° 42′ W. Barometer, 29.20; temperature of air, 38°; of water, 43°. Winds: W. by S., W. by S., W. by S. Strong gales and heavy squalls varying from W.N.W. to S.W., accompanied by hail.

March 30. Lat. 53° 50′ S.; long. 57° 36′ W. Barometer, 29.00; temperature of air, 38°; of water, 42°. Winds: S.W., N. to E., S.W. Commences with strong breezes and hail squalls; middle, light and variable and thick snowy weather. Ends fresh breezes and passing clouds.

March 31. Lat. 53° 46′ S.; long. 58° 58′ W. Barometer, 29.30; temperature of air, 43°; of water, 43°. Winds: S.E., calm, S.W. Light baffling airs.

April 1. Lat. 54° 30′ S.; long. 60° 30′ W. Barometer, 29.45; temperature of air, 40°; of water, 44°. Winds: S.W. by S., calm, S.E. to N.E. First, light; middle, calm; latter, moderate breezes with fine weather; whales in sight daily during the last three days; water colored.

April 2. Lat. 55° 19′ S.; long. 63° 00′ W. Barometer, 29.40; temperature of air, 40°; of water,

42°. Winds: N.E., N.W. to S.S.E; S.S.E. to N.W. Commences with moderate breezes; middle part, hail squalls. Ends light and variable. Staten Land in sight.

April 3. Lat. 56° 42′ S.; long. 64° 37′ W. Barometer, 28.80; temperature of air, 39°; of water, 39°. Winds: W. by N., S.W., W.S.W. Commences with fresh breezes; middle and latter parts, heavy snow and hail squalls and southwest swell.

April 4. Lat. 56° 17′ S.; long. 64° 35′ W. Barometer, 29.00; temperature of air, 41°; of water, 41°. Winds: S.W., S., W.S.W. First and middle parts, heavy snow and hail squalls. Ends with light airs.

April 5. Lat. 57° 30′ S.; long. 65° 00′ W. (D. R.) Barometer, 28.80; temperature of air, 40°; of water, 40°. Winds: W.N.W., W.S.W., W. by N. First and middle, heavy snow and hail squalls. Ends moderate.

April 6. Lat. 56° 49′ S.; long. 64° 20′ W. Barometer, 29.55; temperature of air, 40°; of water, 41°. Winds: W.N.W., S.W., W.N.W. Commences with strong breezes; during the afternoon and night hard gales. Ends light airs.

April 7. Lat. 57° 29′ S.; long. 67° 35′ W. Barometer, 29.00; temperature of air, 40°; of water, 41°. Winds: W.N.W., N.W. by W., W.N.W. to S.W. Commences with light airs; middle part, fresh breezes. Ends moderate, variable, and thick.

April 8. Lat. 57° 32′ S.; long. 67° 40′ W. Barometer, 29.40; temperature of air, 47°; of water, 42°. Winds: S.W. by W., S.W. by W., S.W. to N.W. First and latter parts, variable airs; middle part, fresh breeze. For ten or twelve days have had a current of about one knot to N.E. or E.N.E. To day have found, by good observations, thirty-five miles current E.N.E. true.

April 9. Lat. 57° 30′ S.; long. 72° 40′ W. Barometer, 29.10; temperature of air, 44°; of water, 41°. Winds: W.N.W., N.W., N.N.W. Commences with fresh breezes; middle and latter parts, fresh breezes and squally thick misty weather.

April 10. Lat. 56° 36′ S.; long. 74° 00′ W. Barometer, 29.70; temperature of air, 40°; of water, 42°. Winds: S.W., S.W., S.S.W. First and middle parts, light breezes; heavy sea from westward. Ends with fresh breezes and squally weather.

April 11. Lat. 54° 17′ S.; long. 76° 36′ W. Barometer, 30.15; temperature of air, 44°; of water, 42°. Winds: S.W., S.W., W. First part, strong breezes; middle, moderate; latter, light and variable.

April 12. Lat. 54° 58′ S.; long. 80° 36′ W. (D. R.) Barometer, 29.70; temperature of air, 40°; of water, 41°. Winds: W. by N., N.W., W.N.W. Begins moderate; middle and latter parts, thick misty weather.

April 13. Lat. 53° 27′ S.; long. 82° 20′ W. Barometer, 30.00; temperature of air, 42°; of water, 43°. Winds: S.E., S.E. to N.E., N. First part, calm and light breezes; middle, fresh breezes. Ends moderate, variable breezes, and cloudy.

April 14. Lat. 52° 16′ S.; long. 85° 42′ W. Barometer, 30.00; temperature of air, 42°; of water,

44°. Winds: N. W., N. W. to S., S. W. Begins with thick rainy weather; middle, strong breezes. Ends moderate; during the night the barometer fell to 29.50.

April 15. Lat. 49° 54′ S.; long. 86° 15′ W. Barometer, 30.10; temperature of air, 44°; of water, 47°. Winds: W. S. W., W. S. W., S. W. Commences with fresh breezes and thick weather; middle, moderate. Ends with light airs and passing clouds.

Governor Morton (John A. Bergin), forty-nine days out.

March 29, 1853. No observation. Barometer, 29.14; temperature of air, 52°; of water, 51°. Winds: N. W., N. W., S. E. Commences with a fresh breeze; from 7 to 8 P. M. much chain and flash lightning at N. W., and some thunder, without much increase of wind; middle part, quite moderate; ends light breezes and drizzling rain; passed several tide rips.

March 30. Lat 43° 31′ S.; long. 59° 33′ W. Barometer, 28.94; temperature of air, 54°; of water, 52°. Winds: S. E., N. E., N. W. Wind unsteady, with thick fog, except at intervals; first part, light winds; middle, fresh; latter, moderate, with one hour of clear sky; numerous tide rips setting apparently N. E., 30 miles current in the last two days.

March 31. Lat. 43° 51′ S.; long. 59° 36′ W. Barometer, 29.10; temperature of air, 50°; of water, 51°. Winds: N. W., calm, N. W. First part, light breezes and pleasant; middle, baffling and calm, with fog; latter, baffling and light; much lightning and thunder to the south; 8 A. M., heavy fall of hail, with but little wind from the south; soon after which, it cleared, with a light westerly air. Current to N. E., 30 miles; passed several tide rips.

April 1. Lat. 45° 09′ S.; long. 60° 42′ W. Barometer, 28.92; temperature of air, 57°; of water, 54°. Winds: W. to W. S. W., N. W., W. by N. First part, baffling, with squally appearances at S. S. W.; middle part, with lightning; latter, a strong west wind and pleasant.

April 2. Lat. 46° 17′ S.; long. 61° 30′ W. Barometer, 29.13; temperature of air, 46°; of water, 52°. Winds: W. by S., S. S. W., S. S. W. First part, strong and squally; middle, more moderate; latter, fresh, with rain.

April 3. Lat. 47° 18′ S.; long. 62° 11′ W. Barometer, 29.02; temperature of air, 53°; of water, 53°. Winds: S. W. by S., W. S. W., W. by S. First and middle parts, fresh breezes and squally; latter part, fresh breezes and pleasant.

April 4. Lat. 47° 52′ S.; long. 63° 08′ W. Barometer, 29.00; temperature of air, 51°; of water, 52°. Winds: W., S. S. W., W. First part, strong breezes and squally, with lightning to the S. S. W.; barometer, fluctuating 16 inches; middle part, with rain; at 10 P. M. barometer 28.80; latter, strong moderating wind, with a large sea from S. S. W.

April 5. Lat. 49° 03′ S.; long. 62° 33′ W. Barometer, 29.54; temperature of air, 51°; of water, 50°. Winds: S. W., S. S. W., W. Strong breezes and pleasant.

April 6. Lat. 50° 40 S.; long. 63° 31′ W. Barometer, 29.50; temperature of air, 51°; of water, 48°.

Winds: W., S. W. by W., W. S. W. Moderate and pleasant, first part; middle, light airs and dew; latter, light airs and pleasant.

April 7. Lat. 53° 26′ S.; long. 63° 55′ W. Barometer, 28.92; temperature of air, 50; of water, 46°. Winds: N., N., N. N. W. First, light airs and pleasant; middle, fresh and overcast; latter, light winds, drizzling, and foggy; no observation.

April 8. Lat. 54° 25′ S.; long. 63° 00′ W. Barometer, 28.90; temperature of air, 44°; of water, 44°. Winds: N. N. W., S. W. to S. E., S. E. First part, light airs and foggy; middle, fresh breezes and overcast; latter, light breeze and clear weather; tide rips; current setting N. E.

April 9. Lat. 54° 41′ S.; long. 64° 35′ W. Barometer, 29.04; temperature of air, 46°; of water, 48°. Winds: S. E., calm, W. N. W. First part, light winds and pleasant; many tide rips; middle, calm and pleasant; latter, moderate and pleasant.

April 10. Lat. 56° 00′ S.; long. 66° 45′ W. Barometer, 29.00; temperature of air, 48°; of water, 49°. Winds: N. N. W., N. W. by N., N. Fresh, moderate, and light breezes, and pleasant weather.

April 11. Lat. 56° 11′ S.; long. 69° 53′ W. Barometer, 29.53; temperature of air, 44°; of water, 48°. Winds: S. S. E., S. S. E., S. Commences with fresh breezes, with rain and thick fog; ends moderate, with snow squalls.

April 12. Lat. 56° 48′ S.; long. 72° 56′ W. Barometer, 29.30; temperature of air, 45°; of water, 45°. Winds: S. S. W., W. S. W., N. W. by W. First part, moderate breezes and pleasant; middle, light airs and calm; latter, strong and rainy.

April 13. Lat. 55° 56′ S.; long. 75° 48′ W. Barometer, 29.50; temperature of air, 42°; of water, 45°. Winds: W. S. W., S., S. E. Light and moderate unsteady winds, with, during the first and middle parts, rain and mist; ends pleasant.

April 14. Lat. 55° 02′ S.; long. 79° 00′ W. Barometer, 29.20; temperature of air, 44°; of water, 45°. Winds: N. W., N. W., S. S. W. Commences and ends with light breezes; during middle part, fresh and light winds and rainy.

April 15. Lat. 53° 06′ S.; long. 81° 10′ W. Barometer, 29.46; temperature of air, 42°; of water, 46°. Winds: S. W., S. W. by S., S. W. Fresh and moderate breezes and cloudy, with squalls and some rain.

April 16. Lat. 51° 17′ S.; long. 82° 54′ W. Barometer, 29.66; temperature of air, 43°; of water, 48°. Winds: S. W. throughout. Fresh, moderate, and light breezes, and cloudy, squally weather.

April 17. Lat. 50° 10′ S.; long. 84° 19′ W. Barometer, 29.50; temperature of air, 45°; of water, 48°. Winds: S. W. throughout. Moderate and light baffling winds and cloudy weather.

Paragon (Samuel Duncan), New York to San Francisco.

April 17, 1853. Lat. 50° 19′ S.; long. 62° 16′ W. Temperature of air, 46°; of water, 46°. Winds: S. W., S. W., W. S. W. Comes in strong, with passing clouds; middle part, strong, with snow-squalls; ends, blowing hard; close-reefed topsails; heavy head sea.

April 18. Lat. 51° 13′ S.; long. 62° 34′ W. Temperature of air, 48°; of water, 46°. Winds: W. S. W., W. S. W., W. Strong breezes and clear; heavy head sea; stood four hours to the N. W.

April 19. Lat. 52° 42′ S.; long. 62° 46′ W. Temperature of air, 47°; of water, 46°. Winds: W. by S., W. by S., W. by S. Strong breezes; ends, hazy and overcast.

April 20. By bearings, lat. 54° 50′ S.; long. 65° 10′ W. Temperature of air, 46°; of water, 46°. Winds: W. by S., W. by N., W. Commences brisk and clear; middle, do. until 2 A. M., when it became cloudy, with small rain; 4 A. M. under close reefs; 8 A. M. saw Cape St. Diego, S. S. W., distant 4 leagues; at 10 A. M. it bore west; at noon Good Success Bay bore west; a moderate southerly tide; mountains covered with snow. Ends moderate, thick, and rainy. Seventy days out.

April 21. Lat. 55° 59′ S.; long. 63° 44′. Temperature of air, 40°; of water, 38°. Winds: S. W., S. W., W. S. W. Commences light; at 1 P. M. calm, and the tide ahead; I was afraid of drifting back through the straits. At 3 P. M. the breeze sprung up, and enabled us to clear the land before dark. Middle, wind increasing, with snow-squalls. Ends, heavy gales with snow. Lying to.

April 23. Lat. 55° 46′ S.; long. 65° 08′ W. Temperature of air, 38°; of water, 40°. Winds: S. S. E., S. E., calm. Commences fresh, with appearances of better weather; middle, moderate; ends calm and cloudy. No observation. Land in sight, bearing north.

April 24. Lat. 56° 22′ S.; long. 67° 00′ W. Current, east, 1¼ miles per hour. Temperature of air, 44°; of water, 46°. Winds: N. E., N. E., N. E. Calm, until 3 P. M., then a light breeze. Middle and latter parts, moderate and fine. At noon, Cape Horn bore N. W. by N., distant, 10 leagues.

April 25. Lat. 57° 10′ S.; long. 73° 08′ W. (D. R.). Current, 1 mile east, per hour. Temperature of air, 45°; of water, 42°. Winds: N. E., N. E., N. E. Commences with a moderate breeze, and cloudy. 5 P. M. thick and rainy. Spoke a vessel that sailed 10 days before us. Squally and rainy during the night. Ends, strong breezes and cloudy.

April 26. Lat. 56° 47′ S.; long. 76° 37′ W. (D. R.). Current same. Temperature of air, 44°; of water, 43°. Winds: N. E., N. N. W., N. N. W. Commences brisk, with beautiful weather; during the night, strong breeze, and thick, rainy weather; ends strong breezes, with a black, heavy appearance.

April 27. Lat. 57° 17′ S.; long. 77° 39′ W. Current, E., ¾ mile per hour. Temperature of air, 44°; of water, 43°. Winds: N. E., N. W., N. W. Commences with strong breezes; middle, strong and squally; ends more moderate.

April 28. Lat. 56° 22′ S.; long. 80° 09′ W. Temperature of air, 43°; of water, 44°. Winds: N. W., N. N. E., E. Commences moderate, with a large ground swell from W. S. W.; middle, fresh and squally, with rain; ends very light, with thick fog.

April 29. Lat. 54° 35′ S.; long. 81° 02′ W. Temperature of air, 44°; of water, 44°. Winds: S., W. S. W., N. W. Commences strong and foggy; middle, moderate; ends light.

April 30. Lat. 54° 40′ S.; long. 83° 27′ W. (D. R.). Temperature of air, 47°; of water, 44°. Winds: N. W., N. W., N. W. First part, moderate, with fog; middle, same, with drizzling rain; ends fresh. Noon, wind veered to west, and the weather cleared.

May 1. Lat. 52° 13′ S.; long. 81° 46′ W. Temperature of air, 47°; of water, 48°. Winds: W., W. N. W., N. W. Comes in moderate and fine; middle and latter parts, fresh, with good weather. At 8 P. M. observed a comet, bearing W. S. W., about 15° high.

May 2. (D. R.) lat. 50° 41′ S.; long. 79° 48′ W. Current, N., ½ mile per hour. Winds: N. W., W. N. W., W. by N. First part, fresh and cloudy; middle and latter, strong, with thick and dirty weather.

May 3. (D. R.) lat. 49° 13′ S.; long. 79° 00′ W. Current, ¾ mile per hour, N. Temperature of air, 50°; of water, 51°. Winds; W., W., W. S. W. Strong breezes, with thick, rainy weather during the night.

Herculean (W. M. Chamberlin).

April 20. Lat. 50° 18′ S.; long. 65° 01′ W. Barometer, 29.48; temperature of air, 47°; of water, 46°. Winds: calm, N. N. W., N. W. Middle and latter parts, fresh breezes.

April 21. Lat. 52° 25′ S.; long. 65° W. Barometer, 29.38; temperature of air, 43°; of water, 44°. Winds: W. N. W., S. W., S. W. by S. First part, fresh breezes and pleasant; middle, strong winds and cloudy, with some rain. Barometer fell to 29.12, and when it commenced rising, the wind hauled to S. W. Ends, strong winds, with heavy squalls of hail, snow, and rain.

April 22. Lat. 52° 38′ S.; long. 63° 55′ W. Barometer, 29.50; temperature of air, 36°; of water, 44°. Winds: S. S. W., S. S. E., S. E. First part, strong winds and heavy sea; middle, more moderate; ends cloudy, with light winds.

April 23. Lat. ——; long. ——. Barometer, 29.65; temperature of air, 36°; of water, 42°. Winds: S. E., E. S. E., N. E. Commences light winds and cloudy; middle part, light winds and calm; latter part, light airs and thick.

April 24. Lat. 55° 19′ S.; long. (bearings) 65° 15′ W. Barometer, 29.66; temperature of air, 40°; of water, 44°. Winds: N., N. N. W., N. E. Commences thick and light winds; middle, fresh winds, thick and rainy. 7 A. M. entered the Straits of Le Maire; 7 hours 30 min. St. Diego bore W. N. W. When the weather cleared, saw Staten Land bearing E. N. E. Ends, strong winds and squally, with rain.

April 25. Lat. ——; long. ——. Barometer, 29.40; temperature of air, 40°; of water, 42°. Winds: E. N. E., E. N. E., N. E. Strong winds and thick rainy weather.

April 26. Lat. 56° 24′ S.; long. ——. Barometer, 29.40; temperature of air, 40°; of water, 42°. Winds: N. E., N., N. W. First part, strong winds and cloudy; middle and latter parts, strong gales and squalls of hail and rain.

April 28. Lat. 56° 18′ S.; long. 78° 4′ W. Barometer, 29.05; temperature of air, 42°; of water, 41°. Winds: N., N. E., calm and variable. Commences strong winds and cloudy; 4 P. M. more moderate; 8 P. M. strong winds and squally; barometer fell to 28.92; ends, light airs and calm. Dead reckoning puts the ship in 80° 15′ W., consequently, we have had an easterly current.

April 29. Lat. 55° 6′ S.; long. 79° 20′ W. Barometer, 29.80; temperature of air, 43°; of water, 42°.

Winds: S., S. W., W. N. W. Begins with light winds, and cloudy; middle, strong breezes; ends, light winds and calm.

April 30. Lat. ——; long. ——. Barometer, 29.75; temperature of air, 44°; of water, 42. Winds: N. W., N. W., N. N. W. Fresh breezes and foggy, with a drizzling rain.

May 1. Lat. ——; long. ——. Barometer, 29.90; temperature of air, 43°; of water, 42°. Winds: W. S. W., W., N. W. 1 P. M. the weather cleared; middle and latter parts, fresh breezes and thick.

May 2. Lat. ——; long. ——. Barometer, 29.75; temperature of air, 45°; of water, 43°. Winds: N. W., W. N. W., W. N. W. Strong winds, and thick, rainy weather.

May 3. Lat. 52° 54′ S.; long. 81° 30′ W. Barometer, 92.38; temperature of air, 44°; of water, 44°. Winds: calm, W. S. W., W. S. W. Middle part, fresh winds, with rain squalls; ends, strong gales and clear; ship leaking badly.

May 4. Lat. ——; long. ——. Barometer, 29.51; temperature of air, 44°; of water, 43°. Winds: W. S. W., S. W., S. W. Begins strong winds and clear weather; middle, heavy gales and hard squalls; ends moderate and thick.

May 5. Lat. ——; long. ——. Barometer, 29.49; temperature of air, 48°; of water, 46°. Winds: W., W. N. W., W. N. W. Strong winds and thick weather; ends, strong gales.

May 6. Lat. ——; long. ——. Barometer, 29.44; temperature of air, 50°; of water, 48°. Winds: N. W. by W., N. W. by W., W. N. W., and baffling. First and middle parts, strong gales and thick rainy weather; ends with baffling winds and rain.

New York (David C. Baxter).

April 22, 1853. Lat. 50° 55′ S.; long. 57° 00′ W. Barometer, 28.09; temperature of air, 38°; of water, 42°. Winds: S. S. W., S. W., S. S. W. First part, a moderate breeze; at 8 P. M. wind increasing; midnight, blowing a heavy gale; at 8 A. M. moderating; ends with a moderate breeze.

April 23. Lat. 50° 48′ S.; long. 61° 36′ W. Barometer, 29.01; temperature of air, 40°; of water, 43°. Winds: S. by W., S. by E., S. First part, strong breezes and smooth sea, with snow; middle part, brisk breeze; ends pleasant; made the Jason Isle (Falkland Islands) bearing S. S. W. 12 miles.

April 24. Lat. 52° 14′ S.; long. 63° 12′ W. Barometer, 29.00; temperature of air, 40°; of water, 41°. Winds: W., N. N. W., N. N. E. From 1 to 6 P. M., calm; then a breeze from west; middle part, brisk breezes; latter part, strong breezes and thick weather; saw fin-back whales.

April 25. Lat. 56° 10′ S.; long. 63° 30′ W. Barometer, 29.01; temperature of air, 38°; of water, 40°. Winds: N. N. E., N. N. E., N. N. E. Strong breezes, with snow squalls.

April 26. Lat. 57° 20′ S.; long. 69° 00′ W. Barometer, 28.09; temperature of air, 41°; of water, 41°. Winds: N. N. E., N. E., N. W. Commences a moderate gale; middle, heavy squalls; ends brisk breezes.

April 27. Lat. 57° 31′ S.; long. 74° 20′ W. Barometer, 28.05; temperature of air, 40°; of water,

40°. Winds: N. W., N. W., W. N. W. First part, strong increasing breezes; middle part, heavy squalls; ends, strong winds, with a heavy S. W. swell.

April 28. Lat. 57° 17′ S.; long. 78° 02′ W. Barometer, 28.06; temperature of air, 40°; of water, 40°. Winds: W. N. W., N. W., N. First part, strong breezes, with a heavy S. W. swell; middle, squally; ends fine weather, light airs.

April 29. Lat. 55° 45′ S.; long. 79° 08′ W. Barometer, 29.01; temperature of water, 42°. Winds; S., W., N. W. Commences, and until 2 P. M. calm; then a good breeze; middle part, occasionally foggy; ends fine; saw a great many whales.

April 30. Lat. 55° 52′ S.; long. 82° 40′ W. Barometer, 29.03; temperature of water, 42°. Winds: N. W., N. W., W. N. W. Foggy; at 11 A. M. wind hauled W. S. W., tacked to N. W.; saw a great many whales; I think, sperm and right.

May 1. Lat. 53° 26′ S.; long. 80° 10′ W. Barometer, 29.04; temperature of air, 42°; of water, 44°. Winds: W. N. W., W. N. W., N. W. by W. Strong head winds.

May 2. Lat. 53° 00′ S.; long. 80° 00′ W. Barometer, 29.00; temperature of air, 42°; of water, 44°. Winds: W. N. W., W. N. W., W. by N. Commences with a strong breeze, which increased to a gale; wore to the northward.

May 3. Lat. 52° 38′ S.; long. 79° 40′ W. Barometer, 29.01; temperature of air, 42°; of water, 44°. Winds: W., W., W. S. W. Commences blowing a gale; more to the S. W.; during the night squally; A. M. more to N. W.; latter part, moderating.

May 4. Lat. 50° 40′ S.; long. 79° 50′ W. Barometer, 29.01; temperature of air, 44°; of water, 44°. Winds: W. S. W., W. S. W., W. S. W. Commences a moderate gale; middle part, squally; ends strong winds.

May 5. Lat. 48° 50′ S.; long. 80° 30′ W. Barometer, 29.00; temperature of air, 48°; of water, 44°. Winds: W. N. W., W. N. W., W. N. W. Commences strong winds; midnight, to S. W.; at 8, tacked to north; ends a brisk N. W. gale.

Rosario (Caleb Sprague).

May 4, 1853. Lat. 50° 43′ S.; long. 64° 45′ W. Variation, 21° E. Barometer, 29.26; temperature of air, 51°; of water, 56°. Winds: S. W., W., W. S. W. First part, gales, and heavy hail squall; latter part, the same, with a heavy head sea.

May 5. Lat. 53° 07′ S.; long. 64° 07′ W. Current, E., 24 miles. Barometer, 29.20; temperature of air, 56°; of water, 44°. Winds: W. S. W., W., W.; heavy gales throughout; saw several large patches of kelp.

May 6. Lat. 54° 53′ S.; long. 63° 37′ W. Current, E., 14 miles. Barometer, 28.95; temperature of air, 51°; of water, 44°. Winds: W. S. W., N. W., W. N. W. First part, heavy gales; middle part, strong breezes, with rain squalls; at 9 A. M. made Cape St. John, bearing south, distant ten miles; very strong tide rips about the cape, like breakers.

May 7. Lat. 55° 43′ S.; long. 63° 35′ W. Current, N., 45° E., 18 miles. Barometer, 29.25; temperature of air, 54°; of water, 39°. Winds: W. S. W., S. W. by W., W. S. W. First part, moderate; middle part, light air and baffling wind, with a heavy sea from the southwest.

May 8. Lat. 55° 59′ S.; long. 65° 06′ W. Current, N., 72° E., 23 miles. Barometer, 29.63; temperature of air, 46°; of water, 40°. Winds: W. S. W., S. W., N. N. W. First part, strong breeze; middle and latter part, heavy gales, with rain.

May 9. Lat. 57° 03′ S.; long. 68° 12′ W. Barometer, 29.30; temperature of air, 55; of water, 42°. Winds: N. N. W., W., W. by N. First part, heavy gales; latter part, strong breeze, a heavy sea.

May 10. Lat. 57° 46′ S.; long. 68° 22′ W. Barometer, 29.40. Current, N., 77° E., 26 miles; temperature of air, 51°; of water, 40°. Winds: W., W. by N., W. by N. First part, heavy gales and squalls, with lightning; latter part, the same.

May 11. Lat. 58° 36′ S.; long. 70° 18′ W. Barometer, 29.28; temperature of air, 51°; of water, 40°. Wind: W. N. W.; strong gales, and heavy squalls of wind and rain.

May 12. Lat. 58° 51′ S.; long. 72° 14′ W. Barometer, 28.84; temperature of air, 50°; of water, 39°. Winds: N. W., N. W., N. N. W.; heavy gales and squalls.

May 13. Lat. 58° 55′ S.; long. 72° 40′ W. Barometer, 28.75; temperature of air, 49°; of water, 49°. Winds: W. N. W., W. N. W., W. S. W.; strong gales, with snow squalls and hail; latter part, violent gales.

May 14. Lat. 57° 51′ S.; long. 71° 33′ W. Temperature of air, 48°; of water, 40°. Barometer, 29.30. Winds: S. W., W. S. W., W.; heavy gale, with snow and hail.

May 15. Lat. 57° 12′ S.; long. 72° 08′ W. Barometer, 29.30; temperature of air, 50°; of water, 40°. Winds: W., W., W. N. W.; strong gales, with heavy squall of wind and rain.

May 16. Lat. 57° 34′ S.; long. 73° 15′ W. Barometer, 29.48; temperature of air, 44°; of water, 38°. Wind: W. N. W. Fresh breezes and passing clouds; latter part, squally. At 4 A. M. wind suddenly shifted to the S. W. in a heavy squall; weather extremely cold.

May 17. Lat. 57° 17′ S.; long. 74° 52′ W. Barometer, 29.38; temperature of air, 40°; of water, 38°. Fresh breezes and passing clouds; latter part, squally.

May 18. Lat. 55° 54′ S.; long. 73° 53′ W. Barometer, 29.78; temperature of air, 48°; of water, 42°. Winds: S. W., W. S. W., and W. S. W. First part, strong gale, and cloudy, squally weather; latter part, light squalls.

May 19. Lat. 55° 12′ S.; long. 77° 26′ W. Barometer, 29.05; temperature of air, 45°; of water, 42°. Winds: W., E. N. E., E. N. E. First part, light airs and calms; middle and latter parts, fresh breezes and heavy gales. I have always noticed that in these latitudes the barometer stands much lower than with other winds.

May 20. Lat. 55° 48′ S.; long. 80° 57′ W. Barometer, 28.30; temperature of air, 51°; of water, 42°. Winds: E. N. E., N., and N. W. First part, heavy gales and heavy rain following; middle part, a perfect hurricane; latter part, strong gales.

May 21. Lat. 55° 17′ S.; long. 81° 18′ W. Barometer, 28.50; temperature of air, 48°; of water, 40°. Winds: N. W., W. N. W., and N. W. First part, light airs, with fog squalls. Middle part, squally; latter part, light airs.

May 22. Lat. 53° 02′ S.; long. 81° 01′ W. Barometer, 29.02; temperature of air, 40°; of water, 42°. Winds: W. N. W., W. S. W., and W. Strong gales and heavy hail squalls.

May 23. Lat. 49° 58′ S.; long. 80° 45′ W. Barometer, 29.63; temperature of air, 47°; of water, 46°. Winds: W., W. S. W., W. Fresh breezes, and heavy squalls of hail and snow.

Empress of the Sea (M. E. Putnam).

May 8, 1853. Lat. 52° 11′ S.; long. 64° 51′ W. Barometer, 29.72. Winds: S. S. W., W. by N., and W. N. W. Moderate breezes and overcast.

May 9. Lat. 55° 15′ S.; long. 62° 20′ W. Barometer, 29.27; temperature of air, 45°; of water, 41°. Winds: N. by W., N. N. W., and W. by S.; strong gales; have intended all along to go through the straits, but gales and thick weather will prevent me from doing so. Ends calm; an awful sea on.

May 10. Lat. 56° 12′ S.; long. 65° 38′ W. Current, E., 37 miles. Barometer, 29.50; temperature of air, 43°; of water, 42°. Winds: N. W., N. W., and N. W. by N.; fine weather, and moderate breeze. At 4 P. M. Staten Land bore N., 35 miles distant.

May 11. Lat. 56° 32′ S.; long. 68° 29° W. Barometer, 29.46. Current, 17 miles, S. E. Variation, 24°; temperature of air, 46°; of water, 45°. Winds: W. by N., N. N. W., and W. S. W. Lovely weather; ship under all sail. At meridian, Cape Horn, proper, bore W. 9 miles. Diego Ramirez W. by S. (true), 9 miles.

May 12. Lat. 57° 29′ S.; long. 72° 39′ W. Barometer, 28.50; temperature of air, 43°; of water, 41°. Winds: N. W. throughout. First part, very pleasant; mercury depressed; at meridian, enjoying the delights of a N. W. gale.

May 13. Lat. 56° 53′ S.; long. 73° 55′ W. Current, east, 20 miles. Barometer, 29.30; temperature of air, 36°; of water, 40°. Winds: N. W., W., and W. S. W. Strong gales and squally, with rain; under close reefs.

May 14. Lat. 57° 23′ S.; long. 75° 01′ W. Barometer, 29.37; temperature of air, 41°; of water, 42°. Winds: W., W. by N., and W. Strong gale and a heavy sea. Barometer, falling and rising very fast.

May 15. Lat. 57° 30′ S.; long. 78° 00′ W. Barometer, 29.28; temperature of air, 42°; of water, 44°. Winds: W., N. W., and N. W. by N. Strong gales; two reefs; thick misty weather; latter part, more moderate.

May 16. Lat. 57° 13′ S.; long. 78° 00′ W. Barometer, 29.50; temperature of air, 41°; of water, 42°. Winds: W., W. S. W., and N. W. by W. Fresh gales and open weather; latter part, moderate gale and pleasant; all sail out.

May 17. Lat. 56° 00′ S.; long. 80° 27′ W. Current, 75 miles east, in four days. Barometer, from 29.88 to 29.65. Winds: from N. and W. Fresh gales and heavy sea; under double reefs.

May 18. Lat. 53° 21′ S.; long. 79° 45′ W. Current, S. E., 25 miles. Barometer, 29.17; temperature of air, 41°; of water, 43°. Winds: W., W., and calm. Strong breezes and frequent squalls; middle part, good breezes and pleasant; latter part, calm; a heavy sea, and tide rips.

May 19. Lat. 50° 25′ S.; long. 83° 17′ W. Barometer, 28.35; temperature of air, 52°; of water, 47. Winds: N. E., E. N. E., S. E. to S. S. W. First part, increasing breezes at N. E.; under all sail; mercury falling fast; middle part, a gale at E. N. E., and rain; latter part, wind moderate, rainy weather; mercury fell this day 1.42, and no wind to speak of.

Ship Roscoe (Thomas Smith).

May 2, 1853. Lat. 49° 12′ S.; long. 65° 20′ W. Barometer, 30.00; temperature of air, 45°; of water, 46°; water, 8 feet below surface, 46°. Winds: S. S. E., S. S. E., W. N. W. First and middle parts, light airs and squally; at 6 A. M. calm, on soundings; at 9 A. M. a breeze sprung up from W. N. W. Ends a fresh breeze.

May 3. Lat. 52° 45′ S.; long. 65° 45′ W. Barometer, 29.00; temperature of air, 44°; of water, 44°; water, 8 feet below surface, 46°. Winds: N. W., N. W., S. W. First and middle parts, fresh breezes, and during middle part, cloudy. Barometer, falling. In the morning, the wind changed to west and increased. Ends strong gales. My barometer, thus far, is a good indicator.

May 4. Lat. 54° 06′ S.; long. 65° 25′ W. Barometer, 29.00; temperature of air, 42°; of water, 44°; water, below surface, 45°. Winds: S. W., W., W. S. W. Heavy gales. Barometer fell to 28.80; at 10 A. M. made Cape St. Diego, bearing S. E. by compass, distant about 40 miles.

May 5. Lat. 54° 35′ S.; long. 65° 20′ W. Barometer, 29.20; temperature of air, 42°; of water, 43°; water, below surface, 43°. Winds: W. S. W., S. W., S. W. First and middle parts, heavy gales and a heavy sea; at 8 A. M. saw Cape St. Diego bearing S. S. E. by compass; not being able to fetch through the Straits of Le Maire, I shall go round Staten Land. Barometer ranging at about 29; falling on the approach of a squall, and rising after. Ends quite moderate.

May 6. Lat. 55° 42′ S.; long. 65° 05′ W. Barometer, 29.00; temperature of air, 46°; of water, 47°; of water, below surface, 47°. Winds: W. S. W., W., N. W. First part, strong breezes; middle, moderate; and latter, fresh breezes and squally. A very heavy swell from S. S. W.

May 7. Lat. 56° 00′ S.; long. 65° 10′ W. Current, E. N. E., 1½ knot per hour. Barometer, 29.00; temperature of air, 40°; of water, 47′; of water, below surface, 47°. Winds: W. S. W., S. W., N. W. Commences blowing a gale; wind unsteady. At 4 A. M. fell calm; at 8 A. M. light airs. Ends fresh breeze. Barometer on the rise at noon.

May 8. Lat. 56° 39′ S.; long. 64° 45′ W. Current, E. by N., 3 knots per hour. Barometer, 29.00; temperature of air, 44°; of water, 43°; of water, below surface, 43°. Winds: W., S. W., N. Commences

with a fresh breeze. At 4 P.M. wind increased to a gale, and changing; bad sea running. At 11 P.M. moderating. Ends heavy gales. Barometer indicates the changes in the weather.

May 9. Lat. 57° 44′ S.; long. 68° 45′ W. Current, E. by N., 41 miles. Barometer, 29.40; temperature of air, 44°; of water, 42°; of water, below surface, 42°. Winds: N., W. to S. W., W. Fresh breezes and sharp squalls. Crew in a state of mutiny.

May 10. Lat. 58° 41′ S. (D. R.); long. 69° 20′ W. (D. R.) Barometer, 29.30; temperature of air, 42°; of water, 40°; of water, below surface, 40°. Winds: W., W. N. W., W. N. W. Heavy gales, veering a point or two east way. Barometer rose and fell $\frac{3}{10}$ during the day.

May 11. Lat. 59° 20′ S. (D. R); long. 71° 19′ W. (D. R.) Barometer, 29.10; temperature of air, 40°; of water, 41°; of water, below surface, 41°. Winds: W., N. W. by W., N. W. Heavy gales, varying from W. to N. N. W. At noon, wind north with rain; a bad sea running; ship leaking badly. Crew still mutinous; can't get sail handled.

May 12. Lat. 59° 20′ S. (D. R.); long. 73° 10′ W. Barometer, 28.80; temperature of air, 39°; of water, 38°; of water, below surface, 38°. Winds: W., N., N. N. W. Commences with a gale; wearing ship according to the changes of the wind. At 7 P. M. calm; at 8, light northerly airs; middle part, blowing hard. From 8 to meridian, sharp snow squalls; blowing very hard; ship still leaking badly.

May 13. Lat. 60° 16′ S. (D. R.); long. 74° 50′ W. (D. R.) Barometer, 28.60; temperature of air, 33°; of water, 34°; of water, below surface, 34°. Winds: N., N. W., W. by S. Heavy gales, with sharp snow squalls. Ship making ten inches of water an hour. One of the pumps choked.

May 14. Lat. 58° 24′ S. (D. R.); long. 74° 11′ W. (D. R.) Barometer, 29.20; temperature of air, 39°; of water, 38°; of water, below surface, 38°. Winds: S. W., W. by N., W. by N. Gale still continues, and lasts the whole day. One man washed overboard and drowned. Barometer rose gradually.

May 15. Lat. 58° 25′ S. (D. R.); long. 75° 09′ W. (D. R.) Barometer, 29.27; temperature of air, 41°; of water, 39°; of water, below surface, 39°. Winds: W., W. N. W., N. by W. Gale continues throughout this day; during the middle part, squally with rain. Foggy during the middle and latter parts. At noon, the wind veered to N. W. by W.

May 16. Lat. 58° 45′ S. (D. R.); long. 75° 48′ W. Barometer, 29.47: temperature of air, 39°; of water, 39°; of water, below surface, 39°. Winds: W., W. N. W., N. W. by W. Commences gale still blowing; middle, squally, black heavy clouds. At 10 A.M. quite moderate; bad sea running. The ship's cutwater started by plunging into a head sea. Ends cloudy. No observations for a week.

May 17. Lat. 58° 12′ S. (D. R.); long. 76° 27′ W. Barometer, 29.50; temperature of air, 38°; of water, 38°; of water, below surface, 38°. Winds: W., W. S. W., W. S. W. Commences blowing a gale. At midnight, heavy squally weather. At 4 A. M. a very heavy squall with snow. At 7 A. M. five feet of water in the hold. Put all hands at the pumps, and kept the ship off the wind until she was freed. She leaks at the rate of ten inches per hour.

May 18. Lat. 56° 36′ S.; long. 75° 01′ W. Barometer, 29.80; temperature of air, 41°; of water, 40°; water, below surface, 40°. Winds: W. by S., W. S. W., W. S. W. First part, blowing a gale;

middle, more moderate, but very squally, with some rain; latter part, quite moderate. By observation, discovered that in eight days had made 150 miles east of the reckoning. The last 24 hours we found the current setting south, at the rate of a mile an hour.

May 19. Lat. 65° 20′ S.; long. 76° 21′ W. Current, N., 20 miles. Barometer, 29.00; temperature of air, 42°; of water, 40°; water, below surface, 40°. Winds: W. S. W., calm, S. by E. First part, strong breezes; middle, calm; 11 P. M. light northerly airs; at 8 A. M. fresh gale from N.; at noon, blowing hard from N. E. by E. Barometer fell gradually.

May 20. Lat. 55° 45′ S. (D. R.); long. 80° 33′ W. (D. R.) Barometer, 28.50; temperature of air, 43°; of water, 41°; water, below surface, 51°. Winds: E. N. E., N. W., N. W. First part, a gale; very bad sea; obliged to scud. At 5 hours 30 min. the wind suddenly hauled to N. N. W.; sea breaking over the ship; 4½ feet of water in the hold; both pumps going, and all hands at them. Middle part, still blowing; latter part, more moderate; ends with thick foggy weather, and fine rain. Barometer did not work well.

May 21. Lat. 55° 23′ S. (D. R.); long. 81° 02′ W. (D. R.) Barometer, 28.68; temperature of air, 36°; of water, 41°; of water, below surface, 41°. Winds: N. W., W. N. W., W. N. W. Commences with light airs, with fog and rain; at 10 P. M. calm; 11, light airs from west; 12, sharp snow-squalls from S. W.; ends calm, with snow.

May 22. Lat. 53° 56′ S.; long. 81° 30′ W. Barometer, 29.26; temperature of air, 35°; of water, 40°; water, below surface, 40°. Winds: W., W. S. W., W. S. W. Fresh gales and squally, with plenty of snow.

May 23. Lat. 51° 32′ S. (D. R.); long. 81° 33′ W. (D. R.) Barometer, 29.70; temperature of air, 45°; of water, 45°; water, below surface, 45°. Winds: W., W. to W. S. W., W. Fresh increasing gales, with snow, rain, and fog.

May 24. Lat. 49° 15′ S.; long. 81° 50′ W. Barometer, 29.90; temperature of air, 48°; of water, 48°; water, below surface, 48°. Winds: W. by S., W. S. W., S. W. First part, fresh breeze and squally; middle, do.; latter part, fine breeze.

Surprise (Chas. A. Ranlett).

April 27, 1853. Lat. 47° 10′ S.; long. 60° 22′ W. (D. R.) Very little current. Barometer, 29.75; temperature of air, 59°; of water, 45′. Winds: E. S. E., E., E. to N. E.: cloudy, almost calm, and unpleasant weather, first part; at 6 P. M. a breeze sprung up; a heavy sea on; barometer rising slowly; many birds about; saw a white pigeon—he flew a few times and went off; a long, rolling swell from N. E.; great patches of kelp.

April 28. Lat. 50° 04′ S.; long. 62° 59′ W. Barometer, 29.50; temperature of air, 54°; of water, 46°. Winds: N. W., N. W. Light from northward first part, and hauling W. N. W.; latter part, wind N. W., and a fresh breeze—weather like smoky southwester at the north; barometer falling from 29.75 since midnight; lots of birds, yet no Carey chickens; plenty of kelp.

April 29. Lat. 53° 36′ S.; long. 64° 00′ W. Barometer, 29.65; temperature of air, 50°; of water,

46°. Winds: N., N. E., N. E.; strong breezes from the northward, and smoky or hazy weather—cannot see far; middle part, hauling N. E.—intended to have gone through the Straits of Le Maire, but as the wind hauled eastward, must go outside; saw penguins, kelp, &c., and a great many birds and porpoises.

April 30. Lat. 54° 19′ S.; long. 63° 09′ W. (D. R.); much current, by appearances. Barometer, 29.15; temperature of air, 52°; of water, 45°. Winds: E. N. E., N. E., E. by S. At 2 P. M. thick weather, and very bad to run for land; fresh breeze; at 6 P. M. made a high bluff; land has the appearance of an island—took it to be one of the new islands. Tacked and stood off N. N. W.; at midnight, tacked again, E. S. E., and stood over but saw nothing; hauled up south at noon; wind growing light, sea smooth, and strong tide rips; must set strong to the eastward, as I cannot see Staten Land.

May 1. Lat. 54° 46′ S.; long. 63° 06′ W. (D. R.) A strong current, easterly. Barometer, 29.80; temperature of air, 52°; of water, 46°. Winds: N. E., light, calm, calm; light N. E. winds first part, and thick, rainy weather; fog and rain all night; smooth sea, and a very strong current somewhere by the many tide rips; no sun to be seen since the 29th ult., consequently, cannot find out how much current, nor its course; see penguins.

May 2. Lat. 56° 3′ S.; long. 66° 27′ W. Barometer, 29.50; temperature of air, 50°; of water, 46°. Winds: calm, S. W., W., W. N. W., calm, and thick fog until 4 P. M.; a light breeze sprung up from S. W. by W.; at 8 fine, clear weather. The third mate called me to see a *comet*—a good-sized comet, about 8° S. W. from the middle star of the belt of Orion; latter part, strong W. N. W. wind to sun this day.

May 3. Lat. 57° 3′ S.; long. 66° 1′ W. Current, for four days, easterly, only 1° 5′. Barometer, 28.75; temperature of air, 46°; of water, 42°. Wind W., W. by S., W. S. W. Commences with a violent gale for a few hours; middle part, more moderate; latter part, violent snow storm, a very heavy sea, thick weather; did not see the comet; good observation; found I had not lost so much as I anticipated—40 miles in three days' current.

May 4. Lat. 57° 41′ S.; long. 65° 52′ W. Very little current. Barometer, 28.40; temperature of air, 43°; of water, 39°. Winds: S. W., W. S. W., W. S. W. Squally weather, snow, hail, rain, &c.; wore ship to southward; middle part, wind very strong in squalls; saw two barques; saw the comet, but a long way N. E. of where we first saw it, in about 12° N. E. of Orion Belt, going very fast to the eastward; latter part, very heavy squalls, as much as a close reef can stand.

May 5. Lat. 58° 13′ S. (D. R.); long. 66° 34′ W. (D. R.) Barometer, 28.40; temperature of air, 41°; of water, 38°. Winds: S. W. by W., W. by S., W. S. W. Strong heavy squalls, with rain, hail, and snow all day and night. Barometer rose to 28.70; at 4 P. M. fell to 28.30; some three or four of the most terrific squalls I ever witnessed in the night; mastheads, yardarms, every one of them, had a bright light. After 7 A. M. barometer commenced rising; at noon, barometer, 28.50; heavy head sea; no observations; comet not in sight.

May 6. Lat. 57° 47′ S. (D. R.); long. 70° 19′ W. (D. R.) Barometer, 28.50; temperature of air, 41°; of water, 38°. Wind all around the compass. Barometer rose to 28.95 and then fell to 28.50. A squally day with a rough sea. Not able to make much headway.

May 7. Lat. 58° 03′ S.; long. 68° 40′ W. Strong easterly current for the last three days. Barometer, 28.88; temperature of air, 47°; of water, 42°. Winds all around the compass. Cloudy with rain and very rough head sea. Ship dipping a great deal of water; men breaking down; barometer rising and falling as the day before. Cape Horn is no bugaboo. It is much worse than I expected. 55 days out.

May 8. Lat. 57° 50′ S. (D. R.); long. 69° 30′ W. (D. R.) Appearances of a strong easterly current. Barometer, 29.25; temperature of air, 46°; of water, 45°. Winds: S. W., W. N. W., N. W. Commences squally. At 1 P. M. wind hauled to S. W.; blew a hard gale, and then hauled back to N. W. Barometer from 29.10 to 29.37, and fell to 29.25 as the wind hauled to the westward. Wild looking weather.

May 9. Lat. 58° 25′ S.; long. 72° 52′ W. Barometer, 29.85; temperature of air, 45°; of water, 40°. Winds: N. N. W., W. N. W., W. by N. Stormy, and such a head sea that we cannot get along; several sharp flashes of lightning to S. S. E. of us.

May 10. Lat. 58° 51′ S. (D. R.); long. 73° 50′ W. Barometer, 29; temperature of air, 45°; of water, 41°. Winds: W., W., N. W. Snow squalls and lightning in the south; short S. W. sea; barometer unsteady.

May 11. Lat. 59° 32′ S. (D. R.); long. 73° 46′ W. (D. R.) Current, E. N. E., 30 miles. Barometer, 28.80; temperature of air, 45°; of water, 40°. Winds: W. N. W., W. N. W., N. W. Heavy gales, with hail, rain, snow, &c.

May 12. Lat. 59° 23′ S.; long. 75° 40′ W. Barometer, 28.40; temperature of air, 46°; of water, 39°. Winds: W., N. N. W., W. N. W. Light winds; nearly calm. Barometer fell from 28.90 to 28.40. Latter part, squally, with hail, rain, and snow; wind increasing.

May 13. Lat. 58° 09′ S.; long. 76° 25′ W. Barometer, 28.86; Winds: N. and N. W., S. W., S. S. W. to W S. W. Commences with a gale, with heavy squalls of hail, rain, and snow. Barometer unsteady; squalls the same, without any apparent effect on the barometer; I do not trust to it. At noon a gale at W. S. W.

May 14. Lat. 56° 16′ S.; long. 75° 55′ W. Barometer, 28.90; temperature of air, 48°; of water, 42°; Winds: S. W., W., W. Commences with a strong moderating gale; sea heavy, and breaking over the ship everywhere; trying to get north; it is of no use to try to get to the westward here; barometer acts curiously here, rising and falling very often and very fast.

May 15. Lat. 56° 35′ S.; long. 77° 59′ W. Barometer, 29.20; temperature of air, 44°; of water, 44°. Winds: W. ½ N., N. W. by W., N. W. by W. Commences with thick, stormy weather, with rain, hail, and snow; flashes of lightning. Latter part, more moderate, thick mist, heavy head sea. Barometer falling.

May 16. Lat. 56° 38′ S.; long. 78° 04′ W. Current, 50 miles, the last three days. Thick, cloudy, and all sorts of bad weather. Winds: N. W. by W., W. S. W., W. by N. Barometer, 28.90; temperature of air, 52°; of water, 42°.

May 17. Lat. 54° 41′ S. (D. R.); long. 78° 35′ W. (D. R.) Barometer, 29.60; temperature of air, 42°;

of water, 42°. Winds: W. N. W., S. W., and W. S. W. Stormy-looking weather; blowing hard in squalls; short head sea.

May 18. Lat. 52° 39′ S.; long. 78° 45′ W. Barometer, 29.90; temperature of air, 48°; of water, 42°. Winds: W., W., variable. Stormy weather; moderated during the night; noon almost calm; at 11 A. M. a light breeze sprung up at E. N. E. Barometer high.

May 19. Lat. 50° 15′ S.; long. 82° 22′ W. Current, S. E., 20 miles. Barometer, 28.35; temperature of air, 54°; of water, 48°. Winds: E. N. E., E. N. E., variable. Commences with fine weather; wind soon increased; barometer fell very fast, ranging between 29.80 and 28.35; wind increased to a gale; during the forenoon hauled to the westward, going around by south.

May 20. Lat. 50° 06′ S.; long. 84° 00′ W. Barometer, 28.30; temperature of air, 55°; of water, 48°. Current, 16 miles, south. Winds: N. W., N. W., N. N. W. and S. W., 1 hour. Cloudy and squally; wind hauling to the northward. Barometer ranges from 28.35 to 28.50, too low to venture much sail. At 11 A. M. wind came out S. W.

May 21. Lat. 48° 08′ S.; long. 83° 15′ W. Barometer, 28.70. Winds: S. W. and W., W. N. W., W. All appearances of a S. W. wind, which amounted to nothing; during the evening rainy; weather generally bad.

Houqua (Richard W. Dixey).

April 25. Lat. 49° 1′ S.; long. 63° 43′ W. Barometer, 29.20; temperature of air, 45; of water, 49°. Winds: N. W., N. N. E., E. First part, fine winds, and pleasant; middle and latter, strong winds, and cloudy.

April 26. Lat. 52° 14′ S.; long. 64° 06′ W. Barometer, 29.70; temperature of air, 45; of water, 46°. Winds: E., E., E. N. E.; fine winds, and cloudy. Birds and kelp in abundance.

April 27. Lat. 54° 39′ S.; long. 62° 45′ W. Barometer, 29.60; temperature of air, 44°; of water, 46°. Winds: N. E., N. E., N.; strong winds, and cloudy; middle, strong gales. Lay to for daylight and the land.

April 28. No observation; 64° 45′ W. (D. R.) Barometer, 29.60; temperature of air, 40°; of water, 39°. Winds: N., variable, N. E.; strong winds, and cloudy. At 2 P. M. judged the ship clear of Staten Land; hauled up S. W. by S.

April 29. Lat. 57° 06′ S.; long. 68° 30′ W. Barometer, 29.65; temperature of air, 43°; of water, 43°. Winds: N. N. E., N. N. E., S.; strong winds, and thick weather; middle, moderate and rainy; latter, moderate and foggy.

April 30. Lat. 56° 52′ S. (D. R.); long. 70° 12′ W. Barometer, 30.00; temperature of air, 41°; of water, 43°. Winds: S. S. E., variable, calm; light breezes, and clear; middle, do.; latter, do. and foggy. At 7 P. M. a bright comet, bearing W. S. W. per comp., alt. 10° 20′, in fine view; its range and tail about E. and W. true.

May 1. Lat. 57° 22′ S. (D. R.); long. 72° 22′ W. Barometer, 29.90; temperature of air, 42°; of water,

43°. Winds: calm, W. N. W., variable. First, calm, and thick foggy weather; middle, squally; latter, strong winds and thick.

May 2. Lat. 58° 10′ S. (D. R.); long. 73° 48′ W. Variation observed, 28° 00′ E. Barometer, 29.00; temperature of air, 41°; of water, 43°. Winds: W., W., W.; strong gales, and thick weather; middle, strong gales; latter, strong gales and snow squalls.

May 3. Lat. 57° 15′ S.; long. 72° 18′ W. Current, E., 1 mile per hour. Barometer, 28.84; temperature of air, 39°; of water, 41°. Winds: W. S. W., W. S. W., W. S. W.; heavy gales first part; middle, less wind; latter, squally.

May 4. Lat. 56° 57′ S.; long. 71° 00′ W. Barometer, 28.62; temperature of air, 37°; of water, 41°. Winds: W. S. W., W. S. W., W. S. W.; heavy gales and heavy sea; snow squalls; lying to.

May 5. Lat. 57° 10′ S.; long. 70° 00′ W. Barometer, 28.65; temperature of air, 36°; of water, 42°. Winds: W. S. W., W. S. W., W. S. W.; heavy gales, with snow squalls at times. At 7 hours 30 min. a violent squall passed over the ship. Apparently at the time of its striking her, a meteor, about the size of a man's head, burst at the masthead, and resembled a large rocket; came down the mainmast and passed off to leeward without doing any damage; thank God for the mercy; ship hove to.

May 6. Lat. 57° 19′ S.; long. 70° 10′ W. Barometer, 28.62; temperature of air, 41°; of water, 42°. Winds: W. S. W., variable, W. S. W.; heavy gales; high sea running; part of the time hove to.

May 7. Lat. 57° 32′ S.; long. 69° 45′ W. Barometer, 28.95; temperature of air, 37°; of water, 43°. Winds: W. S. W., N. W., W. S. W. First part, heavy gales; middle, calm; latter, heavy gales; lying to.

May 8. Lat. ——; long. 71° 30′ W. Current, E., 1 mile per hour. Barometer, 29.60; temperature of air, 41°; of water, 42°. Winds: W. S. W., variable, N. W.; strong gales, and cloudy; high sea.

May 9. Lat. 58° 20′ S.; long. 72° 59′ W. Barometer, 28.80; temperature of air, 40°; of water, 40°. Winds: N. N. E., W. N. W., W. N. W.; strong gales, and very heavy squalls; cloudy. The sea runs very high.

May 10. Lat. ——; long. 74° 30′ W. (D. R.) Barometer, 29.10; temperature of air, 39°; of water, 41°. Winds: W. N. W., W. N. W., W. N. W.; heavy gales and clear, first part; snow and rain squalls, latter; occasionally a chance to make sail, but for very short periods.

May 11. Lat. ——; long. 75° 50′ W. (D. R.) Barometer, 29.10; temperature of air, 39°; of water, 41°. Winds: N. W., N. W., N. W.; heavy gales and rain; 7 P. M. violent squalls; middle, snow and rain; clear at intervals. Ends, strong gales and clear.

May 12. Lat. ——; long. 77° 05′ W. (D. R.) Barometer, 28.37; temperature of air, 42°; water, 42°. Wind: variable throughout; moderate and cloudy; 10 A. M. barometer very low; made ready for a heavy gale; ends, strong gale; hove to part of the day.

May 13. Lat. ——; long. 76° 45′ W. (D. R.) Barometer, 28.26; temperature of air, 35°; of water, 39°. Winds: N. W., N. W.; very heavy gales and squally; high sea.

May 14. Lat. 58° 22′ S.; long. 73° 00′ W. Barometer, 29.20; temperature of air, 41°; of water 42°. Winds: S. W., W., W.; heavy gales and squally; rain and hail.

May 15. Lat. ——; long. 73° 22′ W. Barometer, 29.25; temperature of air, 42°; of water, 42°. Winds: W., W. N. W., W. N. W.; strong gales and squally.

May 16. Lat. 57° 27′ S.; long. 73° 44′ W. Barometer, 29.50; temperature of air, 37°; of water, 42°. Winds: N. W. by W., W. N. W., W. by S.; strong gales, rain and fog; middle, do. and rain; latter, moderate.

May 17. Lat. ——; long. 75° 03′ W. Barometer, 29.40; temperature of air, 38°; of water, 41°. Winds: N. W., W. S. W., S. W.; strong winds and clear; latter part, strong gales and cloudy.

May 18. Lat. 56° 02′ S.; long. 74° 42′ W. Barometer, 29.70; temperature of air, 41°; of water, 43°. Winds: W. S. W., W. S. W., W. S. W.; strong gales and heavy squalls; middle, squally, hail and rain.

May 19. Lat. ——; long. 78° 08′ W. Barometer, 28.90: temperature of air, 42°; of water, 43°. Winds: W. S. W., N. N. E., N. E.; first, moderate and cloudy; middle, do. ends hard storm.

May 20. Lat.——; long 80° 18′ W. Barometer, 28.17; temperature of air, 46°; of water, 43°. Winds: N. E., N. N. W., N. N. W.; heavy gales and thick weather; lying to; shipped a sea, doing some slight damage; ends moderate and cloudy.

May 21. Lat. ——; long. 81° 21′ W. Barometer, 28.60; temperature of air, 43°; of water, 42°. Winds: N. W. by W., variable throughout; commences moderate and cloudy; barometer, low; often the barometer has indicated heavy weather, when it was not experienced; *generally very correct.*

May 22. Lat. 53° 49′ S.; long. 81° 05′ W. Barometer, 29.50; temperature of air, 33°; of water, 41°. Winds; variable throughout; squally, with hail, rain, and snow.

May 23. Lat. ——; long. 82° 40′ W. Barometer, 22.60; temperature of air, 43°; of water, 42; Winds: W. S. W., W., W.; first, and middle parts, strong winds and squally; latter, strong gales and rainy.

May 24. Lat. 49° 10′ S.; long. 83° 00′ W. Current, N. E., about ½ knot. Barometer, 29.90; temperature of air, 46°; of water, 48°. Winds: W. S. W., W., W.; strong gales, and thick weather; midnight, rainy; latter, moderate.

Barque Parthian (Smith).

May 13, 1853. Lat. 50° 55′ S.; long. 63° 52′ W. Barometer, 29.1; temperature of air, 50°; of water, 48°. Winds: N., N. W., S. S. W. Fine weather; whole sail breeze.

May 14. Lat. 53° 17′ S.; long. 64° 38′ W. Barometer, 29.3; temperature of air, 47°; of water, 47°. Winds: W. S. W., W., W. S. W. Middle and latter parts, strong breeze and clear. Double reefs.

May 15. Barometer, 29.3; temperature of air, 46°. Wind: W. At 10 P. M. hove to for daylight, to pass through the Straits of Le Maire; at 9 A. M. entered and at noon cleared the straits. Fine weather; all sail.

May 16. Lat. 56° 40′ S.; long. 67° 1′ W. Barometer, 29.2; temperature of air, 45°; of water, 43°. Winds: N. W., W., S. W. Middle part, strong breeze and rainy. Ends calm, with a heavy S. W. swell. At meridian, Cape Horn W. by N. 15 miles.

May 17. Lat. 57° 59′ S.; long. 68° 40′ W. Barometer, 28.7; temperature of air, 42°; of water, 43°. Winds: N., N. W., S. S. W. First and middle parts, moderate and rainy. Ends with a hard gale, with snow squalls.

May 18. Lat. 58° 21′ S.; long. ——. Barometer, 28.9; temperature of air, 40°; of water, 41°. Winds: S. S. W., W., W. S. W. Throughout, a hard gale and squally.

May 19. Lat. 58° 51′ S.; long. ——. Barometer, 29.0; temperature of air, 39°; of water, 40. Winds: W. S. W. Latter part, moderate, inclining to calm.

May 20. Lat. 58° 32′ S.; long. ——. Barometer, 28.2; temperature of air, 44°; of water, 41°. Winds: N. E., N., N. N. W. Latter part, strong breeze and rainy. Double reefs.

May 21. Lat. 58° 45′ S.; long. 77° 10′ W. Barometer, 28.1; temperature of air, 44°; of water, 41°. Winds: N. N. W., N. W., W. N. W. Throughout, and at times rainy. Barometer, 28 lower than I have ever seen it. At meridian, rising a little; since my last chronometer observations, the current, if any, very trifling to the N. E.

May 22. Lat. 57° 47′ S.; long. 78° 53′ W. Barometer, 28.0; temperature of air, 40°; of water, 39°. Winds: N., variable, W. S. W. Moderate, with much snow; middle part, wind went round the compass, from W. to N. and E., and W.

May 23. Lat. 55° 50′ S.; long. ——. Barometer, 28.7; temperature of air, 40°; of water, 40°. Winds: W. S. W., W., W. by N. Latter part, rainy; double reefs in the topsails.

May 24. Lat. 53° 40′ S.; long. ——. Barometer, 29.0; temperature of air, 46°; of water, 42°. Winds: W. S. W., S. W., W. S. W. Third and last parts, moderate and fine weather; all sail.

May 25. Lat. 53° 2′ S.; long. ——. Barometer, 28.5; temperature of air, 46°; of water, 43°. Winds: W. S. W., N. W., W. S. W. Third and last parts, blowing hard, with much rain, and heavy head sea; double reefs.

May 26. Lat. 50° 40′ S.; long. 81° 25′ W. Barometer, 28.7; temperature of air, 47°; of water, 44°. Winds: S. W., S. W., W. S. W. Middle and latter parts, moderate; all sail.

Lantao (Geo. H. Bradbury).

May 15, 1853. Lat. 51° 15′ S.; long. 68° 10′ W. Winds: N. N. W. to N. throughout. First part, moderate; middle, strong; and latter, fresh breezes. Bluff, at Santa Cruz, in sight, bearing W. N. W.; sea very smooth.

May 16. Lat. 53° 05′ S.; long. 56° 30′ W. Winds: N. to W., N. W. throughout. Moderate and cloudy; nasty swell from N. N. E.

May 17. Straits of Le Maire. Current, N. E., strong. Barometer, 29.37. Winds: W. N. W. to N. N. W., W. N. W., N. N. W. to S. W. First part, moderate and fine; middle, moderate and overcast; made Bell Mountain at 2 A. M., and soon after passed Cape St. Diego; was struck by a S. W. squall (in the middle of the straits), which settled into a heavy gale; ran back, and lay to under the lee of St. Diego.

May 18. Off Cape Good Success. Current, N. E., strong. Barometer, 29.80; temperature of air, 42°;

of water, 45°. Winds: S. W., W., S. W. First part, strong gales and heavy squalls; middle, moderate; stood for the straits, and passed Cape Good Success at daylight; at noon it bore N. by W., distant 15 miles; the mountains covered with snow.

May 19. Lat. 56° 10′ S.; long. 66° 30′ W. Current, easterly, light. Barometer, 29.65; temperature of air, 41°; of water, 44°. Winds: W., W., and calm; calm, and N. E. to N. Strong gales and heavy squalls until midnight; then light to 4 A. M.; calm to 6 A. M.; breezed up from east, and round to north; at noon, fresh.

May 20. Lat. 56° 00′ S.; long. 71° 30′ W. Current, easterly, light. Barometer, 28.70; temperature of air, 46°; of water, 46°. Winds: N. N. E., N. N. E., N. Strong breezes and cloudy; ends rainy; at 4 P. M. Cape Horn N. by W., 15 miles; the land at 9 A. M., N. N. E.

May 21. Lat. 57° 00′ S.; long. 75° 30′ W. Barometer, 28.62; temperature of air, 43°. Winds: N. W. by N. throughout. Strong gales, with occasional lulls; little rain; squalls, not heavy.

May 22. Lat. 57° 40′ S.; long. 77° 00′ W. Barometer, 28.52; temperature of air, 35°; of water, 42°. Winds: N.N.W., N.W., W. Commences fresh and rainy, and threatening. At 3 P. M. a heavy squall, which lasted three hours and settled into a strong west gale; 6 A. M. moderating. Ends, strong breezes and squally.

May 23. Lat. 55° 00′ S.; long. ——. Barometer, 29.10; temperature of air, 42°; of water, 42°. Winds: W. S. W., W. by S., W. Strong breezes with heavy snow squalls.

May 24. Lat. 53° 25′ S.; long. 79° 00′ W. Barometer, 29.75; temperature of air, 41°; of water, 44°. Winds: W. to W. S. W. throughout. Fresh gales and rainy with heavy squalls. Ends fresh but moderating; snow and hail in the squalls.

May 25. Lat. 52° 25′ S.; long. 79° 45′ W. Barometer, 29.05; temperature of air, 45°. Winds: W. S. W., calm, W. to N.N. W., W. Fresh until 6 P. M., then calm; middle, strong gales and squally. Ends, do., with sleet, hail, &c.; heavy sea from southwest.

May 26. Lat. 49° 45′ S.; long. 79° 25′ W. Barometer, 29.25; temperature of air, 45°; of water, 48°. Wind: W. by N. to W. by S. throughout. Commences strong gales and hard squalls. Ends the same, but moderating; hail, snow, and rain in the squalls.

Competitor (Moses Hows).

May 18, 1853. Lat. 50° 58′ S.; long. 63° 52′ W. Barometer, 29.90; temperature of air, 47°; of water, 46°. Winds: S. W. by S., S. S. W., and S. S. W. Strong head winds.

May 19. Lat. 54° 07′ S.; long. 63° 45′ W. Barometer, 29.70. (Broke the thermometer.) Winds: S. W., S. W., and N. W. First part, strong breezes; latter part, more moderate. At 4 A. M. wind hauled to the northwest; weather fine. At noon made Staten Land, S. S. E., 36 miles distant.

May 20. Lat. 56° 34′ S.; long. 68° 34′ W. Barometer, 29.50. Winds: N., N., and N. N. W. Begins fine breezes from the north. At 4 P. M. passes the east end of Staten Land, four miles distant. At 4 A. M. Cape Horn, north ten miles; during the night, squally with rain. Latter part, moderate; all sail set. Noon, Isle Diegos N. W. one mile distant.

May 21. Lat. 57° 40′ S.; long. 72° 20′ W. Barometer, 29.10. Winds: N., N., and W. by N. Strong winds and squally, with rain.

May 22. Lat. 57° 36′ S.; long. 74° 20′ W. Barometer, 28.50. Winds: W. N. W., N., and W. S. W. A heavy sea and gale; shipping much water; washed off the eagle and split the stem; three feet water in the hold; worked the pumps till midnight. Ship making three inches water per hour.

May 23. Lat. 56° 08′ S.; long. 73° 50′ W. Barometer, 28.70; Winds: W., W. S. W., and W. S. W. Strong gales, heavy sea and thick weather.

May 24. Lat. 56° 03′ S.; long. 75° 10′ W. Barometer, 29.30. Winds: W. S. W., S. W., and W. S. W. Strong gales; ship leaking three and a half inches per hour. Ends cloudy and heavy sea.

May 25. Lat. 55° 50′ S.; long. 76° 50′ W. Barometer, 28.50. Winds: S. W. by W., W. N. W., W. N. W. First part, strong breezes; latter part, moderate with rain.

May 26. Lat. 55° 48′ S.; long. 77° 50′ W. Barometer, 28.40. Winds: W., W. N. W., calm. A heavy swell. At daylight, put the ship before the wind; all hands employed strapping the bows together; put four parts of chain around through the hawse-pipes, and set it up with lashings over the bowsprit and across the stem. Ends with dark and gloomy weather.

May 27. Lat. 54° 58′ S.; long. 79° 10′ W. Barometer, 29.00. Winds: N., W. N. W., and N. E. Begins with light breezes from the northward; made all sail; fine weather.

May 28. Lat. 53° 18′ S.; long. 79° 40′ W. Barometer, 28.80. Winds: E., S. W., W. S. W. First part, light breezes; latter part, a gale.

May 29. Lat. 52° 12′ S.; long. 79° 45′ W. Barometer, 29.15. Winds: W. S. W., S. W., and S. W. Heavy gale and sea; middle part, more moderate; latter part, heavy squalls.

May 30. Lat. 51° 12′ S.; long. 79° 5′ W. Barometer, 27.02. Winds: S. W. by W., S. S. W., W. S. W. Violent gales.

May 31. Lat. 51° 14′ S.; long. 78° 30′ W. Barometer, 29.10. Winds: W. by S., W. S. W., W. S. W. Violent gales and a heavy sea.

June 1. Lat. 50° 42′ S.; long. 78° W. Barometer, 29.10. Winds: W. S. W., W. by S., W. S. W. Violent gales and heavy sea.

Flying Cloud (Creesy), New York to San Francisco, forty-five days out.

June 12, 1853. Lat. 52° 17′ S.; long. 67° 06′ W. Winds: N. W., W. N. W., S. S. W. First part, fresh; middle and latter, strong gales, clear, and cold.

June 13. Lat. 54° 35′ S.; long. 65° 21′ W. Winds: S. S. W., W. N. W., W. N. W. Strong gales. At noon, Cape San Diego bearing S. E. by E., distant 10 miles.

June 14. Lat. 56° 22′ S.; long. 67° 34′ W. Winds: W. N. W., W. N. W., baffling; strong gales and very heavy squalls from off the land; passed through the Straits of Le Maire; middle part, moderate and cloudy; latter, threatening weather.

June 15. Lat. 56° 32′ S.; long. 69° 08′ W. Winds: S., S. W. by S., S. W. First part, moderate,

with heavy squalls of snow and hail. At 6 hours 30 min. Diego Ramirez Islands in sight, bearing south 5 miles distant; middle part, heavy squalls; latter part, hard gale, with harder squalls.

June 16. Lat. 55° 18′ S.; long. 72° 27′ W. Winds: S. S. W., calm, S. S. E. First part, hard gale, with heavy squalls; middle part, mostly calm; latter, hard squalls.

June 17. Lat. 53° 07′ S.; long. 76° 18′ W. Winds: S. S. E., calm, baffling. First part, strong gales, with heavy squalls; latter, faint; barometer, 30.30.

June 18. Lat. 53° 38′ S.; long. 81° 50′ W. Winds: baffling, N. N. W., N. N. W. First part, light and squally; middle, strong gale; latter, very heavy gale. At 11, hove the ship to. Barometer fell rapidly to 28.35.

June 19. Lat. 53° 10′ S.; long. 81° 23′ W. Wind: W. N. W. throughout. First part, hard gale without violent squalls; ends moderate.

June 20. Lat. 50° 56′ S.; long. 77° 57′ W. Winds: baffling, baffling, and N. W. Strong and squally. Bad sea, running ship continually under water; double reefed sails.

Golden Era (E. P. Sleeper).

June 3, 1853. Lat. 51° 48′ S.; long. 65° 31′ W. Barometer, 29.3; temperature of water, 44°. Winds: W. N. W. Moderate breezes. At 8 A. M. sounded; had 75 fathoms water.

June 4. Lat. 53° 05′ S.; long. 64° 49′ W. Barometer, 29.2; temperature of air, in the cabin, 51°; of water, 44°. Winds: W. S. W., W. S. W., variable, N. W., variable. Light breezes, and pleasant.

June 5. Lat. 54° 18′ S.; long. not observed. Cape St. John, Staten Land, bearing S. E. by S. Barometer, 29.00; temperature of air in the cabin, 48°; of water, 43°. Winds: W. N. W., N. W., N. W. to S. E. Light breezes. At daylight, Staten Land in sight; plenty of snow—very good place to slide down hill.

June 6. Lat. (D. R.) 54° 25′ S.; long. (D. R.) 63° 25′ W. Barometer, 29.00; temperature of air, 46°; of water, 42°. Winds: E., S. E. by S., S. E. by S. First part, light breezes; middle and latter, fresh breezes, and thick, with snow squalls.

June 7. Cape St. John bearing S. W. by S., 45 miles distant. Barometer, 29.30; temperature of air in the cabin, 42°; of water, 42°. Wind: S. Fresh gales and snow squalls all this day.

June 8. Lat. (D. R.) 55° 40′ S.; long. (D. R.) 62° 00′ W. Barometer, 28.9; temperature of air, 42°; of water, 40°. Winds: S., W., S. W. Fresh gales, with snow squalls.

June 9. Lat. (D. R.) 56° 09′ S.; long. 62° 07′ W. Barometer, 28.9; temperature of air in the cabin, 37°; of water, 39°. Winds: S. W., S. W., to S. S. W., S. E., variable. Fresh gales and snow squalls.

June 10. Lat. 56° 04′ S.; long. 62° 25′ W. Barometer, 29.3; temperature of air in the cabin, 34°; of water, 38°. Winds: S. E., S. E. to S. W., S. W. Fresh gales, with heavy squalls of snow and hail. Plenty of ice about deck.

June 11. Lat. (D. R.) 56° 51′ S.; long. (D. R.) 62° 03′ W. Barometer, 29.1; temperature of air, 32°; of water, 36°. Winds: S. W., S. W., variable, S. S. W. to S. The same as the last 24 hours.

June 12. Lat. (D. R.) 56° 17′ S.; long. (D. R.) 64° 12′ W. Barometer, 29.8; temperature of air, 31°; of water, 36°. Winds; S. S. E., S. E., S. S. E. to S. The same as the last 24 hours—darn'd unpleasant.

June 13. Lat. 55° 40′ S.; long. 64° 30′ W. Barometer, 29.8; temperature of air, 34°; of water, 35°. Winds: S. S. W., S. W. by S., S. W. by S. Fresh gales, with heavy squalls of snow and hail; a very bad sea.

June 14. Lat. 56° 16′ S.; long. 63° 45′ W. Barometer, 29.7; temperature of air, 36°; of water, 35°. Winds: S. S. W. to S. W., S. W. by S., S. S. W. Weather the same as yesterday.

June 15. Lat. (D. R.) 56° 09′ S.; long. (D. R.) 64° 40′ W. Barometer, 29.80; temperature of air, 43°; water, 37°. Winds: S. S. W. to S., S. to S. S. W., S. W. to W. Fresh gales and cloudy, with a very bad sea.

June 16. Lat. (D. R.) 57° 00′ S.; long. 64° 17′ W. Barometer, 29.5; temperature of air, 44°; water, 36°. Winds: W., W. by S., W. S. W. Heavy gale, thick and rainy.

June 17. Lat. (D. R.) 57° 44′ S.; long. (D. R.) 63° 43′ W. Barometer, 29.4; temperature of air, 45°; of water, 36°. Winds: W. S. W., W. S. W. Weather the same as yesterday.

June 18. Lat. (D. R.) 58° 28′ S.; long. (D. R.) 63° 16′ W. Barometer, 29.4; temperature of air, 45°; of water, 37°. Winds: S. W., W. S. W., W. by S. Heavy gale, thick and rainy weather; very bad sea.

June 19. Lat. 57° 33′ (D. R.) S.; long. (D. R.) 63° 40′ W. Barometer, 29.20; temperature of air, 42°; of water, 40°. Winds: W. by S., W. N. W., W. to S. Weather the same as yesterday.

June 20. Lat. (D. R.) 57° 48′ S.; long. (D. R.) 63° 48′ W. Barometer, 29.1; temperature of air, 43°; of water, 36°. Winds: S. E. to N. E., N. E. to N. W., N. W. by N. First part, very light breezes; latter part, fresh, thick, and rainy; very bad sea.

June 21. Lat. (D. R.) 58° 39′ S.; long. (D. R.) 64° 30′ W. Barometer, 28.7; temperature of air, 38°; of water, 32°. Winds: S. W. variable, W. N. W., W. by N. variable. First and middle parts, fresh breezes; latter, fresh gale, with snow.

June 22. Lat. (D. R.) 59° 27′ S.; long. (D. R.) 64° 30′ W. Barometer, 28.7; temperature of air, 25°; of water, 29°. Winds: W. S. W., W. variable, W. to S. W. Fresh gale, and light breezes; very heavy squalls of snow and hail throughout.

June 23. Lat. (D. R.) 59° 47′ S.; long. (D. R.) 64° 30′ W. Barometer, 29.00; temperature of air, 16°; of water, 28°. Winds: W. to S. W., W. N. W., calm. First part, fresh gale; at 2 A. M., calm; at daylight the whole ocean was one sheet of ice, or slush, from about six to ten inches in thickness; no water to be seen; ends with fresh breezes; snow throughout.

June 24. Lat. (D. R.) 59° 00′ S.; long. (D. R.) 69° 15′ W. Barometer, 29.2; temperature of air, 20°; of water, 36°. Winds: E., E. by S., S. E., variable. Fresh gales, with a regular "down east" snow storm. At 3 P. M. run out of the ice. For the last three days the vessel has been covered in ice, being from one to two feet thick on the outside.

June 25. Lat. (D. R.) 58° 47′ S.; long. (D. R.) 71° 34′ W. Barometer, 29.2; temperature of air, 27°; of water, 36°. Winds: S. E., S. E. variable, S. E. Light breezes and calms; moderate snow squalls.

June 26. Lat. (D. R.) 57° 30′ S.; long. (D. R.). 74° 21′ W. Barometer, 29.6; temperature of air, 37°; of water, 39°. Winds: S., S. by W., S. to W. S. W. First part, light breezes; middle and latter, moderate breezes, thick and rainy.

June 27. Lat. 56° 12′ S.; long. 76° 00′ W. Barometer, 29.7; temperature of air, 39°; of water, 40°. Winds: S. S. W. to S. W., S. S. W., S. W. by S. First part, moderate breezes, with light snow squalls; latter part, quite pleasant for Cape Horn; but if I was in any other part of the world I should call it unpleasant.

June 28. Lat. 55° 26′ S.; long. 78° 24′ W. Barometer, 29.50; temperature of air, 39°; of water, 40°. Winds: S. S. W., S. S. W., calm. Moderate breezes and quite pleasant.

June 29. Lat. 53° 35′ S.; long. 79° 18′ W. Barometer, 29.50; temperature of air, 38; of water, 41°. Winds: S. W., W. S. W., S. W. to W. Light breezes throughout.

June 30. Lat. (D. R.) 52° 45′ S.; long. (D. R.). 79° 30′ W. Barometer, 29.1; temperature of air, 39°; of water, 41°. Winds: W., W. to W. N. W., W. by N. First part, fresh breezes. Ends a heavy gale, with squalls of hail.

July 1. Lat. 50° 49′ S.; long. 79° 55′ W. Current, E., 40 miles during the last 24 hours. Barometer, 29.4; temperature of air, 39°; of water, 42°. Winds: S. W by S., S. W., S. W. by W. Fresh gales with very heavy sea. Squalls of hail and snow.

Ship White Squall (S. Kennedy), New York to San Francisco.

May 28, 1853. Lat. 50° 7′ S.; long. 63° 37′ W. Barometer, 29.40; temperature of air, 48°; of water, 48°. Winds: W., N. W., N. Moderate all day; cloudy weather.

May 29. Lat. 52° 6′ N.; long. 63° 32′ W. Barometer, 28.80; temperature of air, 44°; of water, 44°. Winds: N., N. W., S. Moderate; very gloomy.

May 30. Lat. 52° 31′ S.; long. 63° 18′ W. Barometer, 28.30; temperature of air, 48°; of water, 46°. Winds: S., calm, baffling. Begins calm; ends N. E. gale.

May 31. Lat. 54° 30′ S.; long. 63° 31′ W. Barometer, 28.90; temperature of air, 40°; of water, 38°. Winds: calm, E., N. E. Strong gale until 4 A. M., when it hauled to the S. W. and cleared up.

June 1. Lat. 56° 32′ S.; long. 65° 2′ W. Barometer, 29.80; temperature of air, 38°; of water, 38°. Winds: N. E., N. E., S. W. The same low barometer until 2 A. M., then rises, and the wind hauls N. E.; moderate.

June 2. Lat. 56° 45′ S.; long. 66° 28′ W. Barometer, 29.30; temperature of air, 34°; of water, 36°. Winds: W., S. W., calm and N. E. Begins fresh breezes N. E.; at 10 P. M. N. W. Ends a gale at west, and snow.

June 3. Lat. 57° 34′ S.; long. 68° 43′ W. Barometer, 29.90; temperature of air, 32°; of water, 34°. Winds: N. E., N. W., W. S. W. Commences a gale at W. S. W. Ends more moderate.

June 4. Lat. 57° 47′ S.; long. 68° 47′ W. Current, E. N. E., 27 knots per day. Barometer, 29.95;

temperature of air, 33°; of water, 37°. Winds: S. W., W., W. Commences a moderate gale; ends a moderate breeze. Saw Diego Ramirez, bearing N. W. by N.

June 5. Lat. 56° 46′ S.; long. 68° 54′ W. Current, E., 35 knots per day. Barometer, 29.70; temperature of air, 34°; of water, 42°. Winds: W., N. W., S. E. Strong breezes and passing snow squalls all day.

June 6. Lat. 55° 47′ S.; long. 75° 30′ W. Current, E. S. E., 15 knots per day. Barometer, 29.70; temperature of air, 28°; of water, 41°. Winds: S. S. E. throughout. Fine breezes all day; saw Aurora Australis.

June 7. Lat. 52° 49′ S.; long. 78° 57′ W. Current, S. E., 25 knots per day. Barometer, 30.10; temperature of air, 32°; of water, 43°. Winds: S. S. E., S., S. W. Cloudy weather all day. Moderate breeze.

June 8. Lat. 49° 12′ S.; long. 77° 46′ W. Current, E., 10 knots per day. Barometer, 30.15; temperature of air, 36°; of water, 45°. Winds: W., N. W., N. W. Nearly calm all day.

Ship Victory (O. G. Lane), New York to San Francisco, 55 days out.

June 15, 1853. Lat. 51° 03′ S.; long. 56° 49′ W. Barometer 28.60; temperature of air, 44°; of water, 42°. Winds: N. N. W., N. W., W. S. W. First part, heavy gales and hazy; second part, fresh breezes; third part, at times calm, and fine breezes with mist and rain.

June 16. Lat. 52° 12′ S.; long. 56° 20′ W. Barometer, 28.90. temperature of air, 31; of water, 42°. Winds: W. S. W., S. W. by W., S. W. by W. First part, fresh and rainy; second part, hard gales, and heavy snow-squalls; third part, heavy gales and thick snow-squalls.

June 17. Lat. 52° 13′ S.; long. 55° 50′ W. Current, E. N. E., 1½ knot per hour. Barometer, 29.45; temperature of air, 32°; of water, 41°. Winds: S. W., S. W., S. W. Strong breezes with snow squalls.

June 18. Lat. 52° 54′ S.; long. 54° 38′ W. Current, N. E. by E., 1 mile per hour. Barometer, 29.62; temperature of air, 37°; of water, 40. Winds: S. W., S. S. W., S. S. W. Fresh breezes with snow squalls.

June 19. Lat. 53° 40 S.; long. 57° 00′ W. Barometer, 29.40; temperature of air, 40; of water, 41°. Winds: S. S. W., N. W., N. W. by W. First and second parts, fresh breezes; third part, gale.

June 20. Lat. 54° 30′ S.; long. 60° 46′ W. Barometer, 28.85; temperature of air, 42°; of water, 42°. Winds: N. W. by W., W. N. W., N. W. First part, strong gale and cloudy; second and third parts, fresh and cloudy.

June 21. Lat. 55°.05′ S.; long. 63° 43′ W. Current, E. N. E., ½ knot. Barometer, 28.60; temperature of air, 42°; of water, 41°. Winds: N. W. by W., W. N. W., N. N. W. First part, moderate, cloudy, and misty; second part, moderate and foggy; third part, light and pleasant.

June 22. Lat. 56° 20′ S.; long. 66° 30′ W. Current, 1½ knot, N. N. E. Barometer, 28.30; temperature of air, 42°; of water, 41°. Winds: N. N. W., N. N. E., E. First and second parts, moderate and cloudy; third part, light breezes and rain.

June 23. Lat. 56° 40′ S.; long. 66° 50′ W. Current, 1 knot, N. E. by N. Barometer, 28.40; temperature of air, 42°; of water, 42°. Winds: S.; calm; S. W. First part, light airs; second part, calm; third part, fresh breezes and cloudy misty weather.

June 24. Lat. 57° 33′ S.; long. 68° 20′ W. Barometer, 28.70; temperature of air, 40°; of water, 40°. Winds: S. W.; calm; N. N. W. First part, fresh; second part, calm; third part, light airs and calm at times.

June 25. Lat. 57° 35′ S.; long. 71° 20′ W. Barometer, 28.07; temperature of air, 37°; of water, 39°. Winds: N. N. W., N. W., N. W. First part, fresh; second and third parts, strong gales and stronger snow squalls, rain, and hail.

June 26. Lat. 57° 20′ S.; long. 71° 30′ W. Barometer, 29.60; temperature of air, 37°; of water, 39°. Winds: N. W., W., W. S. W. Heavy gales and hard snow squalls.

June 27. Lat. 56° 39′ S.; long. 71° 33′ W. Barometer, 28.95; temperature of air, 39°; of water, 41°. Winds: W. S. W., W. S. W., W. First part, strong gales and squalls; second and third parts, moderate.

June 28. Lat. 56° 26′ S.; long. 75° 29′ W. Barometer, 28.80; temperature of air, 40°; of water, 41°. Winds: calm; N. W., N. W. First part, calm; second part, light breezes; third part, moderate and cloudy.

June 29. Lat. 55° 29′ S.; long. 75° 23′ W. Current, E., 1 knot. Barometer, 28.80; temperature of air, 39°; of water, 41°. Winds: N. W., W. S. W., S. E. First and second parts, moderate and cloudy; third part, light airs and pleasant.

June 30. Lat. 53° 30′ S.; long. 79° 03′ W. Barometer, 29.05; temperature of air, 39°; of water, 42°. Winds: E., S. E., S. S. E. First part, moderate; second and third parts, fresh breezes with snow squalls.

July 1. Lat. 51° 04′ S.; long. 82° 16 W. Barometer, 29.50; temperature of air, 39°; of water, 43°. Winds: S. S. E., S. S. W., S. W. First part, fresh breezes and cloudy; second part, moderate with light snow squalls; third part, moderate with light snow squalls.

July 2. Lat. 49° 14′ S.; long. 84° 32′ W. Barometer, 30.00; temperature of air, 40°; of water, 44°. Winds: S. S. W., S. S. E.; calm. First part, moderate, snow squalls; second part, light breezes and cloudy; third part, baffling airs and calms.

Schooner L. P. Foster (J. P. Keller), Boston to Puget Sound, seventy days out.

June 8, 1853. Lat. 49° 16′ S.; long. 66° 38′ W. Barometer, 30.20; temperature of air, 41°; of water, 46°. Winds: W., calm, N. W. Fine fair day; noon, 50 fathoms water. First and latter parts, light breezes; middle, calm. At 4 P. M. land about Port Julien in sight, bearing W. N. W., true, about 30 miles.

June 9. Lat. 50° 42′ S.; long. 67° 15′ W. Var. obs. 18° 30′ E. Barometer, 30; temperature of air, 42°; of water, 45°. Winds: N. W., variable, S. W. by S. Commences with a decreasing breeze; middle,

light, calm, and variable, from N. W. to S. S. W.; day only 8 hours long; weather fine; ends with a fresh breeze, dying away.

June 10. Lat. 51° 34′ S.; long. 67° 20′ W. Barometer, 30.05; temperature of air, 41°; of water, 44°. Winds: S., N. W., N. W. Fine weather. At 5 A. M. sudden fall of wind, and veering westward; 9. A. M. calm; noon, light breeze; dark green and smooth sea; at noon, off the Straits of Magellan.

June 11. Lat. 53° 45′ S. (D. R.); long. 66° 54′ W. (D. R.) Barometer, 29.55; Winds: N. W., N. N. W., N. W. First part, gentle breezes, with dark flying clouds; probably fog; as daylight came on, the sky became obscured by this vapor. At 9 A. M. barometer falling; land in sight about Cape Pinas; noon, quite thick and dark; barometer, 29.35; lower than I have noticed it before; no change in the weather except the fog. Thus far I have made no remarks upon the barometer. If I should dare to hazard an opinion, would say that, with the wind at N. E. and E., north of the equator, it ranges highest; and with southerly winds south of it, and particularly south of Capricorn, lowest; or at least that southerly winds may be expected when low, and westerly and northwesterly when quite high; though we have had our strongest wind (even a terrific gale for a few hours) after the barometer had fallen to 29.40 some two hours and stopped. I think it was rising at the time; wind from about west, perhaps a little northerly and inclining southward. Running along the land; wind veering north; saw what looked like snow on the mountain tops; at 10 P.M. up with Cape Diego, in sight; at the end of the day in the straits; weather getting fair; wind strong at N. W.

June 12. Straits of Le Maire. Barometer, 30.20; temperature of air, 41°; of water, 46°. Winds: W. N. W., S. S. W., W. N. W. At 2 A. M. well through the straits; wind now strong, having just had doldrums and an agitated sea; sea probably effect of currents; doldrums, of high lands. At 4 A. M. wind increasing; 7 hours 30 min. A. M. wind S. S. W., wore to the westward; hail showers. At 10 A. M. bore up for straits; strong gale and snow squalls; rough sea; moderating towards the latter part; at end standing back; strong N. E. current.

June 13. Off west end of Staten Land. Current, N. N. E. Barometer, 30.05; temperature of air, 39°; of water, 42°. Winds: W., W. N. W., N. W. Strong breezes and fresh gales. At noon, standing through the straits again; wind veering northward; barometer, 8 A. M., 29.50. At 4 P. M. Cape Good Success W. N. W. 6 miles; wind N. W., and increasing; 10, moderating; barometer falling. At midnight, quite moderate and overcast.

June 14. Cape Horn, N. W., 20 miles. Barometer, 29.20; temperature of air, 38°; of water, 41°. Winds: N., S., S. S. W. At 4 A. M. kept up for the cape; heavy westerly swell. At 8 A. M. cape, snow covered, W. N. W. 20 miles; wind light. At noon, calm, dark, and cloudy. At 1 P. M. rainy; wind south; barometer, 28.90; ends with an unsteady breeze and snow squalls.

June 15. S. W. part Hermit Island, N. W. 8 miles. Barometer, 29.20; temperature of air, 32°; of water, 42°. Winds: S. W., S. S. W., S. First and middle part, strong breezes; snow squalls throughout. Barometer, at noon, 29.70.

June 16. Diego Ramirez, W. 10 miles. Barometer, 29.70; temperature of air, 32°; of water, 42°

Winds: S. S. E., S. E., S. At 8 A. M. Cape Horn, N. W. 12 miles; ice and snow on deck, cloudy; 6 P. M. nearly calm; at 9 P. M. wind strong, with snow squalls, which last throughout.

June 17. Lat. 55° 45′ S. (D. R.); long. 69° 35′ W. (D. R.) Barometer, 30.30; temperature of air, 38°; of water, 42°. Winds: S., S. W., W. S. W.; fresh breezes, with snow and rain. At 8 A. M. Isle Ildefonso, N. E. by N. 10 miles; at 4 P. M. near the west end of Hoste Island—rough, rugged, snow-covered, fire-rent hills and mountains. Barometer, at sunset, 30.70.

June 18. Lat. 56° 05′ S. (D. R.); long. 69° 45′ W. (D. R.) Barometer, 30.40; temperature of air, 38°; of water, 42°. Winds: W. N. W., N. W. by N., N. N. W.; strong and increasing gales, with occasional rain.

June 19. Lat. 56° 19′ S. (D. R.); long. 72° 52′ W. (D. R.) Barometer, 29.70; temperature of air, 40°. Winds: N. W., N. W., N. W. to W.; fresh gales, with rain squalls. Ends, strong gales. No current noticed since leaving the straits.

June 20. Lat. 56° 41′ S. (D. R.); long. 73° 32′ W. (D. R.) Barometer, 29.40; temperature of air, 39°; of water, 40°. Winds: W. N. W., N. W. by W., N. W. Commences fresh breezes, and rainy; middle, strong; latter, cloudy; 6 P. M. barometer 29.00; moderating.

June 21. Lat. 58° 21′ S; long. 74° 35′ W. (D. R.) Barometer, 28.95; temperature of air, 39°; of water, 40°. Showery during the forenoon; wind rising. Ends, fresh breezes and rainy; sea rough; there may be some current with the wind, as an indifferent observation differs one degree from account.

June 22. Lat. 57° 50′ S.; long. 79° 13′ W. Barometer, 28.90; temperature of air, 40°; of water, 39°. Winds: N. N. W., N. N. W., N.; cloudy and rainy at intervals; latter part, wind light. Barometer, lower than it has been at any time before.

June 23. Lat. 57° 49′ S.; long. 81° 00′ W. Barometer, 28.90; temperature of air, 38°; of water, 39°. Winds: W. N. W., N. W., N. N. E.; cloudy and rainy at times. First and middle parts, light to moderate; latter, fresh and squally, with snow. Wind veered to N. W. at end of day.

June 24. Lat. 57° 09′ S. (D. R.); long. 82° 30′ W. (D. R.) Winds: N. W. by N., N. N. E., S. First part, moderate; middle, strong, with snow squalls. Weather, broken; from 2 to 8 P. M. calm; at that time a strong southerly wind. Barometer, 28.60, and commenced rising. Ends with snow squalls.

June 25. Lat. 55° 00′ S.; long. 83° 28′ W. Barometer, 29.00; temperature of air, 36°; of water, 40°. Winds: S., S., W. N. W. First, strong gales from south; middle, decreasing; latter, varying between S. W. by W., and W. N. W., with occasional snow squalls.

June 26. Lat. 53° 15′ S.; long. 82° 50′ W. Barometer, 29.40; temperature of air, 38°; of water, 41°. Winds: N. W., W. S. W., N. N. W.; wind strong at times, and varying from W. S. W. to N. W., with some rain and snow.

June 27. Lat. 52° 45′ S. (D. R.); long. 83° 41′ W. (D. R.) Barometer, 29.50; temperature of air, 37°; of water, 41°. Winds: N., N., N. N. W.; unsteady winds, with hail and snow; now a storm, and then a calm. Ends, very heavy squalls, but altogether moderating.

June 28. Lat. 52° 25′ S.; long. 85° 21′ W. Barometer, 29.30; temperature of air, 40°; of water, 41°.

Winds: N. calm S. E.; at 4 A. M. calm; decks coated with ice. First part, light winds; middle and latter, calm and increasing S. E. breezes. Barometer up and down $\frac{3}{10}$. Ends rainy.

June 29. Lat. 50° 28′ S.; long. 85° 11′ W. Barometer, 29.50; temperature of air, 38°; of water, 42°. Winds: E. S. E., S. E., S. S. E. First half, increasing breeze; drizzly rain; latter strong, inclining southerly; occasional hail squalls.

Ship John Land (Peleg Howes,) Boston to San Francisco, fifty-three days out.

June 14. Lat. 50° 39′ S.; long. 64° 02′ W. Barometer, 28.8; temperature of air, 46°; of water, 44°. Winds: N. W., N. W., N. W. Heavy gales.

June 15. Lat. 53° 03′ S.; long. 62° 50′ W. Barometer, 28.9; temperature of air, 46°; of water, 44°. Winds: W. N. W., S. W., S. W. First, heavy gales; second, hail and snow; third squally.

June 16. Lat. 53° 50′ S.; long. 61° 53′ W. Current, E. N. E., 1 knot per hour. Barometer, 29.2; temperature of air, 39°; of water, 40°. Winds: S. W., S. S. W., S. S. W. Strong gales.

June 17. Lat. 54° 20′ S.; long. 63° 35′ W. Current, E. by N., ½ knot per hour. Barometer, 28.8; temperature of air, 39°; of water, 40°. Winds: S. S. W., S., S. S. W. Heavy squalls.

June 18. Lat. 54° 27′ S.; long. 62° 01′ W. Current, E. by N., ½ knot per hour. Barometer, 29.2; temperature of air, 30°; of water, 42°. Winds: S. S. W., S. S. W., S. W. by S. Strong winds.

June 19. Lat. 56° 24′ S.; long. 65° 20′ W. Current, E. by N., ½ knot per hour. Barometer, 29.2; temperature of air, 30°; of water, 42°. Winds: W. S. W., W. S. W., W. by S. Heavy snow squalls and sleet.

June 20. Lat. 57° 24′ S.; long. 67° 17′ W. Current, E. by N., ½ knot per hour. Barometer, 28.8; temperature of air, 30°; of water, 42°. Winds: W. by S., W. by S., W. N. W. Strong gales.

June 21. Lat. 58° 12′ S.; long. 70° 27′ W. Current, E. by N., 20 miles. Barometer, 28.6. Winds: N. W. by N., N. W. by N., N. W. by N. Heavy gales.

June 22. Lat. 57° 26′ S.; long. 75° 10′ W. Current, E. by N., 20 miles. Barometer, 28.5; temperature of air, 30°; of water, 42°. Winds: N. W., N. W., N. W. Strong gales, with passing squalls, with snow.

June 23. Lat. 57° 24′ S.; long. 79° 04′ W. Current, E. by N., 20 miles. Barometer, 28.6; temperature of air, 30°; of water, 42°. Winds: N. W. by N. throughout. Heavy weather.

June 24. Lat. 56° 27′ S.; long. 80° 33′ W. Current, E. by N., 20 miles. Barometer, 28.2; temperature of air, 30°; of water, 42°. Winds: W. S. W., W. S. W., N. W. by W. Fresh breezes.

June 25. Lat. 55° 17′ S.; long. 80° 33′ W. Current, east, 1 knot per hour. Barometer, 28.2; temperature of air, 30°; of water, 42. Winds: W. S. W. throughout. Heavy gales.

June 26. Lat. 53° 20′ S.; long. 80° 10′ W. Current, east, 1 knot per hour. Barometer, 28.25; temperature of air, 30°; of water, 42°. Winds: W. by N., W. N. W., N. W. by W. Heavy gales; snow and hail.

June 27. Lat. 52° 36′ S.; long. 80° 35′ W. Current, east, 14 miles. Barometer, 28.9; temperature of air, 30°; of water, 42°. Winds: N. W., N. W., N. W. by W. First part, fresh winds; latter, strong winds, and squally.

June 28. Lat. 52° 10′ S.; long. 83° 32′ W. Current, E. by N., 14 miles. Barometer, 28.8. Winds: N. W., N. W., N. W. by W. Strong breezes, and squally.

June 29. Lat. 50° 32′ S.; long. 85° 13′ W. Current, E. N. E., 15 miles. Barometer, 28.9. Winds: N., N. E., S. E. by E. Moderate breezes, and cloudy.

Barque Ellen Noyes (F. A. Lewis), Boston to San Francisco, seventy-five days out.

July 1. Lat. 50° 46′ S.; long. 54° 20′ W. Barometer, 29.1; temperature of air, 40°. Winds: W. S. W. throughout. Strong gales, and clear.

July 2. Lat. 52° 00′ S.; long. 55° 01′ W. Barometer, 29.0. Winds: W. S. W., W., W. N. W. Fresh gales, and cloudy.

July 3. Lat. 53° 26′ S.; long. 56° 50′ W. Barometer, 28.9. Winds: N. W., N. W., W. S. W. Gales, and cloudy.

July 4. Lat. 54° 40′ S.; long. 57° 57′ W. Barometer, 28.4. Winds: N. W., variable, variable. Gales and squally, with snow.

July 5. Lat. 54° 44′ S.; long. 58° 00′ W. Barometer, 29.0; temperature of air, 25; of water, 38°. Winds: variable throughout. Heavy snow squalls.

July 6. Lat. 55° 20′ S.; long. 57° 00′ W. Barometer, 29.0; temperature of air, 25°; of water, 38°. Winds: variable throughout. Snow squalls.

July 7. Lat. 55° 15′ S.; long. 59° 00′ W. Barometer, 29.3; temperature of air, 28°; of water, 37°. Winds: variable throughout. Snow squalls.

July 8. Lat. 55° 20′ S.; long. 61° 20′ W. Barometer, 29.14; temperature of air, 29°. Winds: variable from E. to S. S. W., with snow squalls.

July 9. Lat. 54° 51′ S.; long. 62° 15′ W. Barometer, 29.6; temperature of air, 29°. Winds: varying from E. to S. S. W., with snow squalls.

July 10. Lat. 54° 48′ S.; long. 62° 40′ W. Barometer, 29.6; temperature of air, 30°. Winds: variable throughout. Light winds, and clear.

July 11. Lat. 56° 08′ S.; long. 64° 20′ W. Barometer, 29.4; temperature of air, 30°. Winds: variable throughout. Strong N. E. gales, and cloudy.

July 12. Lat. 58° 01′ S.; long. 71° 51′ W. Barometer, 29.6; temperature of air, 32°. Winds: N. E., N. E., N. W. Strong gales and squally.

July 13. Lat. 57° 48′ S.; long. 70° 40′ W. Barometer, 29.6. Winds: W. S. W., W. S. W., S. W. by W. Strong gales and squally.

July 14. Lat. 58° 25′ S.; long. 72° 06′ W. Barometer, 29.6. Winds: variable throughout. Light winds and pleasant.

July 15. Lat. 58° 17′ S.; long. 72° 46′ W. Barometer, 29.6; temperature of air, 33°. Winds: variable, calm, calm, light and baffling; second and third, calm.

July 16. Lat. 57° 55′ S.; long. 74° 21′ W. Barometer, 29.6; temperature of air, 33°. Winds: variable throughout. Light airs. Current, E., one knot per hour.

July 17. Lat. 57° 50′ S.; long. 74° 15′ W. Barometer, 29.4; temperature of air, 35°. Winds: calm, calm, S. W. First and second calm; third, fresh and squally. Current, E., one knot per hour.

July 18. Lat. 56° 04′ S.; long. 76° 15′ W. Barometer, 29.4; temperature of air, 32°. Winds: N. W., W., W. Fresh breezes and squally.

July 19. Lat. 53° 28′ S.; long. 78° 30′ W. Barometer, 29.7; temperature of air, 35°. Winds: W., S. W., S. S. W. Fresh breezes and squally.

July 20. Lat. 52° 01′ S.; long. 78° 34′ W. Barometer, 30; temperature of air, 35°. Winds: S. throughout. Light winds and foggy.

July 21. Lat. 50° 02′ S.; long. 78° 41′ W. Barometer, 30. Winds: S., S. E., N. E. Strong winds and foggy, with light rain.

Ship White Squall (Samuel Kennedy), Philadelphia to San Francisco, fifty-seven days out.

July 5, 1852. Lat. 50° 21′ S.; long. 63° 55′ W. Current, N. N. E., 30 miles. Barometer, 29.00; temperature of air, 42°; of water, 41°. Winds: N. W., N. N. E., N. Cloudy, with rain.

July 6. Lat. 51° 32′ S.; long. 64° 35′ W. Current, N. E., 30 miles. Barometer, 29.64; temperature of air, 40°; of water, 40°. Winds: N. E., N. W., N. E. Moderate and cloudy.

July 7. Lat. 54° 25′ S.; long. 63° 00′ W. Barometer, 29.40; temperature of air, 39°; of water, 39°. Winds: N. E., N. E., E. N. E. Moderate and cloudy.

July 8. Lat. 55° 24′ S.; long. 63° 19′ W. Barometer, 29.40; temperature of air, 32°; of water, 36°. Wind: baffling from N. E. to E. S. E. Cloudy, with snow, and rain; calm at times.

July 9. Lat. 55° 50′ S.; long. 65° 00′ W. Barometer, 29.55; temperature of air, 33°; of water, 37°. Winds: E. N. E., E. N. E., N.; nearly calm all day; snow, hail, and rain.

July 10. Lat. 56° 00′ S.; long. 66° 30′ W. Barometer, 29.78; temperature of air, 36°; of water, 38°. Winds: calm, throughout. Thick fog. 4 days, current, N. E., 101 miles.

July 11. Lat. 56° 40′ S.; long. 67° 40′ W. Current, E. N. E., 31 miles. Barometer, 29.53; temperature of air, 36°; of water, 38°. Winds: calm, N., N. W. At times calm and fog.

July 12. Lat. 58° 17′ S.; long. 70° 19′ W. Current, E. by S., 41 miles. Barometer, 29.60; temperature of air, 35°; of water, 41°. Winds: N. W., W., W. Squally, hail, and rain.

July 13. Lat. 58° 42′ S.; long. 72° 32′ W. Barometer, 29.26; temperature of air, 30°; of water, 40°. Winds: N. W. to N. N. W., N. W. to S. W., calm. First and second parts, heavy squalls; third, calm.

July 14. Lat. 57° 59′ S.; long. 75° 53′ W. 2 days, current, E. by N., 92 miles. Barometer, 29.21; temperature of air, 29°; of water, 35°. Winds: calm, E., E. N. E. First, calm; second and third, moderate and snow.

July 15. Lat. 55° 37′ S.; long. 78° 32′ W. Current, N. E., 32 miles. Barometer, 29.46; temperature of air, 25°; of water, 32°. Winds: S. S. E., S., S. Moderate; latter, stormy.

July 16. Lat. 54° 07′ S.; long. 80° 33′ W. Current, E. S. E., 35 miles. Barometer, 29.17; temperature of air, 38°; of water, 39°. Winds: S. S. E., N. S. W. First part, strong breezes and fine weather; second part, blowing fresh; third part, calm and cloudy.

July 17. Lat. 53° 33′ S.; long. 80° 10′ W. Current, E., 27 miles. Barometer, 29.08; temperature of air, 35°; of water, 35°. Winds: S. W., N. N. W., N. W. Hard gales.

July 18. Lat. 52° 35′ S.; long. 78° 57′ W. Current, S. E., 24 miles. Barometer, 28.93; temperature of air, 37°; of water, 38°. Winds: W., W. S. W., W. S. W. Fresh gales throughout.

July 19. Lat. 53° 18′ S.; long. 79° 20′ W. Barometer, 28.97; temperature of air, 37°; of water, 39°. Winds: W., W. N. W., N. W.. Heavy gales and squally.

July 20. Lat. 54° 10′ S.; long. 78° 33′ W. Current, E. S. E., 36 miles. Barometer, 29.06; temperature of air, 38°; of water, 41°. Winds: N. W., W. N. W., N. W. Heavy gales; lightning, hail, and rain.

July 21. Lat. 53° 32′ S.; long. 79° 19′ W. Current, S. E., 42 miles. Barometer, 29.28; temperature of air, 36°; of water, 40°. Winds: W., calm, E. First, gale; middle, calm; latter, blowing hard; snow, hail, and rain.

July 22. Lat. 51° 28′ S.; long. 81° 45′ W. Barometer, 28.87; temperature of air, 38°; of water, 42°. Winds: E., S., S. W. First, heavy gales; second, tremendous gales; third part, moderate.

July 23. Lat. 48° 51′ S.; long. 79° 52′ W. Current, S. S. E., 41 miles. Barometer, 29.60; temperature of air, 38°; of water, 13°. Winds: W. N. W., W., S. W.; moderate and pleasant.

N. B. Palmer (C. P. Low), 49 days out.

July 10, 1852. Lat. 48° 47′ S.; long. 57° 52′ W. Barometer, 29.90. Winds: S. W. by W., W. N. W., S. S. W. Light airs, and variable, with much snow.

July 11. Lat. 51° 54′ S.; long. 55° 43′ W. Barometer, 29.8. Winds: S., W. S. W., W. N. W. Stiff breezes, and cloudy.

July 12. Lat. 53° 23′ S.; long. 55° 04′. Barometer, 29.2: Winds: W. S. W. Stiff breezes and cloudy, hazy weather.

July 13. Lat. 54° 42′ S.; long. 56° 02′ W. Barometer, 28.8. Winds: N. N. W., W. S. W., W. S. W. First part, moderate topgallant breeze; middle and latter, gales, with heavy sea.

July 14. Lat. 55° 02′ S.; long. 56° 51′ W. Barometer, 29.4. Winds: S. W., S. W. by W., S. Heavy gales.

July 15. Lat. 54° 31′ S.; long. 61° 12′ W. Barometer, 28.8. Winds: S., W. N. W., N. W. Double-reefed topsails, and reefed courses; heavy sea.

July 16. Lat. 54° 40′ S.; long. 62° 56′ W. Barometer, 28.8. Winds: N. N. W., N. N. W., S. W. by W. First part, moderate breezes. At 10 A. M. made Staten Land, bearing S. S. W.; distant 20 miles. Ends strong gales.

July 17. Lat. 56° 41′ S.; long. 66° 00′ W. Barometer, 29.6. Wind: W. S. W. First part, under close reefs; ends, under double reefs.

July 18. Lat. 56° 35′ S.; long. 68° 00′ W. Barometer, 29.2. Winds: W. N. W., N. N. E., N. N. E. Under double reefs; Cape Horn bearing north, by compass, 36 miles distant.

July 19. Lat. 57° 18′ S.; long. 69° 30′ W. Barometer, 29.6. Winds: W. N. W., W. by N., W. First part, heavy gales, with heavy sea; middle, close reefs; latter, single reefs.

July 20. Lat. 57° 40′ S.; long. 72° 32′ W. Barometer, 29.6. Winds: S. S. E., S., S. S. W. Single reefs, with top-gallant sails.

July 21. Lat. 56° 21′ S.; long. 73° 47′ W. Barometer, 28.5. Winds: S. S. E., S. S. W., S. S. W. First part, very heavy snow squalls from the south; middle and latter, close reefs.

July 22. Lat. 55° 20′ S.; long. 77° 30′ W. Barometer, 29.2. Winds: N. E., N., N. W. First, moderate breezes and cloudy; ends, double reefed topsail breeze.

July 23. Lat. 54° 44′ S.; long. 78° 04′ W. Winds: N. N. W., W., W. Stiff double-reefed topsail breeze.

July 24. Lat. 52° 58′ S.; long. 78° 04′ W. Barometer, 29.6. Winds: W., W. S. W., S. W. First part, double reefs; middle, close reefs; latter, heavy gales, with hail and snow.

July 25. Lat. 51° 46′ S.; long. 76° 50′ W. Barometer, 29.6. Winds: S. S. W., W. N. W., W. N. W. First part, heavy gales; middle and latter, more moderate.

July 26. Lat. 50° 33′ S.; long. 77° 34′ W. Barometer, 29.6. Winds: W. N. W., W., W. by N. First part, stiff gale; ends, single reefs.

July 27. Lat. 50° 42′ S.; long. 77° 38′ W. Barometer, 29.2. Winds: N. W., N. N. W., W. S. W. First part, heavy gale; at 6 P. M. hove to under close-reefed main topsail, &c.

July 28. Lat. 51° 03′ S.; long. 77° 25′ W. Barometer, 29.2. Winds: W. S. W., W., W. First part, heavy gale, with very dangerous sea; middle, heavy rain squalls; ends more moderate.

July 29. Lat. 50° 07′ S.; long. 77° 47′ W. Barometer, 29.6. Winds: S. W., N. N. W., N. N. W. Stiff breezes; first part squally.

July 30. Lat. 50° 03′ S.; long. 79° 18′ W. Barometer, 29.2. Winds: N. N. W., W. N. W., W. N. W. Commences calm and cloudy, then heavy gales; middle part, gales; latter, single-reefed topsails.

Ship Flying Cloud (Josiah P. Creesy), New York to San Francisco, forty-seven days out.

July 19, 1853. Lat. 49° 39′ S.; long. 66° 17′ W. Winds: calm, N., N. Mostly calm thick weather; sometimes rain.

July 20. Lat. 54° 25′ S.; long. 65° 00′ W. Winds: E. N. E., E. N. E., N. E. First part, light; second part, moderate and sleet; third part, hard gale, with snow squalls.

July 21. Lat. 54° 02′ S.; long. 65° 00′ W. Winds: N. E., N. E., S. E. Hard gales, with snow and rain.

July 22. Lat. 54° 41′ S.; long. 64° 50′ W. Winds: E. S. E., S. E. by S., E. Hard gales, with sleet and snow.

July 23. Lat. 56° 04′ S.; long. 68° 16′ W. Winds: E., E., E. Moderate; passed through Straits of Le Maire; strong tide setting to northward; middle, rainy.

July 24. Lat. 55° 43′ S.; long. 72° 51′ W. Winds: E. N. E., N. E., N. W. Light breezes with moderate snow squalls. Latter part, clear.

July 25. Lat. 53° 36′ S.; long. 78° 04′ W. Winds: N., N., N. E. Moderate breezes, with rain and snow squalls.

July 26. Lat. 50° 57′ S.; long. 80° 33′ W. Winds: S., S., S. W. First and second part, light and cloudy; third, moderate and clear.

July 27. Lat. 47° 55′ S.; long. 84° 06′ W. Winds: S. S. W., S. S. W., S. by E. Light breezes and cloudy.

Southerner (E. Hooper).

July 6, 1852. Lat. 51° 02′ S. (D. R.); long. 64° 20 W. (D. R.) Temperature of air, 50°; of water, 48°. Commences with strong gales and clear. Wind: S. E., and inclining westerly; 8 P. M. wind shifted S. W.; barometer falling; middle and latter parts, moderate breezes with rain; wind, W. N. W. at noon. Barometer fell suddenly from 28.80 to 28.35.

July 7. Lat. 50° 36′ S.; long. 64° 26′ W. (D. R.) Comes in with heavy gales and rain. At 8 P. M. the barometer at 28.10; wore ship to the westward. Wind: S. S. E., gale increasing at 10 P. M. At 2 A. M. the gale suddenly increased so much as to knock the vessel's lee sail under water; run her off before the wind and furled main topsail, then brought by and lay to under storm sails; sea rising fast. At 4 A. M. wind increased to a violent hurricane, keeping the whole of the starboard side under water; decks full up to the hatches; vessel laboring very much. Found it necessary for the safety of the ship and people to throw overboard cargo. Ends with a violent hurricane; the barometer at 28.10; all hands engaged throwing overboard cargo; heavy sea.

July 8. Lat. 50° 03′ S.; long. 64° 06′ W. Commences as the last ended. The vessel laboring very much and shipping heavy seas; decks filled with water fore and aft; still very unsafe; all hands still throwing overboard cargo. At 11 A. M. the vessel making better weather; stopped throwing overboard the cargo; secured things about decks. Current, N. E., 40 miles in 24 hours. Barometer commences to rise at 5 P. M.; at noon, barometer, 28.50.

July 9. Lat. 50° 34′ S.; long. 63° 28′ W. Barometer, 28.90. Current, N. E., 40 miles in 24 hours. Commences with more moderate S. W. gales; middle and latter parts, strong gales from S. S. W.

July 10. Lat. 51° 21′ S.; long. 62° 14′ W. Barometer, 29.05; temperature of air, 40°; of water, 41°. Current, E. N. E., 20 miles. Commences with fresh S. S. W. gales and squally; middle and latter parts, much the same. At noon, wind west.

July 11. Lat. 52° 43′ S.; long. 62° 33′ W. Barometer at noon, 29.30; temperature of air, 42°; of

water, 40°. Current, E. N. E., 24 miles. Fresh westerly gales, first and middle parts; latter part, moderate southerly winds.

July 12. Lat. 54° 07′ S.; long. 62° 31′ W. Barometer, 29.50; temperature of air, 45°; of water, 40°. Current, E. N. E., 24 miles. Comes in, with a moderate southerly wind; at 8 P. M. wind west; tacked south. Ends with a westerly breeze and clear.

July 13. Lat. (D. R.) 55° 50′ S.; long. (D. R.) 64° 08′ W. Barometer, 28.60; temperature of air, 46°; of water, 40°. Current, E. N. E., 30 miles. First part, wind west and moderate; middle part, fresh gales and clear; latter part, heavy gales and cloudy. Ends with the wind at N. W.

July 14. Lat. 57° 03′ S.; long. 65° 53′ W. Barometer at noon, 28.50, and rising; temperature of air, 42°; of water, 40°. Current, N. E. by E., 24 miles. Commences with strong N. W. gales, with rain; middle part, more moderate; latter part, fresh gales at S. S. W. with squalls of snow and hail.

July 15. Lat. 56° 30′ S.; long. 67° 01′ W. Barometer at noon, 29.40; temperature of air, 34°; of water, 40°. Current, E. N. E., 20 miles. Commences with strong gales, and passing squalls, of hail and snow. Barometer rising fast; middle part, a light south wind and clear; latter part, a moderate S. W. wind.

July 16. Lat. (D. R.) 57° 11′ S.; long. (D. R.) 69° 59′ W. Barometer at noon, 28.08; temperature of air, 38°; of water, 40°. Current, E. N. E., 2 miles per hour. Comes in moderate and clear. Wind: W. S. W. inclining northerly. At 3 P. M. saw Cape Horn, bearing per compass, W. N. W. distant about 25 miles; at 4 P. M. tacked south, and hauled by the wind, to double the cape as sharp as possible; middle part, fresh N. W. winds and clear; latter part, strong gales, with a heavy cross sea; wind N. N. W.

July 17. Lat. 57° 11′ S.; long. 70° 34′ W. Barometer at noon, 28.90; temperature of air, 36°; of water, 41°. Current, E. N. E., 2 miles per hour. Commences with a strong increasing gale, from N. N. W. inclining to west. Barometer, 28.45; moderating during the night; latter part, fresh gales from W. S. W.

July 18. Lat. (D. R.) 58° 01′ S.; long. (D. R.) 72° 48′ W. Barometer at noon, 28.60, and falling. First part, fresh W. S. W. winds, with occasional squalls of snow, rain, and hail; middle part, moderate and clear; latter part, strong N. N. W. gales; lying to.

July 19. Lat. (D. R.) 58° 20′ S.; long. (D. R.) 72° 14′ W. Barometer at noon, 28.50; temperature of air, 46°; of water, 41°. Commences with heavy N. N. W. gales; 2 P. M., barometer, 28.50, and at 6 P. M., 28.20; middle part, strong gales, with rain; midnight, barometer rising; latter part, moderate N. W. gales, and cloudy.

July 20. Lat. (D. R.) 58° 10′ S; long. 74° 37′ W. Barometer, 28.50; temperature of air, 40; of water, 41°. Commences with strong gales and overcast; middle, light E. S. E winds, and thick weather; latter, fresh S. E. gales; hail, snow, and rain.

July 21. Lat. 57° 51′ S.; long. 77° 24′ W. Temperature of air, 44°; of water, 40°. Commences with strong S. E. gales, with snow; middle and latter parts, moderate S. E. winds, with snow; barometer at noon, 28.94.

July 22. Lat. (D. R.) 57° 18′ S.; long. (D. R.) 80° 46′ W. Barometer at noon, 28.70, and rising; temperature of air, 42°; of water, 41°. First part, light baffling winds, and flying clouds; middle part, fresh N.

N. E. gales, with snow; latter part, fresh N. N. W. gales, with rain; at noon, wind shifted to S. S. W.; current, during the last three days, E. N. E., 70 miles.

July 23. Lat. 56° 50′ S.; long. 82° 11′ W. Barometer unsteady; temperature of air, 41°; of water, 41°. Current, 26 miles, E. N. E. First part, light S. S. W. wind; at 8 P. M. it shifted to N. N. W., and blew a gale, with rain and snow.

July 24. Lat. 55° 32′ S.; long. 83° 05′ W. Barometer at noon, 28.20; temperature of air, 40; of water, 41°. Commences with fresh westerly gales, with snow squalls; at 8 P. M. the wind shifted to E. S. E.; barometer falling to 28.00; during the night, heavy gales and squally; 4 A. M. barometer rose to 28.25; latter part, moderating gales, and clear.

July 25. Lat. 54° 27′ S.; long. 81° 37′ W. Barometer at noon, 28.10; temperature of air, 40°; of water, 41°. Current, E N. E., 2 miles per hour. First part, moderate N. W. gales, and squally; middle part, strong westerly gales; barometer fell during the night, to 27.90, and at 8 A. M. rose to 28.10; wind shifted to S. W., and blew strong, with snow squalls.

July 26. Lat. (D. R.) 52° 27′ S.; long. (D. R.) 81° 00′ W. Barometer at noon, 29.80; temperature of air, 41°; of water, 42°. First part, strong W. S. W. gales, with heavy squalls of wind, hail, and snow; middle and latter parts, more moderate; at 8 A. M. wind hauled to N. W.; ends light breezes, with overcast sky.

July 27. Lat. 53° 10′ S.; long. 81° 31′ W. Barometer at noon, 27.97; temperature of air, 43°; of water, 42°. Commences with moderate breezes, and cloudy. At 3 P. M. wind N. N. W.; tacked to the westward. Barometer falling. At 8 P. M. blowing a hard gale, with heavy squalls; lying to. Ends with violent gales, and tremendous squalls of wind, hail, and rain from N. N. W.

July 28. Lat. 52° 13′ S.; long. 81° 12′ W. Barometer at noon, 28.77; temperature of air, 48°; of water, 44°. First part, heavy gales, with squalls of wind and hail; at 4 P. M. the wind hauled to west; wore to the north; at 8 P. M. the barometer rose 0.2. Middle and latter parts, fresh W. S. W. gales, with snow and hail squalls.

July 29. Lat. 50° 59′ S.; long. 79° 19′ W. Barometer at noon, 29.10; temperature of air, 46°; of water 44°. First part, fresh west gales; at 8 P. M. barometer commenced rising; middle and latter parts, light breezes, and fine, clear weather.

July 30. Lat. 50° 55′ S.; long. 80° 15′ W. Barometer at noon, 28.88; temperature of air, 50°; of water, 45°. First part, light N. W winds, and clear; at 2 P. M. tacked west; at 8 P. M. strong gales which continued from N. N. W.; at 8 A. M. the wind moderating at west; ends with fine weather.

July 31. Lat. 50° 00′ S.; long. 78° 10′ W. Barometer at noon, 28.95; temperature of air, 52°; of water, 46°. Commences with moderate N. W. winds; middle part, strong gales; at 4 A. M. tremendous heavy gales; lying to under storm fore and aft sails. Barometer in this case gave no warning. Ends with a more moderate wind at west.

Aug. 1. Lat. 50° 23′ S.; long. 78° 38′ W. Barometer at noon, 28.90. Commences with moderate

west gales; at 4 P. M. wind hauling northward; wore ship to S. W.; middle and latter parts, heavy gales; lying to under storm sails.

Ship Levanter (Wm. A. Follansbee), New York to San Francisco, eighty-one days out.

July 14. Lat. 48° 25′ S.; long. 64° 46′ W. Current, easterly, 1½ knot per hour. Barometer, 29.4; temperature of air, 47°; of water, 45°. Winds: W. by N., W. ½ N., W. ½ S. Moderate and pleasant.

July 15. Lat. 50° 33′ S.; long. 64° 10′ W. Current, 1½ knot. Barometer, 29; temperature of air, 44°; of water, 45°. Winds: W. N. W., W. N. W., S. W. by W. First and second parts, moderate; third part, gale.

July 16. Lat. 50° 23′ S.; long. 65° 21′ W. Current, S. E., ¾ knot. Barometer, 29.4; temperature of air, 38°; of water, 44°. Winds: S. W. by W., S. W., S. W. First part, moderate; second and third parts, hard gale, with snow squalls.

July 17. Lat. 53° 15′ S.; long. 64° 56′ W. Barometer, 29.1; temperature of air, 40°; of water, 42°. Winds: W. N. W. to N. W., S. W., S. W. First part, fresh; second part, gale; third part, strong and squally.

July 18. Lat. 54° 40′ S.; long. none. Barometer, 28.8; temperature of air, 45°; of water, 42°. Winds: W. S. W., W. N. W., N. W. Fresh breezes and thick; passed through the Straits of Le Maire.

July 19. Lat. 56° 08′ S.; long. 65° 30′ W. Barometer, 29.8; temperature of air, 41°; of water, 41°. Winds: W. to W. S. W., calm and W., W. N. W. Strong gales and heavy squalls.

July 20. Lat. 56° 44′ S.; long. 67° 22′ W. Barometer, 29.2; temperature of air, 42°; of water, 43°. Winds: W., N. N. W., N. N. W. First part, fresh breezes; second and third parts, strong gales.

July 21. Lat. (D. R.) 57° 10′ S.; long. 67° 56′ W. Barometer, 29.4; temperature of air, 38°; of water, 42°. Winds: N. N. W., W. N. W. to W., S. W. Hard gales; ends calm.

July 22. Lat. 57° 32′ S.; long. 69° 16′ W. Barometer, 28.5; temperature of air, 38°; of water, 41°. Winds: calm, E. N. E., E. N. E. to N. W., E. N. E. to S. S. W. First part, calm; second part, moderate; third part, hard gales and snow.

July 23. Lat. (D. R.) 58° 21′ S.; long. 69° 46′ W. Barometer, 28.5; temperature of air, 38°; of water, 41°. Winds: S. S. W., W. S. W. to W. N. W., N. W. by W. Hard gales and heavy snow squalls.

July 24. Lat. (D. R.) 58° 30′ S.; long. 69° 10′ W. Barometer, 28.9; temperature of air, 36°; of water, 40°. Winds: S. S. W., W. S. W. to S. W., S. W. to W. S. W. Hard gales and heavy snow squalls; calm for 10 minutes.

July 25. Lat. (D. R.) 58° 40′ S.; long. 67° 09′ W. Barometer, 29.2; temperature of air, 25°; of water, 39°. Winds: S. W. throughout. Hard gales; third part, moderate.

July 26. Lat. (D. R.) 58° 08′ S.; long. 67° 34′ W. Barometer, 29.1; temperature of air, 30°; of water, 40°. Winds: S. W., calm, E., calm. First part, moderate; second part, calm; third part, light airs and calm, snowing.

July 27. Lat. 56° 31′ S.; long. 73° 08′ W. Barometer, 29.07; temperature of air, 28°; of water,

40°. Winds: S. E., S. to S. E., S. to S. E. First part, light airs; second and third parts, fresh, and snow squalls.

July 28. Lat. (D. R.) 55° 31′ S.; long. 77° W. Barometer, 30.1; temperature of air, 38°; of water, 41°. Winds: S. E. to S., S. E., S. to W. N. W. First and second parts, moderate and pleasant; third part, light airs and calm.

July 29. Lat. 53° 45′ S.; long. 79° 33′ W. Barometer, 30.2; temperature of air, 40°; of water, 42°. Winds: W. N. W., W. N. W. to W., W. Fresh breezes and squalls of rain.

July 30. Lat. 52° 26′ S.; long. 79° 55′ W. Barometer, 30.1; temperature of air, 40°; of water, 43°. Winds: W., W., W. Fresh breezes and rain squalls, and misty all day.

July 31. Lat. (D. R.) 50° 07′ S.; long. 81° 04′ W. Barometer, 30.2; temperature of air, 44°; of water, 44°. Winds: W. S. W., S. W. by W., W. by S. to W. Moderate breezes and fog showers.

Aug. 1. Lat. 48° 37′ S.; long. 82° 00′ W. Barometer, 30.1; temperature of air, 48°; of water, 46°. Winds: W. by S., W. S. W. to S. W., S. to S. W. Moderate breezes and foggy; latter, nearly calm.

Eliza Mallory (John E. Williams).

July 30, 1852. Lat. 50° 38′ S.; long. 62° 34′ W. Barometer, 29.8; temperature of air, 46°. Winds: S. S. E., E., N. E. First part, calm, and light winds; middle and latter, strong. Barometer, going down.

July 31. Lat. 53° 34′ S.; long. 64° 41′ W. Barometer, 29.3; temperature of air, 40°. Wind: N. N. E.; strong breezes, cloudy, thick and rainy.

Aug. 1. Lat. 54° 36′ S.; long. 63° 15′ W. Barometer, 29.3; temperature of air, 40°. Winds: N. W. to W., W., W. First part, strong breezes from N. W., and thick; middle, wind shifting to west, cleared up; blowing strong gale. At 8 A. M. made Staten Land; unsettled glass, going up and down.

Aug. 2. Lat. 54° 31′ S.; long. 65° 40′ W. Barometer, 29.02; temperature of air, 40°. Winds: N. W., N. N. W., N. N. W. First part, strong gale; at 6 P. M. passed close to Cape St. John; heavy squalls off the land; latter part, squalls not so heavy; at daylight, made Terra del Fuego.

Aug. 3. Lat. 56° 00′ S.; long. not observed. Barometer, 29.2; temperature of air, 42°. Winds: N. N. W., N. First part, strong gale; middle, heavy squalls, with snow; latter, pleasant. At noon, about 20 miles east of Cape Horn.

Aug. 4. No observations. Barometer, 29.05; temperature of air, 37°. Winds: N., W., W. First part, moderate and pleasant; at 5 P. M. Cape Horn bore north, distant about five miles; at 8 P. M. heavy bank coming up from the west, and barometer going down; at midnight, close-reefed; latter part, hail squalls. At 7 A. M. made the Diego Rocks.

Aug. 5. Lat. 57° 28′ S.; long. 69° 00′ W. Barometer, 29.1; temperature of air, 38°. Wind: W. N. W. First part, strong gale, with hail squalls; middle, more moderate; latter part, moderating; under topgallant-sails.

Aug. 6. Lat. 57° 02′ S.; long. 70° 51′ W. Barometer, 29.00; temperature of air, 40°. Winds:

N. W., N., N. N. E. First part, strong breezes and rain squalls. Ends, light and baffling; heavy sea from west; weather looks bad.

Aug. 7. Lat. 56° 04′ S.; long. 72° 30′ W. Barometer, 29.5; temperature of air, 36°. Winds: S., S. W., S. W. First part, light; middle, hail and snow squalls—under close reefs; latter part, more moderate; made sail.

Aug. 8. No observation. Barometer, 29.3; temperature of air, 38°. Winds: W. to W. N. W., N. W., N. First part, strong breezes, and baffling. Barometer, going down; at 3 P. M. it stood at 28.85. Ends, with snow and rain—double reefs.

Aug. 9. Lat. 54° 30′ S.; long. 78° 36′ W. Barometer, 29.5; temperature of air, 34°. Winds: N. W., S. W., S. W. First part, all sorts of weather—fog, rain, and calm, with heavy sea from N. W.; middle part, strong gale; latter, more moderate, but still squally.

Aug. 10. No observation. Barometer, 30.2; temperature of air, 34°. Winds: S. W., S. W., E. First part, strong breezes, with snow and hail squalls; middle, moderate breezes, and baffling; latter, moderate and cloudy. The weather changes very quick about here; from all sail to close reefs.

Aug. 11. Lat. 48° 38′ S.; long. 83° 25′ W. Barometer, 29.8; temperature of air, 44°. Winds: E. N. E., E. N. E., N. E. First part, strong breezes; middle part, same; barometer going down fast; latter, strong and hazy; heavy sea from the north.

Ship Pelican State (S. Weeks), Philadelphia to San Francisco, 76 days out.

July 30. Lat. 50° 30′ S.; long. 64° 45′ W. Barometer, 30° 03′; temperature of air, 41°; of water, 43°. Winds: calm; S. W., S. W. First part, calm; second part, moderate; third part, fresh breeze.

July 31. Lat. 51° 17′ S.; long. 66° 00′ W. Barometer, 30; temperature of air, 41°; of water, 42°. Winds: W. S. W., S. W., W. S. W. Fresh breezes and pleasant.

Aug. 1. Lat. 52° 58′ S.; long. 66° 10′ W. Barometer, 29.7; temperature of air, 42°; of water, 42°. Winds: W. S. W. throughout. Strong gales and squally. Barometer falling.

Aug. 2. Lat. 54° 18° S.; long. 65° 35′ W. Barometer, 29.8; temperature of air, 42°; of water, 42°. Winds: S. W., N., N. W. First part, moderate weather, dark and cloudy.

Aug. 3. Lat. 55° 00′ S.; long. 63° 32′ W. Barometer, 29.5; temperature of air, 38°; of water, 42°. Winds: N. W., S. W., S. W. First part, moderate. Should have gone through Straits of Le Maire, but wind contrary, south, and night coming on, thought it prudent to go round Staten Land. Third part, gales with squalls of hail and snow. Current, E. N. E., 15 miles.

Aug. 4. Lat. 55° 30′ S.; long. 63° 32′ W. Barometer, 29.8; temperature of air, 30°; of water, 41°. Winds: S. S. W., S. S. Heavy gales with squalls of snow and hail. Current, E. N. E., 36 miles.

Aug. 5. Lat. 55° 50′ S.; long. 64° 00′ W. Barometer, 30.2; temperature of air, 31°; of water, 40°. Winds: S., S., S. S. E. Strong gales and dark cloudy weather. Current, E. N. E., 30 miles.

Aug. 6. Lat. 55° 25′ S.; long. 64° 20′ W. Barometer, 30.3; temperature of air, 33°; of water, 41°.

Winds: S. S. E. throughout. First part, strong winds and heavy squalls of snow. Second part, strong gales. Third part, moderate. Strong current setting northward at E. N. E. 40 miles.

Aug. 7. Lat. 55° 25′ S.; long. 63° 45′ W. Barometer, 30.3; temperature of air, 33°; of water, 35°. Winds: S., S., S. W.; moderate snow squalls and cloudy.

Aug. 8. Lat. 56° 40′ S.; long. 63° 40′ W. Barometer, 30.1; temperature of air, 38°; of water, 35°. Winds: S. W. throughout; moderate and dark cloudy weather. Current, E., 20 miles.

Aug. 9. Lat. 57° 00′ S.; long. 63° 00′ W. Barometer, 29.5; temperature of air, 38°; of water, 35°. Winds: S. W., W. N. W., W. N. W.; moderate. Second part, light; third part, calm. Current, E., 20 miles.

Aug. 10. Lat. 57° 18′ S.; long. 63° 30′ W. Barometer, 29.5; temperature of air, 41°; of water, 42°. Winds: N. W., calm, calm. First part, light airs and dark cloudy weather; second part, calm and baffling; third part, calm. Current, E. N. E., 20 miles.

Aug. 11. Lat. 57° 10′ S.; long. 66° 33′ W. Barometer, 29.5; temperature of air, 41°; of water, 42°. Winds: E. N. W. First part, light airs and dark cloudy weather; second part, baffling; third part, light breezes. Current, E., 25 miles.

Aug. 12. Lat. 57° 40′ S.; long. 68° 30′ W. Barometer, 29.8; temperature of air, 35°; of water, 38°. Winds: W. S. W., W. S. W., E. First and second parts, fresh breezes and rainy; third part, light winds and cloudy; strong tide rips. Current, E. by N., 35 miles.

Aug. 13. Lat. 56° 49′ S.; long. 73° 20′ W. Barometer, 29.5; temperature of air, 42°; of water, 40°. Winds: N. E., N. E., N. N. E. First part, light airs; second part, moderate; third part, fresh breezes. Current, E. by N., 30 miles.

Aug. 14. Lat. 55° 57′ S.; long. 75° 53′ W. Barometer, 29.3; temperature of air, 44°; of water, 40°. Winds: N. E., N. E., N. N. E. First part, fresh; second part, light and baffling, and cloudy; third part, light winds. Current, E., 15 miles.

Aug. 15. Lat. 55° 44′ S.; long. 76° 30′ W. Barometer, 29; temperature of air, 45°; of water, 42°. Winds: E., calm, calm. First part, light winds and cloudy; second and third parts, calm. Current, E., 15 miles.

Aug. 16. Lat. 54° 08′ S.; long. 78° 45′ W. Barometer, 28.5; temperature of air, 46°; of water, 43°. Winds: E., S. E., S. First part, light airs; second part, fresh and squally, with snow; third part, light airs. Current, E., 20 miles.

Aug. 17. Lat. 53° 48′ S.; long. 80° 45′ W. Barometer, 29.3; temperature of air, 45°; of water, 43°. Winds: S., S., S. First part, light airs; second and third parts, fresh gales and rainy. Current, E., 20 miles.

Aug. 18. Lat. 53° 20′ S.; long. 82° 00′ W. Barometer, 29.00; temperature of air, 42°; of water, 40°. Winds: variable, variable, calm. First and second variable; third, from calms to strong gales, and fine weather to squalls of snow and rain. Current, E., 20 miles.

Aug. 19. Lat. 51° 16′ S.; long. 83° 30′ W. Barometer, 29.3; temperature of air, 41°; of water, 42°.

Winds: calm, S. W., S. W. First part, calm; second, fresh southwest gales with squalls of snow and hail; third, moderate. Current, E. S. E., 30 miles.

Aug. 20. Lat. 48° 10′ S.; long. 84° 30′ W. Barometer, 30.00; temperature of air, 46°; of water, 48°. Wind: S. W. throughout. Fresh gales with heavy squalls of wind, rain, hail, and snow. Current, S. E., 20 miles.

Ship White Swallow (F. W. Lovett), Boston to San Francisco, eighty-six days out.

Aug. 21, 1853. Lat. 49° 33′ S.; long. 62° 55′. Barometer, 29.40; temperature of air, 33°; of water, at surface, 32°; at 10 feet below surface, 35°. Winds: W., S., S. Fresh breezes and pleasant. At 10, wind changed to south in a squall, and blew a gale for the remainder of the day. Hail and snow.

Aug. 22. Lat. 50° 40′ S.; long. 63° 50′ W. Barometer, 29.40; temperature of air, 40°; of water, 35°; do. 36°. Winds: S. W., W. N. W., W. N. W. Fresh gales; cloudy and cold.

Aug. 23. Lat. 53° 15′ S.; long. 62° 46′ W. Barometer, 29.25; temperature of air, 41°; of water, 34°; do. 35°. Winds: W., W. S. W., W. S. W. Strong gales; middle and latter, more moderate.

Aug. 24. Lat. 55° 38′ S.; long. 61° 46′ W. Barometer, 28.67; temperature of air, 37°; of water, 34°; do. 35. Winds: W., N. E., W. First part, fresh breezes; middle and latter, strong gales.

Aug. 25. Lat. 55° 42′ S.; long. 60° 42′ W. Barometer, 28.38; temperature of air, 29°; of water, 38°; do. 37. Winds: W. by S., W. S. W., S. W. First part, gales with hail and snow; middle, more moderate; latter, light breezes. Heavy westerly swell.

Aug. 26. Lat. 56° 29′ S.; long. 62° 56′ W. Barometer, 28.67; temperature of air, 38°; of water, 36°; do. 37°. Winds: S., N. E., W. All kinds of weather; middle, light and calm; latter, strong gale with hail and snow.

Aug. 27. Lat. 56° 16′ S.; long. 63° 33′ W. Barometer, 28.63; temperature of air, 38°; of water, 36°; do. 37°. Winds: W., calm, S. W. Commences fresh gale; middle, quite moderate; latter, calm and thick; snow storm.

Aug. 28. Lat. 56° 14′ S.; long. 65° 10′ W. Barometer, 29.50. Temperature of air, 39°; of water, 37°; do. 37°. Winds: calm, W., N. W. Commences light airs and snow; middle, light; ends same.

Aug. 29. Lat. 57° 00′ S.; long. 67° 40′ W. No observation. Barometer, 29.07; temperature of air, 40°; of water, 38°; do. 38°. Winds: N. W., W. N. W., N. E. Commences fresh breezes; middle, wind working southerly with rain; latter, N. E. to N. W.; moderate and raining.

Aug. 30. Lat. 57° 40′ S.; long. 70° 30′ W. Barometer, 28.65; temperature of air, 41°; of water, 39°; do. 38°. Winds: N. W., N. W., W. N. W. Fresh breezes and raining.

Aug. 31. Lat. 58° 42′ S.; long. 71° 41′ W. Current, east, 36 miles. Barometer, 28.40; temperature of air, 40°; of water, 38°; do. 37°. Winds: W. N. W., W. N. W., N. N. W. Strong breeze, heavy squalls, with snow and hail; midnight, moderate.

Sept. 1. Lat. 59° 18′ S.; long. 73° 11′ W. Strong easterly current. Barometer, 28.30; temperature

of air, 40°; of water, 38°; do. 37°. Winds: W. N. W., W. N. W., N. N. E. Fresh breezes and squally, with snow and hail.

Sept. 2. Lat. 58° 32′ S.; long. 74° 00′ W. Current, east, strong. Barometer, 28.37; temperature of air, 40°; of water, 39°; do. 37°. Winds: N. N. E., W., S. S. E. Commences light breezes, and snow; middle, light; ends good breeze.

Sept. 3. Lat. 55° 24′ S.; long. 76° 15′ W. Current, east, 1½ knots per hour. Barometer, 29.05; temperature of air, 39°; of water, 38°; do. 38°. Winds: S., S. W., W. Fine breeze. During the last four days we have had an easterly current, from 1 to 1½ knot per hour.

Sept. 4. Lat. 54° 27′ S.; long. 76° 25′ W. Current, east, 1 knot per hour. Barometer, 29.05; temperature of air, 40°; of water, 39°; do. 38°. Winds: W., W. N. W., N. W. Commences fresh breezes, and cloudy; ends heavy gales and squally, with hail, rain, and snow.

Sept. 5. Lat. 52° 57′ S.; long. 76° 22′ W. Barometer, 29.10; temperature of air, 41°; of water, 40°; do. 38°. Winds: N. W., W. N. W., W. N. W. Strong gales, with hail and snow; middle, more moderate.

Sept. 6. Lat. 49° 52′ S.; long. 79° 29′ W. Barometer, 29.50; temperature of air, 44°; of water, 43°; do. 42°. Winds: W. N. W., S. W., S. W. Strong breeze, with heavy squalls, with rain and hail; at 4 P. M. wind hauled to S. W. in a squall, and lasted strong throughout the day.

Ship Corinne (John K. Stickney), New York to San Francisco, ninety-two days out.

July 29. Lat. 49° 09′ S.; long. 64° 52′ W. Current, west, half knot per hour. Barometer, 30.26; temperature of air, 37°; of water, 43°. Winds: S. to S. E., calm, calm. First part, squally, and fresh winds; second and third, light airs and calm.

July 30. Lat. 51° 11′ S.; long. 64° 52′ W. Barometer, 30.03; temperature of air, 39°; of water, 42°. Winds: S. by W., S. W., W. S. W. First, light airs and cloudy; second and third, moderate and pleasant.

July 31. Lat. 52° 35′ S.; long. 65° 00′ W. Barometer, 29.77; temperature of air, 41°; of water, 41°. Winds: W. by S., S. W. by W., S. W. by W. First, moderate; second, hard gales; third, moderate.

Aug. 1. Lat. 54° 23′ S.; long. 64° 03′ W. Barometer, 29.50; temperature of air, 40°; of water, 42°. Winds: S. W. throughout. First, moderate; second, suddenly a furious gale; third, hard gale.

Aug. 2. Lat. 54° 33′ S.; long. 63° 50′ W. Barometer, 29.60; temperature of air, 39°; of water, 42°. Winds: S. W., W. S. W., W. N. W. First, hard gales; second, same; third, more moderate, and thick weather.

Aug. 3. Lat. 56° 21′ S.; long. 63° 08′ W. Barometer, 29.20; temperature of air, 35°; of water, 36°. Winds: W. S. W. to W., S. W. by W., S. W. by W. First, fresh breezes and thick; second, light breezes and thick; third, strong breezes, with squalls of sleet and snow.

Aug. 4. Lat. 56° 25′ S.; long. 63° 24′ W. Barometer, 29.92; temperature of air, 26°; of water, 34°.

Winds: S. by W., S. S. E., S. S. E. First part, fresh gale and thick snow; second, hard gale, with heavy squalls of sleet and snow; third, moderating.

Aug. 5. Lat. 56° 40′ S.; long. 66° 17′ W. Barometer, 30.30; temperature of air, 34°; of water, 40°. Winds: S. S. E. to S., S. S. E., S. S. E. to S. First part, fresh gales and frequent snow squalls; second, moderating; third, moderate and cloudy.

Aug. 6. Lat. 56° 57′ S.; long. 66° 22′ W. Barometer, 30.38; temperature of air, 33°; of water, 41°. Winds: S. S. E. to S. S. W. throughout; winds variable, with frequent squalls of snow and sleet.

Aug. 7. Lat. 50° 40′ S.; long. 65° 50′ W. Barometer, 30.10; temperature of air, 34°; of water, 39°. Winds: S. to S. S. W., S. W., S. W. by W.; fresh and flawy, also cloudy.

Aug. 8. Lat. 58° 49′ S.; long. 66° 06′ W. Current, N. E. strong, rate not ascertained. Barometer, 29.86; temperature of air, 36°; of water, 37°. Winds: S. W., S. W. by W., W. by S.; squally and cloudy.

Aug. 9. Lat. 60° 07′ S.; long. 68° 06′ W. Current, E. N. E., 1 mile per hour. Barometer, 29.54; temperature of air, 36°; of water, 31°. Winds: W., W., W. S. W.; moderate, with frequent squalls of sleet and snow, and drizzling rain.

Aug. 10. Lat. 59° 42′ S.; long. 69° 11′ W. Current, easterly. Barometer, 29.55; temperature of air, 34°; of water, 37°. Winds: W. S. W., S. W. to W. S. W., S. S. W. to S. S. E.; light, variable winds, and calms; squalls of snow and sleet.

Aug. 11. Lat. 59° 39′ S.; long. 71° 05′ W. Current, for 56 hours, N. 87° E., 54 miles. Barometer, 29.56; temperature of air, 34°; of water, 38°. Winds: S. E. by S., S. E. by E., E. First part, light airs; second, moderate; third, fresh and cloudy.

Aug. 12. Lat. 58° 25′ S.; long. 76° 18′ W. Current, easterly. Barometer, 29.72; temperature of air, 33°; of water, 39°. Winds: E., E., E. to N. E. First part, fresh, with snow squalls; second, moderate, with snow; third, fresh snow squalls and sleet.

Aug. 13. Lat. 57° 09′ S.; long. 78° 00′ W. Current, for 48 hours, S. 71° E., 42 miles. Barometer, 29.35; temperature of air, 40°; of water, 40°. Winds: N. N. E. to calm, N. E. do. First part, strong, and rainy; calm for a few moments; second, light airs; third, moderate, and drizzling rain.

Aug. 14. Lat. 55° 27′ S.; long. 81° 30′ W. Current, S. 17° E., 29 miles. Barometer, 28.85; temperature of air, 38°; of water, 40°. Wind: N. E. throughout. First and second parts, fresh breezes and thick weather; third, light airs and calms, thick fog.

Aug. 15. Lat. 54° 23′ S.; long. 83° 10′ W. Barometer, 29.07; temperature of air, 40°; of water, 40°. Winds: N. E., calm and baffling, S. S. E. First, light breezes and dense fog; second, calm and baffling airs; third, gentle breezes.

Aug. 16. Lat. 53° 37′ S.; long. 83° 46′ W. Barometer, 29.22; temperature of air, 37°; of water, 40°. Winds: S. S. E., S. W. to N. W., S. W. to N. W. Light variable breezes; latter, squalls of rain.

Aug. 17. Lat. 52° 38′ S.; long. 84° 14′ W. Barometer, 29.03; temperature of air, 42°; of water, 41°. Winds: W. to W. N. W., W. N. W. to N. N. W., W. to W. N. W. Fresh breezes and squally weather.

Aug. 18. Lat. 52° 00′ S.; long. 84° 13′ W. Barometer, 28.85; temperature of air, 40; of water, 41°. Winds: W. N. W., W. N. W., W. N. W. to W. S. W. First, fresh and squally; second, fresh gales, squally with sleet and rain; third, fresh breezes and squally.

Aug. 19. Lat. 50° 12′ S.; long. 84° 40′ W. Barometer, 29.45; temperature of air, 40°; of water, 42°. Winds: S. W. by S. throughout. Strong gales; heavy squalls of snow and hail.

"Your *Sailing Directions*, with the accompanying *Charts*, contain much valuable information, and I would recommend them to every shipmaster, in whatever trade he may be, with regard to doubling Cape Horn. I should prefer running down between the parallels of 58° and 60°, rather than contend with adverse winds, heavy sea, and strong easterly currents, between 58° and the cape. I experienced smooth sea, good weather, and easterly winds, while other ships 2° or 3° N. of me were fighting westerly gales, and had a much stronger easterly set."

Ship Wild Ranger (J. Henry Sears), Boston to San Francisco, sixty days out.

Aug. 20, 1853. Lat. 51° 00′ S.; long. 62° 00′ W. Barometer, 29.50; temperature of air, 36°; of water, 36°. Winds: S. W., W. S. W., W. S. W. Moderate breezes and pleasant.

Aug. 21. Lat. 51° 40′ S.; long. 63° 10′ W. Barometer, 29.95; temperature of air, 31°; water, 32°. Wind: S. S. W. throughout. First part, light winds; at 4 P. M. made Cape Percival (Falkland Islands); at 8 P. M. violent squall from S. S. E.; ends moderate.

Aug. 22. Lat. 54° 25′ S.; long. 63° 50′ W. Barometer, 29.60; temperature of air, 34°; of water, 35°. Winds: W. S. W., S. W., S. W. Strong breezes and squally; snow and hail.

Aug. 23. Lat. 55° 00′ S.; long. 64° 00′ W. Northerly current. Barometer, 29.30; temperature of air, 32°; of water, 34°. Wind: S. W. throughout. At 1 P. M. made east end of Staten Land, bearing S. ½ W.; strong gales, and heavy snow squalls.

Aug. 24. Lat. 56° 00′ S.; long. 64° 20′ W. Current, N. E., 1½ knot per hour. Barometer, 28.40; temperature of air, 29°; of water, 31°. Winds: W. N. W., S. W., S. W. At 6 P. M. Staten Land bore W. N. W. 25 miles; strong gales from S. W.

Aug. 25. Lat. 55° 23′ S.; long. 63° 30′ W. Current, east, 2 knots per hour. Barometer, 28.80; temperature of air, 28°; of water, 30°. Winds: S. W., S. W., S. S. W. Strong gales and heavy snow squalls; ends more moderate.

Aug. 26. Lat. 56° 08′ S.; long. 62° 40′ W. Current, east, 3 knots per hour. Barometer, 28.10; temperature of air, 27°; of water, 27°. Winds: S. by W., N. W., W. S. W. Commences moderate breezes and cloudy; midnight, fresh breezes, squally weather; ends a heavy gale.

Aug. 27. Lat. 56° 20′ S.; long. 63° 00′ W. Current, same. Barometer, 28.30; temperature of air, 30°; of water, 32°. Winds: W. S. W., S. W., W. S. W. Commences heavy gales; ends more moderate.

Aug. 28. Lat. 56° 28′ S.; long. 64° 00′ W. Current, east, 1½ knot per hour. Barometer, 28.60; temperature of air, 36°; of water, 34°. Winds: calm, S. W., N. W. First and middle parts, light and calm; ends moderate; cloudy, with rain.

Aug. 29. Lat. 56° 53′ S.; long. 67° 48′ W. Current, east, 1 knot per hour. Barometer, 28.85; temperature of air, 38°; of water, 36°. Winds: W., calm, N. W. First and middle, light airs and calm; ends fresh breezes, thick and rainy.

Aug. 30. Lat. 57° 30′ S.; long. 70° 22′ W. Current, same. Barometer, 28.80; temperature of air, 41°; of water, 39°. Winds: W. N. W., W. N. W., W. N. W. Strong breezes and rainy.

Aug. 31. Lat. 58° 23′ S.; long. 72° 17′ W. Current, same. Barometer, 28.80; temperature of air, 36°; of water, 37°. Winds: W. N. W., W., W. Strong gales, and squally; snow.

Sept. 1. Lat. 51° 17′ S.; long. 73° 20′ W. Current, same. Barometer, 28.75; temperature of air, 34°; of water, 36°. Winds: W. N. W., N. W., N. W. Fresh breezes and squally.

Sept. 2. Lat. 56° 55′ S.; long. 73° 40′ W. Current, east, 28 miles. Barometer, 28.80; temperature of air, 36°; of water, 36°. Winds: W., W. N. W., W. N. W. Strong breezes and squally.

Sept. 3. Lat. 54° 38′ S.; long. 76° 20′ W. Current, east, 29 miles. Barometer, 29.40; temperature of air, 35°; of water, 34°. Winds: W. S. W., S. W., W. Strong breezes, and heavy snow squalls.

Sept. 4. Lat. 53° 41′ S.; long. 77° 14′ W. Barometer, 29.50; temperature of air, 36°; of water, 35°. Winds: W. S. W., S. W., W. N. W. Strong breezes and squally.

Sept. 5. Lat. 52° 15′ S.; long. 77° 42′ W. Current, south, 12 miles. Barometer, 29.80; temperature of air, 39°; of water, 37°. Winds: W. N. W., W. S. W., W. Fresh breezes and squalls of hail and rain; hope I am most clear of bad weather, and worse winds.

Sept. 6. Lat. 49° 21′ S.; long. 80° 55′ W. Current, south, 12 miles. Barometer, 29.95; temperature of air, 43°; of water, 40°. Winds: W. S. W., S. W., S. Fresh breezes, with squalls of hail and rain; latter part, wind hauling to south; first fair wind for a month.

"SAN FRANCISCO, *October* 25, 1853.

"I followed your track to the equator for July, and had a passage of 28 days to the equator; crossed in 32° 30′, just clear of Rocas, and then had a very hard chance to Cape Horn. I highly approve of your track from Boston to the equator, and have no doubt but that I gained by following your instructions.

"I found very little current near St. Roque. I intended to have gone through Straits of Le Maire, but the wind being S. W., I could not get far enough to westward, and thought it better to pass east end of Staten Land. With regard to a passage around Cape Horn, I would say I have seen worse weather between Boston and Liverpool, in September, than I have seen yet in this passage. North of equator, I had a long spell of calm weather which prolonged my passage; but find, on arrival, that I was in company with four other clipper ships, and all arrived here same day."

Barque Mermaid (George Smith), Pernambuco to San Francisco, from Cape St. Roque, thirty-one days.

Aug. 20, 1851. Lat. 50° 30′ S.; long. 65° 35′ W. Winds: N. W., N. N. W., and N. N. E. Fresh breezes.

Aug. 21. Lat. 54° 31′ S.; long. 65° 16′ W. Winds: W. N. W., W., and W. S. W. Fresh gales at meridian, Cape St. Diego bore S. E., distant, 10 miles.

Aug. 22. Lat. 56° 14′ S.; long. 64° 50′ W. Winds: W. S. W., S. W. by W., W. S. W. At 1 P. M. entered the Straits of Le Maire, and was set to the southward by a tide at the rate of 6 miles per hour. At 5 P. M. Cape Good Success bore N. W., distant 25 miles. After getting through the straits, experienced a heavy irregular sea from the S. W., which lasted until midnight; latter part squally.

Aug. 23. Lat. 57° 05′ S.; long. 65° 12′ W. Winds: W. S. W., S. W., and S. by W. Squally weather.

Aug. 24. Lat. 56° 45′ S.; long. 67° 35′ W. Winds: N. W., S. S. W., N. Unsteady wind; ship under all sail.

Aug. 25. Lat. 57° 30′ S.; long. 70° 45′ W. Winds: N. N. E., N. W., and W. Temperature of air, 43°; of water, 41°. Strong winds; made Diegos Island.

Aug. 26. Lat. 57° 20′ S.; long. 70° W. Temperature of air, 40°; of water, 41°. Winds: W. N. W., N. W., and N. W. Heavy gales; hove to.

Aug. 27. Lat. 57° 40′ S.; long. 71° 10′ W. Temperature of air, 39°; of water, 41°. Winds: N. N. W., W., and W. Strong gales; under close reefs.

Aug. 28. Lat. 56° 48′ S.; long. 72° 50′ W. Temperature of air, 38°; of water, 41°. Winds: W. S. W., S., and S. First part, strong gales; middle and latter part, moderate.

Aug. 29. Lat. 55° 19′ S.; long. 78° 00′ W. Temperature of air, 38°; of water, 41°. Winds: S., S. S. W., and S. W. Fresh wind.

Aug. 30. Lat. 53° 12′ S.; long. 79° 00′ W. Temperature of air, 39°; of water, 42°. Winds: S. W., W., and W. N. W. First part, moderate; middle and latter parts, squally.

Aug. 31. Lat. 51° 45′ S.; long. 78° 45′ W. Temperature of air, 41°; of water, 43°. Winds: W. N. W., N. W., and W. N. W. Fresh gales, and squally.

Sept. 1. Lat. 51° 10′ S.; long. 78° 18′ W. Temperature of air, 43°; of water, 43°. Winds: N. W., W. N. W., and N. E. Fresh winds.

Sept. 2. Lat. 49° 42° S.; long. 80° 10′ W. Temperature of air, 44°; of water, 44°. Winds: N. E., N. W., and E. First and latter part, moderate; middle part, squally.

Ship Queen of Clippers (John Zerega), New York to San Francisco, 61 days out.

Aug. 30. Lat. 49° 53′ S.; long. 64° 57′ W. Barometer, 29.30; temperature of air, 47°; of water, 43°. Winds: N. W. by W., W. N. W., W. by S. First, moderate; second and third, fresh and squally; water, at 12 feet 2 inches below surface, 43°.

Aug. 31. Lat. 54° 05′ S.; long. 65° 00′ W. Barometer, 29; temperature of air, 39°; surface of water, 43°; below surface, 12 feet 2 inches, 43°. First, moderate and squally; second, fresh; third, blowing hard in squalls.

Sept. 1. Lat. 54° 52′ S.; long. 65° 02′ W. Barometer, 29; temperature of air, 42°; of water, at

surface, 41°; below, 41°. Winds: W. by N., W. N. W., N. First and second, strong gales; third part, light winds.

Sept. 2. Lat. 56° 08′ S.; long. 65° 27′ W. Barometer, 28.70; temperature of air, 36°; of water, at surface, 40°; below, 40°. Winds: W. N. W., S. S. W., W. by S. First, light winds and strong tide rips; second, calm; third, heavy gales and squalls of hail.

I see in your book of *Directions*, that some of the captains state that they do not consider the barometer as a guide in high southern latitudes; but I differ from them. Although I may not have had as much experience as some of them—having been thirteen years at sea, of which time I have been captain six years—I think if the glass falls three or four-tenths in a few hours, it will be succeeded by a gale and very heavy gust, which will last several hours—although the simple fact that the barometer falls, does not, as a natural consequence, predict wind; it only shows that there is a commotion in the atmosphere in your vicinity, which may be succeeded by wind or rain, but I think more likely by the former.

Sept. 3. Lat. 56° 30′ S.; long. 66° 50′ W. Barometer, 29; temperature of air, 34°; surface of water, 40°; below, 40°. Winds: W. by S., W. by E., S. S. W. Strong gales and snow squalls.

Sept. 4. Lat. 57° 28′ S.; long. 66° 50′ W. Barometer, 29.3; temperature of air, 36°; of water, 40°; below surface, 40°. Winds: "not put down." Squally and misty weather.

Sept. 5. Lat. 58° 37′ S.; long. 68° 15′ W. Barometer, 29.00; temperature of air, 35°; of water, 40°; below surface, 40°. Current, E., 1¼ knot. Winds: W. ½ S., W., W. by N. Heavy gales and squalls.

Sept. 6. Lat. 58° 00′ S.; long. 69° 40′ W. Barometer, 29.03; temperature of air, 31°; of water, 40°; below surface, 40°. Current, E., 1¼ knot. Winds: W., S., S. by W. First, gales; second, gales and snow squalls; third, blowing very hard.

Sept. 7. Lat. 56° 09′ S.; long. 73° 33′ W. Barometer, 30.18; temperature of air, 33°; of water, 40°; below surface, 40°. Current, N. E., 1 knot. First part, gales; second, more moderate; third, fine weather.

Sept. 8. Lat. 54° 29′ S.; long. 76° 00′ W. Barometer, 30.03; temperature of air, 32°; of water, 40°; below surface, 40°. Winds: S. by W., S. W. by S., S. E. First and second, moderate with rain squalls; latter, light airs and calm.

Sept. 9. Lat. 53° 30′ S.; long. 80° 13′ W. Barometer, 29.05; temperature of air, 36°; of water, 40°; below surface, 40°. Winds: E., E., N. W. Light breezes and squally.

Sept. 10. Lat. 53° 05′ S.; long. 82° 30′ W. Barometer, 29.00; temperature of air, 36°; of water, 40°; below surface, 40°. Winds: N. W. by N., N. N. W., W. by N. Strong gales.

Sept. 11. Lat. 50° 24′ S.; long. 82° 00′ W. Barometer, 29.40; temperature of air, 40°; of water, 42°; below surface, 42°. Winds: N. W. by N., S. W., W. First part, strong gales and misty; second, moderate; third, moderate and squally.

Ship John Bertram (F. Lendholm), Boston to San Francisco, fifty-eight days out.

Aug. 28, 1853. Lat. 49° 27′ S.; long. 65° 17′ W. Barometer, 29.70; temperature of air, 49°; of water, 43°. Winds: W. by S., S. W. by W., N. W. by W. First and middle parts, light breezes. Sounded in 60 fathoms. Ends fine breezes and pleasant.

Aug. 29. Lat. 51° 55′ S.; long. 66° 30′ W. Barometer, 29.46; temperature of air, 46°; of water, 41°. Winds: W. N. W., W. N. W., N. W. First and middle parts, light breezes; latter part, faint airs.

Aug. 30. Lat. 54° 03′ S.; long. 65° 32′ W. Barometer, 29.07; temperature of air, 46°; of water, 41°. Winds: variable, variable, N. W. Commences light variable airs. Ends fine breeze.

Aug. 31. Lat. 56° 45′ S.; long. 66° 57′ W. Barometer, 29.00; temperature of air, 43°; of water, 41°. Winds: N. W., N. W. by N., W. by S. Commences with fine breezes and pleasant. At 2 P. M. Cape St. Diego bore, by compass, S. E. At 3 hours 30 min. P.M. passed it and entered Straits of Le Maire. Becalmed two hours. A strong northerly current. At 7 P. M. clear of the straits. Middle, unsteady winds with snow. At 6 hours 30 min. A. M. Cape Horn bore W. ½ S. Ends strong gales.

Sept 1. Lat. 57° 06′ S.; long. 69° 01′ W. Barometer, 28.82; temperature of air, 44°; of water, 42°. Winds: W., W. S. W., W. by S. First part, moderate breezes with frequent snow squalls; middle, dark gloomy weather. Ends with unsteady winds and snow squalls.

Sept. 2. Lat. 57° 27′ S.; long. 69° 45′ W. Barometer, 28.70; temperature of air, 37°; of water, 39°. Winds: W. by S., W. S. W., W. by N. Moderate breezes with snow squalls, and a high sea.

Sept. 3. Lat. 56° 02′ S.; long. 72° 00′ W. Current, E. N. E., 26 miles. Barometer, 28.97; temperature of air, 37°; of water, 40°. Winds: variable, S., W. S. W. First, light baffling winds; middle and latter fresh breezes with snow squalls.

Sept. 4. Lat. 57° 21′ S.; long. 73° 13′ W. Barometer, 29.28; temperature of air, 40°; of water, 40°. Winds: W. S. W., W. S. W., W. by N.; strong gales with a heavy sea.

Sept. 5. Lat. 58° 17′ S.; long. 74° 01′ W. Barometer, 29.07; temperature of air, 38°; of water, 39°. Winds: W. S. W., W., W. N. W.; heavy gales and a heavy sea.

Sept. 6. Lat. 57° 24′ S.; long. 74° 28′ W. Current (two days), E., 29 miles. Barometer, 29.00; temperature of air, 35°; of water, 39°. Winds: W., W. S. W., S. S. W.; strong gales and heavy sea; long and heavy squalls.

Sept. 7. Lat. 56° 10′ S.; long. 77° 28′ W. Barometer, 30.23; temperature of air, 39°; of water, 40°. Winds: S. S. W., S. S. W., S. W. by S. First part, strong gales and stronger squalls; middle, strong breezes and squally; ends, moderate breezes and cloudy.

Sept. 8. Lat. 54° 56′ S.; long. 79° 11′ W. Barometer, 30.48; temperature of air, 36°; of water, 40°. Winds: S. W. by W., S. S. W. to W. by S.; calm. First part, light breezes and light squally weather; middle, baffling; ends, calm and foggy.

Sept. 9. Lat. 53° 34′ S.; long. 83° 00′ W. Barometer, 29.96; temperature of air, 38°; of water, 40°. Winds: calm, N. E., N. W. by N. Commences, calm and foggy; middle and latter parts, fine breezes.

Sept. 10. Lat. 53° 11′ S.; long. 85° 28′ W. Barometer, 29.08; temperature of air, 40°; of water, 41°. Winds: N. W. by N., W. by S., W.; strong breezes and strong gales, and cloudy squally weather.

Sept. 11. Lat. 50° 26′ S.; long. 85° 48′ W. Barometer, 29.46; temperature of air, 40°; of water, 41°. Winds: W. N. W., S. W., S. W. by W. Commences, strong breezes and squally, with rain; 9 P. M. wind hauled to S. W.; middle and latter parts, strong breezes and squally, with a heavy cross sea.

Ship Eagle (John S. Farran), New York to San Francisco, sixty-two days out.

Sept. 10, 1853. Lat. 48° 38′ S.; long. 49° 35′ W. Current, N. 66° E., 20 miles. Barometer, 29.28; temperature of air, 42°; of water, 46°. Winds: S. W. by S., S. W. by W., S. W. by W. First and second parts, fresh; latter, hard gales and cloudy.

Sept. 11. Lat. 50° 31′ S.; long. 51° 10′ W. Current, N. 80° E., 22 miles. Barometer, 28.93; temperature of air, 42°; of water, 38°. Winds: W. by S., W. by N., W. N. W.; strong gales, cloudy and rain.

Sept. 12. Lat. 51° 20′ S.; long. 51° 06′ W. Current, E., 20 miles. Barometer, 29.20; temperature of air, 40°; of water, 38°. Winds: W. by N., W., W.; heavy gales, hail, and lightning.

Sept. 13. Lat. 52° 20′ S.; long. 51° 41′ W. Current, S. 81° E., 24 miles. Barometer, 29.38; temperature of air, 41°; of water, 37°. Winds: W. S. W., S. W., W. by N. First part, strong gale; second and third parts, moderate.

Sept. 14. Lat. 54° 01′ S.; long. 54° 46′ W. Current, S. 83° E., 26 miles. Barometer, 29.09; temperature of air, 41°; of water, 39°. Winds: W. by N., W. N. W., W. by N.; moderate, cloudy and hazy.

Sept. 15. Lat. 55° 05′ S.; long. 59° 42′ W. Current, S. 80° E., 20 miles. Barometer, 29.03; temperature of air, 34°; of water, 39°. Winds: E. S. E., E., S.; moderate breezes, with sleet of snow.

Sept. 16. Lat. 53° 00′ S.; long. 60° 53′ W. Current, S. 86° E., 25 miles. Barometer, 29.64; temperature of air, 32°; of water, 39°. Winds: S. W. by S., S. W. by S., S. S. W. Heavy squalls of sleet and snow; latter, passing clouds.

Sept. 17. Lat. 55 °07′ S.; long. 62° 56′ W. Current, E., 32 miles. Barometer, 29.85; temperature of air, 43°; of water, 39°. Winds: S., S. W., W. N. W. Moderate, and cloudy.

Sept. 18. Lat. 56° 58′ S.; long. 67° 23′ W. Current, S., 25 miles. Barometer, 29.28; temperature of air, 43°; of water, 40°. Winds: N. N. W., W. N. W., W. N. W. First, moderate; second, variable; third, fresh gales, and cloudy.

Sept. 19. Lat. 58° 21′ S.; long. 69° 5′ W. Barometer, 29.62; temperature of air, 42°; of water, 39°. Winds: W., W. by S., W. by N. Strong breezes, and cloudy.

Sept. 20. Lat. 59° 38′ S.; long. 71° 33′ W. Barometer, 29.48; temperature of air, 39°; of water, 39°. Winds: W. N. W., W. N. W., W. Hard squalls and hail; latter, fair.

Sept. 21. Lat. 61° 07′ S.; long. 73° 30′ W. Barometer, 29.45; temperature of air, 38°; of water, 36°. Winds: W., W. by S., W. Moderate, and thick drizzling rain.

Sept. 22. Lat. 61° 48′ S.; long. 76° 36′ W. Barometer, 28.65; temperature of air, 37°; of water, 34°. Winds: W. N. W., N. W., N. W. by W. Moderate, cloudy, and rainy.

Sept. 23. Lat. 60° 59′ S.; long. 76° 50′ W. Current, N. 82° E., 16 miles. Barometer, 28.70; temperature of air, 36°; of water, 36°. Winds: W. S. W., E. S. E., W. N. W. First, light, with snow; latter, cloudy.

Sept. 24. Lat. 59° 45′ S.; long. 78° 50′ W. Barometer, 28.42; temperature of air, 37°; of water, 38°. Winds: W. by N., N. W., N. N. W. Moderate and cloudy, with drizzling rain.

Sept. 25. Lat. 59° 16′ S.; long. 80° 47′ W. Barometer, 28.30; temperature of air, 39°; of water, 37°. Winds: N. N. W., calm, S. S. W. First and second, drizzling; third, snow.

Sept. 26. Lat. 56° 14′ S.; long. 83° 1′ W. Barometer, 29.03; temperature of air, 32°; of water, 39°. Winds: S. W. by W., S. E., S. E. by S. First, baffling, with snow squalls; second, snow; third, cloudy.

Sept. 27. Lat. 52° 50′ S.; long. 84° 45′ W. Barometer, 28.80; temperature of air, 36°; of water, 40°. Winds: S. E. throughout. Fresh breezes; dark cloudy weather, with heavy snow squalls.

Sept. 28. Lat. 50° 00′ S.; long. 85° 16′ W. Barometer, 29.25; temperature of air, 40°; of water, 42°. Winds: S. E., S., S. E. First and third, baffling and fair; latter, rain.

Barque Sarah H. Snow (Laban Hawes), Boston to Valparaiso, thirty-eight days from Cape St. Roque.

Sept. 11, 1851. Lat. 49° 46′ S.; long. 65° 00′ W. Barometer, 29.40; temperature of air, 46°; of water, 42. Winds: W. S. W., W., and W. S. W. Strong breezes and clear weather.

Sept. 12. Lat. 51° 30′ S.; long. 64° 59′ W. Barometer, 29.60; temperature of air, 44°; of water, 42°. Winds: W. S. W., S. W., and W. S. W. Fresh breezes and passing clouds.

Sept. 13. Lat. 54° 33′ S.; long. 65° 12′ W. Barometer, broke; temperature of air, 46°; of water, 42°. Winds: W. N. W., N. W., and W. N. W., Strong gales, with quick passing clouds; made Cape St. Diego, bearing S. E.

Sept. 14. Lat. 55° 45′ S.; long. 65° 39′ W. Temperature of air, 40°; of water, 42°. Winds: W. N. W., calm, and S. E. Weather variable; passed through the Straits of Le Maire.

Sept. 15. Lat. 56° 37′ S.; long. 64° 56′ W. Temperature of air, 37°; of water, 42°. Winds: S. E., S. by E., and S. W. by S. Hard gales, with snow.

Sept. 16. Lat. 56° 45′ S.; long. 65° 00′ W. Temperature of air, 35°; of water, 42°. Winds: S. S. W., S. S. W., and variable. First and middle parts, blowing hard, with snow; ends fair.

Sept. 17. Lat. 57° 20′ S.; long. 65° 50′ W. Temperature of air, 42°; of water, 41°. Winds: variable, variable, and W. N. W. Moderate breezes and squally; latter part, fresh and squally.

Sept. 18. Lat. 57° 46′ S.; long. 69° 33′ W. Temperature of air, 42°; of water, 40°. Wind: W. N. W. Fresh breezes and hard gales, with rain.

Sept. 19. Lat. 58° 50′ S.; long. 70° 50′ W. Temperature of air, 42°; of water, 40°. Winds: W., W. S. W., and W. Blowing hard, with squalls and high sea.

Sept. 20. Lat. 59° 50′ S.; long. 71° 47′ W. Temperature of air, 39°; of water, 40°. Wind: W. Hard gales, with squalls, and rain, and snow.

Sept. 21. Lat. 59° 50′ S.; long. 72° 00′ W. Temperature of air, 40; of water, 40. Wind: W. Dull, rainy weather, blowing hard.

Sept. 22. Lat. 60° 27′ S.; long. 72° 58′ W. Current, E., 24 miles. Temperature of air, 39°; of water, 37°. Wind: W. N. W. Blowing hard, cloudy and rainy.

Sept. 23. Lat. 60° 26′ S.; long. 73° 00′ W. Temperature of air, 40; of water, 37°. Winds: W. Strong gales, with rain and heavy sea.

Sept. 24. Lat. 59° 50′ S.; long. 74° 00′ W. Temperature of air, 38°; of water, 38°. Winds: W., W., and S. W. Fresh breezes, and light squalls of rain and snow.

Sept. 25. Lat. 59° 41′ S.; long. 76° 30′ W. Temperature of air, 40°; of water, 39°. Winds: N. W., N. W. by W., and variable. Strong breezes and squally, with snow and rain.

Sept. 26. Lat. 57° 31′ S.; long. 77° 35′ W. Temperature of air, 38°; of water, 40°. Winds: S. W., S. W., and S. S. W. Fresh winds, with hail and snow squalls.

Sept. 27. Lat. 55° 02′ S.; long. 79° 41′ W. Temperature of air, 39°; of water, 40°. Winds: S., S. S. E., and S. E. by E. Strong breeze, with dark clouds; hail and snow.

Sept. 28. Lat. 52° 00′ S.; long. 81° 25′ W. Temperature of air, 38°; of water, 42°. Winds: S. E., S., and S. S. W. Fresh winds and squally, with rain and snow.

Sept. 29. Lat. 50° 10′ S.; long. 81° 45′ W. Temperature of air, 42°; of water, 42°. Winds: S. W., S. W. by W., and N. N. E. First part, snow and hail squalls; latter part, fresh gale and rain.

Ship Raven (W. H. Henry), New York to San Francisco, nineteen days from Cape St. Roque.

Sept. 23. Lat. 50° 51′ S.; long. 65° 20′ W. Current, E., 20 miles. Barometer, 29.70; temperature of air, 40°; of water, 40°. Winds: W. S. W. calm, E. S. E.; light airs and calm.

Sept. 24. Lat. 51° 46′ S.; long. 64° 31′ W. Current, N. E. ½ E., 23 miles. Barometer, 29.80; temperature of air, 38°; of water, 40°. Winds: S. E., S., and S. S. E. Moderate breeze and squally.

Sept. 25. Lat. 52° 53′ S.; long. 66° 10′ W. Current, N., 14 miles. Barometer, 29.80; temperature of air, 36°; of water, 40°. Winds: S. E., baffling, E. S. E., light and variable.

Sept. 26. Lat. 54° 26′ S.; long. 65° 10′ W. Current, E., 24 miles. Barometer, 29.60; temperature of air, 38°; of water, 40°. Winds: N. N. E., light and variable; made the land of Terra del Fuego; at noon, Cape St. Diego bore S. by E., 12 miles.

Sept. 27. Lat. 55° 58′ S.; long. 69° 05′ W. Current, E., 24 miles. Barometer, 29.50; temperature of air, 42°; of water, 42°. Wind: N. W. Moderate and cloudy; passed through the straits of Le Maire, and cleared them at 6 A. M.; at 5 A. M. Cape Horn bore N. N. W., 2 miles.

Sept. 28. Lat. 56° 14′ S.; long. 71° 05′ W. Current, none. Barometer, 29.50. Winds: calm and W. N. W., light and calm.

Sept. 29. Lat. 55° 45′ S.; long. 73° 00′ W. Current, E., 36 miles. Barometer, 29.70; temperature of air, 40°; of water, 40°. Winds: W., S. S. W., and W. S. W. Fresh breezes and squally, with rain.

Sept. 30. Lat. 55° 38′ S.; long. 74° 35′ W. Barometer, 29.70; temperature of air, 40°; of water, 40°. Wind: W. Fresh gales and thick cloudy weather; *double reefs.*

Oct. 1. Lat. 56° 03′ S.; long. 75° 24′ W. Barometer, 29.20; temperature of air, 40°; of water, 40°. Wind: W. N. W. Heavy gales and violent squalls, with rain.

Oct. 2. Lat. 55° 57′ S.; long. 74° 35′ W. Current in three days, E., 88 miles. Barometer, 29.40; temperature of air, 41°; of water, 41°. Winds: W. N. W., W. S. W., and S. W. Hard gales and squalls.

Oct. 3. Lat. 55° 32′ S.; long. 74° 35′ W. Current, E., 30 miles. Barometer, 29.40; temperature of air, 40°; of water, 41°. Winds: W., and W. N. W. Strong gales and hard squalls; turbulent sea.

Oct. 4. Lat. 55° 36′ S.; long. 74° 45′ W. Barometer, 28.70; temperature of air, 41°; of water, 41°. Winds: W., and W. N. W. Strong gales and violent squalls, with rain.

Oct. 5. Lat. 55° 26′ S.; long. 75° 45′ W. Barometer, 28.50; temperature of air and water, 41°. Winds: W. N. W., W., W. S. W. Heavy gales.

Oct. 6. Lat. 53° 47′ S.; long. 75° 20′ W. Barometer, 29.70; temperature of air, 46°; of water, 45°. Wind: W. Light winds and passing squalls, with rain.

Oct. 7. Lat. 54° 03′ S.; long. 78° 21′ W. Current, E., 12 miles. Barometer, 29.60; temperature of air, 46°; of water, 46°. Winds: N. W., N. N. W., and N. W. First part, light; latter part, fresh breezes.

Oct. 8. Lat. 54° 25′ S.; long. 80° 18′ W. Barometer, 29.70; temperature of air, 43°; of water, 42°. Wind: N. W. Strong gales, and thick rainy weather.

Oct. 9. Lat. 54° 04′ S.; long. 83° 25′ W. Barometer, 29.50; temperature of air, 43°; of water, 43°. Winds: W., N. W., and N. N. W. Strong breezes, and thick rainy weather.

Oct. 10. Lat. 53° 10′ S.; long. 82° 40′ W. Current, E., 12 miles. Barometer, 29.50; temperature of air, 42°; of water, 43.° Winds: W., calm, and N. W. Variable breezes, and thick weather.

Oct. 11. Lat. 50° 55′ S.; long. 79° 10′ W. Current, E., 18 miles. Barometer, 29.70; temperature of air, 42°; of water, 42.° Wind: N. W. Moderate breeze, and cloudy.

Oct. 12. Lat. 50° 02′ S.; long. 80° 18′ W. Barometer, 29.70; temperature of air, 44°; of water, 45°. Winds: W. N. W., N. N. W., and N. N. W. Variable breezes, and thick weather.

Ship Samuel Russell (Joseph Limeburner), from New York to San Francisco, twenty-six days from Cape St. Roque.

Oct. 8, 1852. Lat. 51° 18′ S.; long. 64° 00′ W. Barometer, 30.30; temperature of air, 54°. Winds: E. N. E., N., and N. N. W. Fresh breeze and calms; thick and foggy.

Oct. 9. Lat. 55° 46′ S.; long. 65° 03′ W. Barometer, 30.29; temperature of air, 52°. Winds: N. W., S. W. by W., and calm. Foggy weather.

Oct. 10. Lat. 55° 00′ S.; long. 63° 43′ W. Barometer, 30.10; temperature of air, 46.° Winds: calm, N., and N. W. First part, light breeze and thick fog; latter part, clear.

Oct. 11. Lat. 56° 22′ S.; long. 67° 50′ W. Barometer, 30.10; temperature of air, 42.° Winds: W. S. W., baffling. Strong breezes and snow squalls.

Oct. 12. Lat. 56° 35′ S.; long. 67° 50′ W. Barometer, 30.10; temperature of air, 42°. Winds: W. S. W., baffling. Light breezes and thick weather.

Oct. 13. Lat. 56° 49′ S.; long. 71° 40′ W. Barometer, 29.65; temperature of air, 46.° Winds: N. E., N., and N. W. First part, light; latter part, strong breezes.

Oct. 14. Lat. 57° 34′ S.; long. 73° 59′ W. Barometer, 29.50; temperature of air, 40°; of water, 54°. Winds: N. W., W., W. N. W. Strong gales and rain during first part; latter part, clear.

Oct. 15. Lat. 57° 12′ S.; long. 75° 13′ W. Barometer, 29.90; temperature of air, 40°. Winds: W. by N., S. W., and W. N. W. Heavy gales, and squally.

Oct. 16. Lat. 57° 33′ S.; long. 77° 50′ W. Barometer, 29.70; temperature of air, 42°. Winds: N. W. by W., N. W., and N. W. Strong gales, and heavy sea.

Oct. 17. Lat. 57° 10′ S.; long. 79° 12′ W. Barometer, 29.70; temperature of air, 38°. Winds: W. N. W., W., and W. by S. Strong breezes and clear.

Oct. 18. Lat. 54° 34′ S.; long. 78° 12′ W. Barometer, 29.75; temperature of air, 40°. Winds: W. N. W., W., and W. Heavy gale and squalls.

Oct. 19. Lat. 52° 02′ S.; long. 77° 29′ W. Barometer, 29.80; temperature of air, 43°. Winds: W., W. S. W., and N. W. by W. Strong breezes and thick weather; heavy head sea.

Oct. 20. Lat. 52° 45′ S.; long. 78° 31′ W. Barometer, 29.00; temperature of air, 42°. Winds: W. S. W., W. and S. by W. Heavy gales and heavy head sea.

Oct. 21. Lat. 52° 30′ S.; long. 78° 50′ W. Barometer, 29.50; temperature of air, 46°. Winds: S. S. W., W. S. W., and N. W. Strong gale, and hail squalls.

Oct. 22. Lat. 52° 37′ S.; long. 77° 49′ W. Barometer, 29.10; temperature of air, 40°. Wind: W. Strong gales and hail squalls.

Oct. 23. Lat. 50° 44′ S.; long. 79° 18′ W. Barometer, 29.00; temperature of air, 40. Winds: W. by S., W. S. W., and S. W. Strong gales and rainy.

Ship Winged Arrow (F. Bearre), Boston to San Francisco, twenty-one days from St. Roque.

Sept. 25. Lat. 50° 05′ S.; long. 66° 41′ W. Barometer, 29.5; temperature of air, 56°; of water, 55°. Winds: S. E., calm, variable. Light airs and calms.

Sept. 26. Lat. 52° 30′ S.; long. 67° 00′ W. Barometer, 29.5; temperature of air, 56°; of water, 55°, Winds: S. E. throughout. Light breezes and cloudy weather.

Sept. 27. Lat. 55° 00′ S.; long. 64° 15′ W. Barometer, 29.5; temperature of air, 56°; of water, 55°. Winds: N. E., N. E., N. First and second parts, moderate; third, fresh breezes.

Sept. 28. Lat. 56° 30′ S.; long. 67° 30′ W. Barometer, 29.5; temperature of air, 56°; of water, 55°. Winds: N., N., N. W. Moderate and pleasant.

Sept. 29. Lat. 56° 40′ S.; long. 69° 14′ W. Barometer, 28.7; temperature of air, 56°. Winds: W., S. S. W., W. S. W. Fresh gales and heavy squalls.

Sept. 30. Lat. 57° 15′ S.; long. 70° 15′ W. Barometer, 28.6; temperature of air, 50°. Winds: W., S. W., S. W. by W., W. S. W. Fresh gales and variable weather.

Oct. 1. Lat. 57° 20′ S.; long. 71° 00′ W. Barometer, 28.8. Winds: W., W. by N., W. by N. Heavy gales.

Oct. 2. Lat. 57° 33′ S.; long. 70° 42′ W. Barometer, 28.8. Winds: W., W., S. S. W. Heavy gales.

Oct. 3. Lat. 57° 52′ S.; long. 71° 51′ W. Barometer, 28.8. Winds: W., W., W. by S. Heavy gales and rain.

Oct. 4. Lat. 58° 00′ S.; long. 71° 50′ W. Barometer, 28.9. Winds: W. by N. throughout; heavy gales, with constant rains and snow.

Oct. 5. Lat. 56° 12′ S.; long. 71° 36′ W. Barometer, 29.0. Winds: W. by S., W. by S., W.; fresh gales; third part, more moderate.

Oct. 6. Lat. 55° 49′ S.; long. 72° 03′ W. Barometer, 29.7. Winds: W. by S. throughout; squally and variable.

Oct. 7. Lat. 57° 03′ S.; long. 74° 19′ W. Barometer, 29.6. Winds: W., W. N. W., N. W. First and second parts, moderate; third part, fresh.

Oct. 8. Lat. 57° 50′ S.; long. 74° 30′ W. Barometer, 29.3. Winds: W. N W. throughout; fresh gales and rainy.

Oct. 9. Lat. 57° 30′ S.; long. 76° 30′ W. Barometer, 29.3. Winds: W. by N., W. by N., N. N. W.; moderate and rainy.

Oct. 10. Lat. 56° 13′ S.; long. 78° 39′ W. Barometer, 29.6. Winds: N. N. W., W.; variable, moderate and foggy.

Oct. 11. Lat. 56° 43′ S.; long. 79° 57′ W. Barometer, 29.4. Winds: N. W., W. N. W., W. by S.; moderate breezes.

Oct. 12. Lat. 56° 30′ S.; long. 82° 10′ W. Barometer, 29.3. Winds: W. S. W., calm, N. First part, moderate; second part, calm; third part, gales.

Oct. 13. Lat. 55° 13′ S.; long. 84° 10′ W. Barometer, 29.02. Winds: W. N. W., W. N. W., W. by N.; fresh gales and rain.

Oct. 14. Lat. 52° 19′ S.; long. 83° 03′ W. Barometer, 29.5. Winds: W., W., W. by S.; fresh breezes and light squalls of rain.

Oct. 15. Lat. 48° 43′ S.; long. 83° 37′ W. Barometer, 29.8. Winds: W., throughout; fine breezes and clear pleasant weather.

Ship Louis Philippe (Robert Benthall), Baltimore to Valparaiso, thirty days from St. Roque.

Sept. 29, 1849. Lat. 50° 00′ S.; long. 63° 02′ W. Current, N. 56° E., 0.6 mile per hour; temperature of air, 43°; of water, 41°. Barometer, 30.05. Winds: W., S. W., S. W.; moderate breezes and pleasant.

Sept. 30. Lat. 51° 54′ S.; long. 63° 20′ W. Current, N. 45° E., 0.5 mile per hour; temperature of air, 42°; of water, 40°. Barometer, 29.92. Winds: W. S. W., W. S. W., W.; moderate and clear.

Oct. 1. Lat. 53° 18′ S.; long. 63° 54′ W. Current, N. 78° E., 1 mile per hour. Barometer, 29.8. Winds: W., W. S. W. to W.; variable, light breezes and clear.

Oct. 2. Lat. 54° 52′ S.; long. 65° 14′ W. Current, S. 74° E., 1.7 mile per hour; temperature of air,

43°; of water, 41°. Barometer, 29.47. Winds: N., W. N. W. to N. W., N. W. to variable; light breezes, cloudy and rainy. Passed through the Straits of Le Maire; strong tide rips.

Oct. 3. Lat. 56° 29′ S.; long. 65° 55′ W. Current, N. 19° E., 0.6 mile per hour; temperature of air, 42°; of water, 38°. Barometer, 29.35. Winds: W. throughout; moderate breezes and rainy.

Oct. 4. Lat. 57° 29′ S.; long. 66° 42′ W. Current, N. 19° E., 0.6 mile per hour; temperature of air, 39°; of water, 38°. Barometer, 29.34. Winds: W., W. to W. N. W., W. N. W. to W.; cloudy, with hard snow squalls, moderate breezes.

Oct. 5. Lat. 56° 20′ S.; long. 66° 19′ W. Current, S. 77° E., 1 mile; temperature of air, 42°; of water, 38°. Barometer, 29.62. Winds: S. W. to W. S. W., W. S. W., W. N. W.; cloudy, with hail squalls, moderate breezes.

Oct. 6. Lat. 56° 08′ S.; long. 70° 40′ W. Current, S. 57 E., 1.5 mile per hour; temperature of air, 46°; of water, 40°. Barometer, 29.20. Winds: N. W. and S. W., N. W. by N., N. by W.; moderate breezes, and cloudy with rain.

Oct. 7. Lat. 57° 07′ S.; long. 70° 50′ W. Current, N. 57° E., 1.5 mile per hour. Temperature of air, 40°; water, 38°. Barometer, 28.82. Winds: N. by E. to N. W., W. N. W., W. N. W; strong breezes and snow squalls.

Oct. 8. Lat. 57° 18′ S.; long. 71° 42′ W. Current, N. 64° E., 1 mile per hour. Temperature of air, 39°; of water, 38°. Barometer, 28.70. Winds: N. W. to W. N. W., W. N. W., S. E. to S. W., W. N. W.; strong winds, and hard snow squalls.

Oct. 9. Lat. 57° 25′ S.; long. 71° 43′ W. Current, N. 26° E., 0.7 mile per hour. Temperature of air, 40°; of water, 41°. Barometer, 28.97. Winds: W. N. W., W., S. W. to S. S. W. First part, moderate gales and snow squalls; second and third parts, moderating.

Oct. 10. Lat. 56° 50′ S.; long. 72° 40′ W. Current, N. 69° W., 0.7 mile per hour. Temperature of air, 40°; of water, 41°. Barometer, 29.42. Winds: S. W., S. W. to W. S. W., W.; moderate and cloudy, with snow and hail.

Oct. 11. Lat. 58° 00′ S.; long. 74° 54′ W. Current, N. 76° W., 0.7 mile per hour. Temperature of air, 38°; of water, 39°. Barometer, 28.97. Winds: W. N. W., W. N. W. to N. W., W. to W. N. W.; moderate and cloudy, with rain.

Oct. 12. Lat. 58° 21′ S.; long. 77° 09′ W. Current, S. 74° W., 1.3 mile per hour. Temperature of air, 40°; of water, 39°. Barometer, 28.45. Winds: N. N. W., N. N. W. to W. N. W., W. N. W. First part, moderate and cloudy; second and third parts, light breeze and rain.

Oct. 13. Lat. 56° 31′ S.; long. 77° 04′ W. Current, S. 13° E., 0.5 mile per hour. Temperature of air, 37°; of water, 40°. Barometer, 28.82. Winds: S. W. to W. N. W., W. S. W. to W. by N., W. S. W. to W. by N.; moderate breezes, with snow squalls.

Oct. 14. Lat. 54° 42′ S.; long. 76° 31′ W. Current, S. 49° E., 0.5 mile per hour. Temperature of air, 40°; of water, 39°. Barometer, 29.17. Winds: W. to W. S. W., W. to W. S. W., W., W. N. W.; moderate breezes, with snow squalls.

Oct. 15. Lat. 55° 26′ S.; long. 76° 53′ W. Temperature of air, 43°; of water, 42°. Barometer, 28.82. Winds: W. to W. S. W., W. S. W. to W. N. W., W. N. W.; strong winds and cloudy, with rain.

Oct. 16. Lat. 55° 24′ S.; long. 77° 27′ W. Temperature of air, 37°; of water, 39°. Barometer, 28.94. Winds: W. N. W., W., W. S. W. First part, moderate and cloudy, with snow squalls; second part, moderate and rainy; third part, moderate, with snow and rain.

Oct. 17. Lat. 55° 20′ S.; long. 77° 47′ W. Current, S. 39° E., 0.6 mile per hour. Barometer, 28.82. Winds: S. W. to W. S. W., W. to W. N. W., W. N. W. to N. by W. First and second parts, moderate and clear; third part, stormy, with rain.

Oct. 18. Lat. 55° 34′ S.; long. 77° 25′ W. Current, S. 39° E., 0.6 mile per hour. Temperature of air, 40°; of water, 39°. Barometer, 28.67. Winds: N. W. to W. N. W., W. N. W., W.; stormy weather, with snow squalls.

Oct. 19. Lat. 55° 28′ S.; long. 77° 17′ W. Current, S. 46° E., 1 mile. Temperature of air, 40°; of water, 39°. Barometer, 29.18. Winds: W., W. S. W.; cloudy, and fresh breezes, with snow squalls.

Oct. 20. Lat. 52° 50′ S.; long. 78° 15′ W. Current, S. 46° E., 1 mile. Temperature of air, 40°; of water, 40°. Barometer, 29.52. Winds: S. W., S. W. by W., S. W. by W.; fresh breezes and cloudy, with snow, rain, and hail.

Oct. 21. Lat. 50° 10′ S.; long. 79° 53′ W. Current, S. 42° E., 0.5 mile per hour. Temperature of air, 43°; of water, 43°. Barometer, 30.17. Winds: S. W. to S. S. W., S., S. S. E. to S. S. W.; moderate, with passing clouds and light hail.

Schooner Clifton (Daggett), New York to Acapulco, from Cape St. Roque, 32 days out.

Sept. 26. Lat. 50° 31′ S.; long. 64° 27′ W. Barometer, 28.48; temperature of air, 44°; of water, 42°. Winds: W. by N., N. N. E., and N. Strong breeze.

Sept. 27. Lat. 51° 57′ S.; long. 64° 27′ W. Barometer, 28.48; temperature of air, 46°: of water, 41°. Winds: N. N. W., N. N. E., and N. Misty and cloudy.

Sept. 28. Lat. 53° 40′ S.; long. 64° 28′ W. Barometer, 28.25; temperature of air, 44°; of water, 44°. Winds: N. W., S. W., and S. W. Strong breezes and passing squalls.

Sept. 29. Lat. 54° 08′ S.; long. 63° 42′ W. Temperature of air, 40°; of water, 42°. Barometer, 28.94. Winds: W. S. W., S. W., and S. W. Snow squalls and strong breezes; saw Staten Land.

Sept. 30. Lat. 54° 54′ S.; long. 63° 28′ W. Barometer, 29.25; temperature of air, 44°; of water, 42°. Winds: N., N. E., and N. E. Fair weather; saw Cape St. John.

Oct. 1. Lat. 56° 32′ S.; long. 66° 00′ W. Barometer, 28.65; temperature of air, 40°; of water, 41°. Winds: W. by S., W. S. W., and W. S. W. Squally.

Oct. 2. Lat. 56° 55′ S.; long. 65° 48′ W. Barometer, 28.85; temperature of air, 42°; of water, 39°. Winds: W. N. W., N. N. W., and N. N. W. Some rain; wind strong.

Oct. 3. Lat. 57° 13′ S.; long. 66° 37′ W. Barometer, 28.85; temperature of air, 41°; of water, 39°. Winds: N., N. N. W., and N. Squally; an occasional blue sky.

Oct. 4. Lat. 57° 22′ S.; long. 67° 31′ W. Barometer, 28.87; temperature of air, 44°; of water, 41°. Winds: N., E., and E. N. E. Cloudy and misty; light wind.

Oct. 5. Lat. 56° 57′ S.; long. 70° 30′ W. Barometer, 28.30; temperature of air, 46°; of water, 44°. Winds: N. E., N. E., and S. W. Snow squalls.

Oct. 6. Lat. 57° 05′ S.; long. 71° 13′ W. Barometer, 29.68; temperature of air, 40°; of water, 43°. Winds: W. N. W., N., and W. N. W. Strong winds, and snow squall.

Oct. 7. Lat. 57° 20′ S.; long. 73° 19′ W. Barometer, 28.80; temperature of air, 41°; of water, 40°. Winds: N. by W., N., and N. E. Moderate breezes and rain.

Oct. 8. Lat. 56° 52′ S.; long. 76° 50′ W. Barometer, 28.57; temperature of air, 44°; of water, 41°. Winds: N. W., S. W., and W. S. W. Cloudy, light winds.

Oct. 9. Lat. 56° 14′ S.; long. 79° 17′ W. Barometer, 29.27; temperature of air, 43°; of water, 42°. Winds: S. E., S. E., and S. S. E. Cloudy; fresh winds.

Oct. 10. Lat. 54° 29′ S.; long. 81° 49′ W. Barometer, 29.60; temperature of air, 40°; of water, 41°. Winds: S. W., S. W., and W. N. W. Cloudy and rainy; light winds.

Oct. 11. Lat. 52° 20′ S.; long. 82° 14′ W. Barometer, 29.60; temperature of air, 43°; of water, 42°. Winds: W., W. N. W., W. Cloudy; fresh winds with rain.

Oct. 12. Lat. 50° 21′ S.; long. 82° 25′ W. Barometer, 29.65; temperature of air, 43°; of water, 43°. Winds: W., W., W. by N. Some rain.

Ship Sea Witch (George W. Fraser), New York to San Francisco, twenty-one days from St. Roque.

Oct. 14, 1852. Lat. 51° 43′ S.; long. 64° 15′ W. Temperature of air, 50°; of water, 42°. Winds: N. N. E., N., N. W. First and second parts, fresh and foggy; third part, light airs.

Oct. 15. Lat. 52° 51′ S.; long. 63° 40′ W. Temperature of air, 48°; of water, 42°. Winds: S. W., S. E., E. S. E. First and second parts, fresh breezes; third part, moderate.

Oct. 16. Lat. 54° 15′ S.; long. 64° 46′ W. Barometer, 29.47; temperature of air, 48°; of water, 41°. Winds: S. E., calm, W. First part, moderate; second part, calm; third part, light breezes.

Oct. 17. Lat. 55° 33′ S.; long. 66° 40′ W. Barometer, 29.25; temperature of air, 46°; of water, 42°. Winds: W., calm, W. S. W. First and second parts, light breezes; third part, calm.

Oct. 18. Lat. 56° 30′ S.; long. 67° 16′ W. Barometer, 29.02; temperature of air, 46°; of water, 42°. Winds: W. S. W., W., W. N. W. First part, light airs; second part, fresh gales; third part, heavy gales.

Oct. 19. Lat. 56° 02′ S.; long. 67° 12′ W. Barometer, 28.70; temperature of air, 42°; of water, 42°. Winds: W. N. W., W. S. W., W. S. W. Hard gales; third part, moderate.

Oct. 20. Lat. 56° 30′ S.; long. 69° 8′ W. Barometer, 28.35; temperature of air, 44°; of water, 42°. Winds: W. N. W., N. N. W., W. N. W. Heavy gales.

Oct. 21. Lat. 56° 15′ S.; long. 70° 56′ W. Barometer, 28.3; temperature of air, 41°; of water, 40°. Winds: W. N. W., S., N. N. W. Hard gales, with squalls of rain, hail, and snow.

Oct. 22. Lat. 57° 12′ S.; long. 71° 44′ W. Barometer, 28.22; temperature of air, 39°; of water, 40°. Winds: W. N. W. throughout. Hard gales, with gales of hail and snow.

Oct. 23. Lat. 56° 23′ S.; long. 72° 18′ W. Barometer, 28.12; temperature of air, 38°; of water, 39°. Winds: W. S. W., W. S. W., calm. First and second parts, hard gales; third part, calm.

Oct. 24. Lat. 55° 22′ S.; long. 73° 25′ W. Barometer, 27.89; temperature of air, 40°; of water, 40°. Winds: W. S. W., W. S. W., calm and E. First part, fresh; second part, heavy gales; third part, calms and light airs.

Oct. 25. Lat. 54° 49′ S.; long. 77° 29′ W. Barometer, 27.97; temperature of air, 40°; of water, 42°. Winds: E., N. W., S. W. Hard gales and rain.

Oct. 26. Lat. 54° 18′ S.; long. 78° 47′ W. Barometer, 28.15; temperature of air, 44°; of water, 43°. Winds: S. W., N. N. W., N. W. Hard gales and cloudy.

Oct. 27. Lat. 52° 29′ S.; long. 79° 24′ W. Barometer, 28.50; temperature of air, 44°; of water, 44°. Winds: W., W. S. W., W. Fresh gales and squally.

Oct. 28. Lat. 51° 41′ S.; long. 80° 15′ W. Barometer, 28.43; temperature of air, 44°; of water, 43°. Winds: W. N. W., W. N. W., W. Fresh gales and squally.

Oct. 29. Lat. 49° 47′ S.; long. 79° 5′ W. Barometer, 29.10; temperature of air, 45°; of water, 44°. Winds: W. by N., W. by N., W. N. W. Fresh gales and squally weather.

Thomas W. Leach (Joseph Osgood), New York to San Francisco, seventy-five days out.

Nov. 1. Lat. 49° 32′ S.; long. 65° 27′ W. Current, N. 35° E., 1.1 knot per hour. Barometer, 29.74; temperature of air, 48°; of water, 44°. Winds: N., N. N. W., S. First and middle parts, fresh gales. Ends pleasant breeze.

Nov. 2. Lat. 50° 50′ S.; long. 65° 04′ W. Barometer, 29.86; temperature of air, 46°; of water, 43°. Winds: E., N. E., S. Light winds throughout.

Nov. 3. Lat. 51° 36′ S.; long. 64° 57′ W. Current, N. 31° E., 0.3 knot per hour. Barometer, 29.90; temperature of air, 50°; of water, 44°. Winds: S. S. W., calm, E. by S. Light airs and calms this day.

Nov. 4. Lat. 52° 55′ S.; long. 65° 13′ W. Current, S. 53° W. 0.6 knot per hour. Barometer, 29.79; temperature of air, 50°; of water, 47°. Winds: E. N. E., E. N. E., E. S. E. Light airs and pleasant throughout.

Nov. 5. Lat. 53° 34′ S.; long. 65° 58′ W. Current, N. 20° W., 0.8 knot per hour. Barometer, 29.35; temperature of air, 47°; of water, 46°. Winds: E., E., S. Light airs and pleasant throughout.

Nov. 6. Lat. 54° 15′ S.; long. 64° 35′ W. Current, N. 58° W., 30 miles. Barometer, 29.40; temperature of air, 52°; of water, 44°. Winds: S. E. by S., calm, N. W. First and middle parts, light airs and calm; latter, fine breeze. At 8 hours 30 min. A. M. saw Cape St. Vincent bearing south, distant 40 miles.

Nov. 7. Lat. 56° 16′ S.; long. 65° 55′ W. Current, S. 44° W., 27 miles. Barometer, 29.08; tem-

perature of air, 47°; of water, 44°. Winds: N. W., N. W., N. W. by N. Strong breezes. At 6 P. M. Cape St. John bore west. Land in sight in the morning.

Nov. 8. Lat. 56° 55′ S.; long. 65° 18′ W. Barometer, 29.20; temperature of air, 41°; of water, 43°. Winds: W. S. W. throughout. Hard gale, with rain, snow, and hail. An ugly sea.

Nov. 9. Lat. 57° 09′ S.; long. 67° 57′ W. Barometer, 28.90; temperature of air, 44°; of water, 43°. Winds: W. S. W., N. W., N. W. Commences moderating. Morning, light and baffling airs.

Nov. 10. Lat. 57° 23′ S. (D. R.); long. 67° 12′ W. (D. R.) Strong easterly current. Barometer, 28.50; temperature of air, 39°; of water, 41°. Winds: calm, W., N. N. W. At 6 P. M. looking bad to the westward. At 10 A. M. hard gales, with hail, rain, and snow. Ends hard gales.

Nov. 11. Lat. 57° 38′ S.; long. 66° 00′ W. Current, strong easterly. Barometer, 28.57; temperature of air, 42°; of water, 41°. Winds: S. W., S. W., W. S. W. Heavy gales. During the forenoon a snow storm.

Nov. 12. Lat. 58° 07′ S.; long. 65° 27′ W. Barometer, 28.80; temperature of air, 38°; of water, 40°. Winds: W. S. W., S. W., S. W. Hard gales and squally with hail and snow.

Nov. 13. Lat. 58° 30′ S.; long. 65° 05 W. Current, E. S. E., 27 miles. Barometer, 28.78; temperature of air, 37°; of water, 38°. Winds: S. W. by W., S. W., W. Commences fresh gales and squally; middle part, baffling airs with snow; latter part, light airs. Ends squally.

Nov. 14. Lat. 57° 55′ S.; long. 65° 44′ W. Current, E., 20 miles. Barometer, 29.03; temperature of air, 37°; of water, 38°. Winds: W., S. W., W. Strong breezes, with snow.

Nov. 15. Lat. 59° 01′ S.; long. 68° 36′ W. Current. E. by S., 20 miles. Barometer, 28.48; temperature of air, 40°; of water, 39°. Winds: W. N. W., N. W. by W., W. by S. Fresh gales, with frequent snow squalls.

Nov. 16. Lat. 58° 08′ S.; long. 69° 31′ W. Current, S. 43° E., 17 miles. Barometer, 29.04; temperature of air, 36°; of water, 40°. Winds: W. S. W., S. S. W., S. S. W. Commences squally; snow and hail; at 8 P. M. hard gales, which lasted all night. Ends moderating.

Nov. 17. Lat. 58° 00′ S.; long. 71° 30′ W. Current, E., 15 miles. Barometer, 28.64; temperature of air, 43°; of water, 40°. Winds: S. W., N. N. W., W. N. W. Commences light breezes; middle and latter parts, cloudy with rain.

Nov. 18. Lat. 57° 33′ S.; long. 71° 44′ W. Current, easterly. Barometer, 28.98; temperature of air, 40°; of water, 40°. Winds: W., W., S. W. At 4 P. M. wore ship to the west. Evening, hard squalls from west; bad sea; wind increased to a hard gale.

Nov. 19. Lat. 56° 48′ S.; long. 73° 00′ W. Barometer, 29.10; temperature of air, 40°; of water, 40°. Winds: S. W., baffling, N. Commences moderating; middle part, light breezes; morning fresh breeze and rainy.

Nov. 20. Lat. 55° 48′ S.; long. 77° 39′ W. Barometer, 29.06; temperature of air, 40°; of water, 40°. Winds: S. E., E., E. by N. Strong breezes and large sea.

Nov. 21. Lat. 54° 05′ S.; long. 81° 12′ W. Barometer, 29.12; temperature of air, 40°; of water, 40°. Winds: E. throughout. Strong breezes and cloudy.

Nov. 22. Lat. 51° 52′ S.; long. 84° 24′ W. Barometer, 29.38; temperature of air, 43°; of water, 41°. Winds: E.N.E., E.S.E., E.S.E. Fine breezes and cloudy.

Nov. 23. Lat. 50° 39′ S.; long. 85° 17′ W. Barometer, 29.78; temperature of air, 44°; of water, 41°. Winds: E.S.E., S.S.E., S.E. Light breezes and cloudy.

Nov. 24. Lat. 49° 41′ S.; long. 86° 05′ W. Barometer, 29.80; temperature of air, 44°; of water, 42°. Winds: W.N.W., E.N.E., E. Light airs and calm; cloudy weather.

John Wade (J. H. Little), fifty-two days out.

Nov. 4, 1852. Lat. 50° 00′ S.; long. 63° 58′ W. Barometer, 29.40; temperature of air, 45°; of water, 43. Winds: E., E. by S., E. Strong breezes and squalls, with constant rain.

Nov. 5. Lat. 50° 50′ S.; long. 66° 45′ W. Barometer, 29.30; temperature of air, 44°; of water, 43°. Winds: E.S.E., S., and S. by W. Light breezes and rainy; latter part, clear. A barque in company, sounded in 70 fathoms water.

Nov. 6. Lat. 51° 41′ S.; long. 66° 16′ W. Barometer, 29.50; temperature of air, 50°; of water, 54°. Winds: S.W., calm, and N. Light baffling winds and fine weather.

Nov. 7. Lat. 53° 35′ S.; long. 64° 36′ W. Barometer, 29.30; temperature of air, 52°; of water, 45°. Winds: N.E., N.E., N.N.E. Light breezes and cloudy. Saw many whales.

Nov. 8. Lat. 55° 34′ S.; long. 64° 36′ W. Current, E.N.E., 40 miles. Barometer, 29.10; temperature of air, 45°; of water, 44°. Winds: N., N.W., and W. Light baffling winds and squally, and calm. At 5 P.M. Staten Land bore south, distant 26 miles. At 8 A.M. Cape St. John, S. by E., distant 18 miles. A strong easterly current.

Nov. 9. Lat. 56° 26′ S.; long. 66° 58′ W. Current, E., 20 miles. Barometer, 28.80; temperature of air, 45°; of water, 43°. Winds: N.N.E., N., N.N.W. Light breezes and pleasant. Latter part, moderate breezes and perfectly clear. At 12 M. Cape Horn bore N. by W. ½ W., true, distant 30 miles. Barometer falling steadily.

Nov. 10. Lat. 57° 02′ S.; long. 67° 01′ W. Barometer, 28.60; temperature of air, 40°; of water, 42°. Winds: S.W., S.S.W., N.W. First part, light airs; middle and latter parts, heavy gales, with heavy squalls of wind and rain. At 12 M. close reefed the topsails. At 6 P.M. spoke the ship Golden City, who sailed four days previous. Cape Horn bore N.W., distant 18 miles. Passed another ship standing the same way with ourselves. Barometer falling very fast.

Nov. 11. Lat. 57° 50′ S.; long. 66° 00′ W. Barometer, 28.40; temperature of air, 38°; of water, 39°. Winds: S.S.W., S.W., S.W. Weather the same as yesterday.

Nov. 12. Lat. 58° 13′ S.; long. 65° 27′ W. Current, E., for two days, 60 miles. Barometer, 28.50; temperature of air, 37°; of water, 38°. Winds: S.W., S.W., and S.W. by S. Weather the same, with frequent snow squalls.

Nov. 13. Lat. 57° 39′ N.; long. 66° 27′ W. Current, east, 20 miles. Barometer, 28.60; temperature of air, 35°; water, 37°. Winds: S. W., S. S. W., and S. W. Heavy gales, and squalls of snow and sleet.

Nov. 14. Lat. 57° 27′ N.; long. 67° 47′ W. Current, E., 14 miles. Barometer, 28.80; temperature of air, 38°; water, 37°. Winds: S. S. W., S. W., and W. S. W. First and middle parts, fresh gales, with heavy squalls of wind and snow; a heavy head sea. Two barques in company.

Nov. 15. Lat. 28° 20′ S.; long. 69° 53′ W. Current, E. by N., 20 miles. Barometer, 28.50; temperature of air, 38°; of water, 37°. Winds: W. S. W., W. N. W., and W. Calms, and very heavy squalls of snow; double reefs; exchanged signals with the barque Isabelita Hyne.

Nov. 16. Lat. 57° 18′ N.; long. 71° 39′ W. Current, east, 10 miles. Barometer, 28.90; temperature of air, 39°; of water, 38°. Winds: S. S. W., S. S. W., S. W. First and middle parts, heavy gale; close reef topsails and courses; severe squalls of snow. Latter part, moderate.

Nov. 17. Lat. 57° 51′ S.; long. 73° 55′ W. Current, E. N. E., 20 miles. Barometer, 28.50; temperature of air, 40°; of water, 38°. Winds: N., W. by S., W. Moderate breezes, and showery; at 4 P.M. wore ship.

Nov. 18. Lat. 55° 51′ S.; long. 76° 05′ W. Barometer, 28.90; temperature of air, 40°; of water, 41°. Winds: W. S. W., S. W., W. S. W. Heavy squalls and heavy sea.

Nov. 19. Lat. 55° 02′ S.; long. 78° 12′ W. Current, E. N. E., 20 miles. Barometer, 28.60; temperature of air, 42°; of water, 41. Winds: W., N. W., and W. Moderate breezes and cloudy.

Nov. 20. Lat. 53° 50′ S.; long. 78° 41′ W. Current, E. N. E., 20 miles. Barometer, 29.00; temperature of air, 44°; of water, 43°. Winds: W. by N., W. by N., and W. S. W. Light baffling squalls and calms.

Nov. 21. Lat. 50° 48′ S.; long. 82° 00′ W. Barometer, 28.70; temperature of air, 45°; of water, 44°. Winds: W. S. W., E. N. E., E. N. E. Moderate; latter part, strong breezes and rain.

Nov. 22. Lat. 49° 24′ S.; long. 84° 01′ W. Current, east, 35 miles in two days. Barometer, 29.10; temperature of air, 46°; of water, 46°. Winds: E. S. E., E. S. E., and S. S. E. Light breezes and rainy; passed two vessels steering north.

Ship White Squall (B. Lockwood), New York to San Francisco, twenty-two days from Cape St. Roque.

Nov. 8, 1850. Lat. 51° 12′ S.; long. 64° 50′ W. Barometer, 29.70; temperature of air, 64°. Winds: N. W., and S. E. Moderate weather.

Nov. 9. Lat. 53° 38′ S.; long. 65° 15′ W. Barometer, 29.60; temperature of air, 65°. Winds: W. and S. Moderate winds.

Nov. 10. No observation. Barometer, 29.40; temperature of air, 50°. Wind: W. Gale at 12 hours 30 min.; made Cape St. John at 11 A. M.; passed the Straits of Le Maire.

Nov. 11. Lat. 56° 36′ S.; long. no observation. Barometer, 29.40; temperature of air, 35°. Wind: W. Close reefs; rain and hail squalls.

Nov. 12. Lat. 56° 13′ S.; long. 65° 58′ W. Barometer, 29.10; temperature of air, 35°. Wind: W. Snow and hail squalls.

Nov. 13. Lat. 56° 37′ S.; long. 66° 05′ W. Barometer, 29.10. Winds: W., W. by N., and W. by N. Strong snow and hail squalls.

Nov. 14. Lat. 57° 15′ S.; long. 65° 52′ W. Barometer, 28.75; temperature of air, 34°. Wind: W. N. W., strong; snow and hail squalls.

Nov. 15. Lat. 57° 50′ S.; long. 65° 59′ W. Barometer, 28.70; temperature of air, 33°. Wind: W. N. W., strong; snow and hail squalls.

Nov. 16. Lat. 57° 57′ S.; long. 65° 40′ W. Barometer, 29.00; temperature of air, 35°. Wind: W. N. W., strong; snow and hail squalls.

Nov. 17. Lat. 56° 56′ S.; long. 66° 43′ W. Barometer, 29.20; temperature of air, 34°. Wind: W. S. W., strong; hail and snow.

Nov. 18. Lat. 57° 16′ S.; long. 66° 28′ W. Barometer, 29.40; temperature of air, 33°. Wind: W., strong; hail and snow squalls.

Nov. 19. Lat. 57° 37′ S.; long. 66° 38′ W. Barometer, 29.00; temperature of air, 34°. Winds: W., W. N. W., and W. N. W., strong; snow and hail squalls.

Nov. 20. Lat. 65° 52′ S.; long. 57° 28′ W. Barometer, 29.00; temperature of air, 35°. Wind: W., strong; snow and hail squalls.

Nov. 21. Lat. 57° 07′ S.; long. 68° 10′ W. Barometer, 29.20; temperature of air, 32°. Winds: S. W., W. N. W., strong; saw Diego Ramirez.

Nov. 22. No observation. Barometer, 29.00; temperature of air, 35°. Winds: S. W., and W. N. W., strong breeze; snow and hail.

Nov. 23. Lat. 57° 49′ S.; long. 70° 20′ W. Barometer, 29.00; temperature of air, 28°. Wind: W. Close reefs; snow and hail.

Nov. 24. Lat. 59° 23′ S.; long. 74° 10′ W. Barometer, 29.20; temperature of air, 29°. Wind: W. N. W. Close reefs.

Nov. 25. No observation. Barometer, 29.00; temperature of air, 28°. Wind: W. Lying to; snow and hail squalls.

Nov. 26. Lat. 58° 42′ S.; long. 74° 27′ W. Barometer, 28.90; temperature of air, 30°. Wind: W. N. W. Lying to; snow and hail squalls.

Nov. 27. Lat. 57° 47′ S.; long. 74° 10′ W. Barometer, 28.20; temperature of air, 33. Winds: N. N. W. and W. S. W. Lying to, snow and hail.

Nov. 28. Lat. 55° 19′ S.; long. 73° 28′ W. Barometer, 29.20; temperature of air, 37°. Wind: W. S. W. Close reefs.

Nov. 29. Lat. 54° 51′ S.; long. 74° 25′ W. Barometer, 29.60; temperature of air, 45°. Wind: S. W. First part, close reefs; latter part, light airs and calm.

Nov. 30. Lat. 52° 29′ S.; long. 78° 28′ W. Barometer, 29.80. Wind: S. W. Fine weather; all studding sail.

Dec. 1. Lat. 50° 23′ S.; long. 80° 54′ W. Barometer, 30.25; temperature of air, 60°. Winds: S. W., S. W., and S. E. Fine weather.

Ship Senator (Roland F. Coffin), New York to San Francisco, 60 days out.

Nov. 12, 1853. Lat. 50° 04′ S.; long. 63° 00′ W. Barometer, 29.19; temperature of air, 52°; of water, 46°. Winds: W., calm, W. First part, good winds; at 1 P. M. until 4 A. M. calm; barometer fell to 29.32; went up in an hour, to 29.40, as the breeze freshened; after 4 A. M. it again fell; at 8 A. M. barometer, 29.30. I do not see that it is a guide to be depended on certainly; my experience this passage would show its fall to be followed by delightful weather. Ends light breeze from west.

Nov. 13. Lat. 52° 04′ S.; long. 63° 56′ W. Barometer, 29.04; temperature of air 48°; of water, 46°. Winds: W. by S., W. by S., S. W. by S. Fine weather; barometer still falling at 10 P. M. 28.97; we shall certainly have *some kind* of weather. Ends with fresh breezes; heavy dew for the last two nights.

Nov. 14. Lat. 52° 27′ S.; long. 65° 34′ W. Barometer, 29.45; temperature of air, 46°; of water, 46°. Winds: S. W. by S., calm, S. W. by S. First part, fresh; middle, calm; saw Aurora Australis; the quadrant from S. E. to S. W., to altitude of 30°; sky cloudless; heavy mass of clouds in S. E.; latter part, moderate breezes.

Nov. 15. No observation. Barometer, 28.80; temperature of air, 38°; of water, 40. Winds: W., W. N. W., N. W. to S. W. First part, fine weather; middle part, moderate gale. At 4 A. M. made Cape St. Diego, bearing S. per compass, distant 20 miles; intended to pass through the Straits of Le Maire, but wind headed me off. Kept away for Cape St. John; at meridian it bore E. S. E., distant 15 miles.

Nov. 16. Lat. 55° 20′ S.; long. 63° 00′ W. Barometer, 29.0; temperature of air, 40°; of water, 42°. Winds: calm, W., S. S. W. Begins calm; middle, fresh breezes; latter, a gale with snow and hail.

Nov. 17. Lat. 55° 30′ S.; long. 62° 30′ W. Barometer, 29.07; temperature of air, 40°; of water, 40°. Winds: S. W., calm, W. Begins hard gale; found we had been set to the eastward 1½ knot the last 24 hours; middle, calm; latter, light airs. We had a strong set to the N. E. this day.

Nov. 18. Lat. 56° 40′ S.; long. 63° 12′ W. Barometer, 28.88; temperature of air, 42°; of water, 42°. Winds; W., S. W., W. S. W. First and middle part, fine weather; latter, hard gale from W. S. W.

Nov. 19. No observation. Barometer, 29.15; temperature of air, 41°; of water, 42°. Winds: W. S. W., W. S. W., W. N. W. First, hard gale; middle and latter, moderate with snow.

Nov. 20. Lat. 57° 00′ S.; long. 66° 41′ W. Barometer, 29.29; temperature of air, 40°; of water, 44°. Winds: W. N. W., W. S. W., E. First and middle, fresh breezes; latter, moderate.

Nov. 21. Lat. 57° 00′ S.; long. 71° 40′ W. Barometer, 29.29; temperature of air, 38°; of water, 42°. Winds: E. N. E., E. N. E., S. E. First part, thick snow storm; middle, snow storm; latter part, heavy snow. Point Blancard just in sight astern.

Nov. 22. Lat. 56° 25′ S.; long. 74° 22′ W. Barometer, 29.28; temperature of air, 40°; of water, 42°. Winds: S.E., S.E., S. Fine weather and smooth sea.

Nov. 23. Lat. 54° 26′ S.; long. 76° 30′ W. Barometer, 29.70; temperature of air, 42°; of water, 44°. Winds: S.W., S.W., W.S.W. First part moderate, with squalls of snow and hail; middle and latter parts, moderate.

Nov. 24. Lat. 52° 07′ S.; long. 78° 36′ W. Barometer, 29.96; temperature of air, 48°; of water, 48°. Winds: W.S.W., S.W., S.W. Sky overcast; wind increasing; middle and latter parts, moderate.

Nov. 25. Lat. 50° 59′ S.; long. 80° 30′ W. Barometer, 30.07; temperature of air, 52°; of water, 48°. Winds: S.S.W., E.S.E., E.S.E. Light winds and pleasant.

Brig Tigris (O. Howe), Salem to San Francisco, from Cape St. Roque, thirty-two days.

Nov. 14, 1850. Lat. 50° 32′ S.; long. 61° 52′ W. Temperature of air, 57°; of water, 48°. Winds: W. by S., S.W., and W. by S. Strong gales, and cloudy.

Nov. 15. Lat. 51° 58′ S.; long. 64° 16′ W. Temperature of air, 51°; water, 48°. Winds: W., N.N.W., and W.N.W. Strong winds and large sea. Current, S. 51° E., 48 miles.

Nov. 16. Lat. 53° 35′ S.; long. 63° 50′ W. Temperature of air, 50°; of water, 48°. Winds: W.N.W., W. by N., W.N.W. First part, strong winds and clear; middle part, heavy gale. Current, E., 24 miles.

Nov. 17. Lat. 55° 12′ S.; long. 63° 41′ W. Temperature of air, 50°; of water, 48°. Winds: W.S.W., W.N.W., and variable. Fresh breezes and cloudy, squally weather; at 5 A.M. made Staten Land. Current, E., 24 miles.

Nov. 18. Lat. 56° 09′ S.; long. 65° 00′ W. Current, E., 20 miles. Temperature of air, 50°; of water, 47°. Winds: W., N.W., and W. Light breezes and cloudy; latter part, fresh breezes.

Nov. 19. Lat. 56° 41′ S.; long. 65° 57′ W. Temperature of air, 51°; of water, 47°. Winds: W., N.W., and W.N.W. Fresh gales and squally; at 9 A.M. wind hauled to N.W.

Nov. 20. Lat. 57° 00′ S.; long. 65° 48′ W. Temperature of air, 50°; of water, 47°. Winds: W. by S., W.N.W., and N.W. Heavy gales, with lightning.

Nov. 21. Lat. 56° 55′ S.; long. 65° 46′ W. Temperature of air, 48°; of water, 48°. Strong gales and squally, with rain; middle part, more moderate, and calm; latter part, gales and rain.

Nov. 22. Lat. 56° 26′ S.; long. 68° 00′ W. Current, E., 21 miles. Temperature of air, 51°; of water, 47°. Winds: N.W., W., and S.W. Strong gales and heavy sea.

Nov. 23. Lat. 57° 43′ S.; long. 69° 08′ W. Current, E., 24 miles. Winds: N.W., W., and S.W. Temperature of air, 51°; of water, 47°. Hard gales. Cape Horn bearing north, 25 miles. Chronometer is right.

Nov. 24. Lat. 57° 17′ S.; long. 71° 30′ W. Temperature of air, 45°; of water, 44°. Winds: W. by S., N.W., and N.W. Strong gales and cloudy, with rain.

Nov. 25. Lat. 57° 17′ S.; long. 72° 28′ W. Temperature of air, 44°; of water, 42°. Winds: W., W. N. W., and W. N. W. Hard gales and squally, with hail and snow.

Nov. 26. Lat. 59° 31′ S.; long. 74° 57′ W. Temperature of air, 45°; of water, 42°. Winds: W. N. W., N. W., and N. Heavy gales and squally, with hail and snow.

Nov. 27. Lat. 59° 10′ S.; long. 76° 24′ W. Temperature of air, 45°; of water, 43°. Winds: N. N. W., W. S. W., and S. W. Strong gales, and squalls with rain.

Nov. 28. Lat. 57° 50′ S.; long. 76° 30′ W. Current, E., 24 miles. Temperature of air, 45°; of water, 44°. Winds: W., S. W., and W. Strong galesand hard squalls, with snow and sleet.

Nov. 29. Lat. 56° 04′ S.; long. 78° 56′ W. Current, E., 26 miles. Temperature of air, 46°; of water, 44°. Winds: S. W. by S., S. S. W., and S. Fresh breezes, and squalls of snow and hail.

Nov. 30. Lat. 53° 46′ S.; long. 80° 41′ W. Current, E., 24 miles. Temperature of air, 49°; of water, 45°. Winds: S., S. S. W., and S. W. Fresh breezes from the S. W., and snow squalls.

Dec. 1. Lat. 52° 20′ S.; long. 81° 33′ W. Current, E., 24 miles. Temperature of air, 53°; of water, 47°. Winds: S. W., S., and S. by E. Light breezes and cloudy weather.

Dec. 2. Lat. 50° 05′ S.; long. 81° 40′ W. Temperature of air, 52°; of water, 48°. Winds: E. S. E., E., and E. by S. Moderate winds and cloudy weather.

Ship Revere (Charles W. Hamilton), Boston to California, sixty-two days out.

Nov. 16, 1852. Lat. 49° 24′ S.; long. 52° 41′ W. Barometer, 29.31; temperature of air, 40°. Winds: N. N. W., W. N. W., W. First part, moderate; middle and latter, squally, with gales of snow and hail.

Nov. 17. Lat. 50° 48′ S.; long. 52° 51′ W. Barometer, 29.36; temperature of air, 40°. Winds: W., W. S. W., W. by N.; squally, with gales of snow and hail.

Nov. 18. Lat. 51° 49′ S.; long. 55° 19′ W. Barometer, 29.26; temperature of air, 40°. Winds: W. by N., W. N. W., N. W.; baffling and squally weather.

Nov. 19. Lat. 53° 49′ S.; long. 56° 04′ W. Barometer, 30.1; temperature of air, 40°. Winds: N. W. by W., W., W.; changeable and squally, with heavy sea from S. S. W.

Nov. 20. Lat. 58° 40′ S.; long. 86° 13′ W. Barometer, 29.23; temperature of air, 48°. Winds: W., N. N. W., S. W. by S.; weather changeable; ends, light airs and rain.

Nov. 21. Lat. 55° 04′ S.; long. 60° 47′ W. Barometer, 29.28; temperature of air, 40.° Winds: S. W. by S., N. to N. W., N. W.; light breezes and light rain; middle, calm; latter, airs.

Nov. 22. Lat. 55° 46′ S.; long. 64° 32′ W. Barometer, 29.26; temperature of air, 40°. Winds: N. W., S. to S. S. E., S. S. E.; changeable and cloudy, with snow squalls, calms, and baffling airs.

Nov. 23. Lat. 56° 43′ S.; long. 66° 19′ W. Barometer, 29.28; temperature of air, 40°. Winds: S. S. E. to S. W., W., W. S. W.; changeable and baffling; made Staten Land, distant about 50 or 60 miles; had a current in our favor for last 48 hours.

Nov. 24. Lat. 57° 58′ S.; long. 66° 09′ W. Barometer, 29.30. Winds: W. S. W., S. W., S. S. W.; strong breezes and squally, rain, hail, and snow.

Nov. 25. No observation. Barometer, 30.12. Winds: S. S. W., S. S. W., S. W.; changeable weather; made the land off Cape Horn, bearing north.

Nov. 26. Lat. 56° 48′ S.; long. 67° 54′ W. Barometer, 30.12. Winds: W. S. W., S. W.; calm and baffling airs, light breezes and fine weather.

Nov. 27. Lat. 57° 42′ S.; long. 70° 24′ W. Barometer, 29.34. Winds: E., W. N. W., N. N. W. First part, light breezes and pleasant; middle, fresh; latter, moderate; cloudy and foggy weather.

Nov. 28. Lat. 28° 45′ S.; long. 73° 23′ W. Barometer, 29.21. Winds: W. N. W. throughout; fine breezes and squally.

Nov. 29. Lat. 59° 08′ S.; long. 74° 33′ W. Barometer, 29.19. Winds: W. N. W., W., W. S. W. to N. W.; baffling airs and squally, with snow, hail, and rain.

Nov. 30. Lat. 58° 56′ S.; long. 74° 37′ W. Barometer, 29.23. Winds: N. W. and calm, calm and S. S. W.; changeable airs and calms, and squally appearances.

Dec. 1. Lat. 56° 23′ S.; long. 76° 45′ W. Current, E. by N., 24 miles. Barometer, 29.35. Winds: baffling S. S. W., S. W. by W., W. S. W.; variable airs; squalls of snow, hail, and rain.

Dec. 2. Lat. 55° 11′ S.; long. 77° 48′ W. Current, S. by E., 16 miles. Barometer, 29.36. Winds: baffling W. S. W., S. S. W., S.; variable breezes and calm; latter, good breezes.

Dec. 3. Lat. 53° 04′ S.; long. 80° 06′ W. Barometer, 30. Winds: S. by W. to S. W., S. E. E. to N. E.; variable airs and cloudy.

Dec. 4. Lat. 50° 54′ S.; long. 83° 29′ W. Current, S. W. by S., 37 miles. Winds: N. E., S. E., S. W.; variable breezes, and cloudy, rainy weather.

Adelaide Metcalfe (George Scott).

Dec. 4, 1853. Lat. 45° 09′ S.; long. 53° 42′ W. Barometer, 29.55; temperature of air, 52°; of water, 49½°; water, at 10 feet 6 inches depth, 49½°. Winds: W. S. W., W. S. W., N. W. First and middle, moderate and clear; latter, light airs, calm and rainy. At 8 P. M. water 64° and at 9 A. M. as per log. I think it very singular, so great a change from cold to warm, and the reverse, when we have made so little distance. Saw one patch of kelp. The water has the appearance of being shoal, and has most of the time for several days. At 12 M. the barometer down to 29.44, and falling slowly; think it indicates northerly winds; no observations.

Dec. 5. Lat. 46° 01′ S.; long. 54° 02′ W. Current, E. N. E., ¾ knot per hour. Barometer, 29.49; temperature of air, 52°; of water, 51½°; water, at 10 feet 6 inches in depth, 51½°. Winds: N. N. W., S. E., N. E. First and last parts, cloudy at times, some rain; wind baffling, but averaging as per log; middle part, clear; barometer has varied several times, and the water from 2° to 3°; twice saw several patches of kelp; most of the time a bad sea from southward; ends clear, and very light airs from N. N. W. Think my D. R. was wrong yesterday.

Dec. 6. Lat. 47° 07′ S.; long. 55° 04′ W. Barometer, 29.66; temperature of air, 47°; of water, 47½°; water, at 10 feet 6 inches in depth, 47½°. Winds: W., W. S. W., N. N. W. All this day moderate and cloudy, with smooth sea; no observation; saw some sea-weed and kelp. First part, barometer stationary at 29.46; middle, rose as per log, and so remained until 11 A. M., then fell.

Dec. 7. Lat. 48° 32′ S.; long. 57° 44′ W. Barometer, 29.67; temperature of air, 45°; of water, 44°; water, at 10 feet 6 inches depth, 44°. Winds: N. N. W., W. N. W., S. Commences moderate; barometer falling; at 4 P. M. strong breeze; barometer, 29.45, and stationary; middle part, moderate; barometer stationary; at 4 A. M. tacked to the westward; latter, moderate; barometer rising fast; at noon, stood at 29.77; ends, fine clear weather, and bad sea from S. W.; saw much kelp and sea-weed at 6 P. M., and until 8 P. M. the water had the peculiar green appearance it usually has on soundings, so much so that it was noticed by every person on board.

Dec. 8. Lat. 49° 06′ S.; long. 59° 03′ W. Current, W. N. W., ½ knot per hour. Barometer, 29.87; temperature of air, 48°; of water, 46°; water, at 10 feet 6 inches depth, 46°. Winds: calm, W. N. W., W. All this day fine clear weather; middle part, barometer rising; at 4 A. M. stood at 29.92; at noon, 29.81, and falling slowly; saw kelp and sea-weed; latter part, water has the appearance of being very shoal.

Dec. 9. Lat. 50° 35′ S.; long. 61° 20′ W. Current, W. S. W., ¾ knot per hour. Barometer, 29.43; temperature of air, 48°; of water, 46½°; water, at 10 feet 6 inches in depth, 46½. Winds: N. W., N. W., W. S. W. First part, moderate; middle, strong breeze; latter part, light airs. First part, barometer falling, and so continues to do until midnight, when it stood at 29.43, and has so remained since; at 4 P. M. (the water still having the appearance of being very shoal) hove to, to get a cast of the lead, but did not get bottom with 60 fathoms; at 10 A. M. made the Jason Islands, bearing S. by E. by compass, distant 25 or 30 miles; saw much kelp and sea-weed and one right whale.

Dec. 10. Lat. 52° S.; long. 61° 55′ W. Barometer, 29.20; temperature of air, 47°; of water, 46°; water, at 10 feet 6 inches depth, 46°. Winds: W., N. W., W. S. W. First part, fine weather and moderate; barometer falling; middle, strong breeze; barometer at midnight, 29.20, and stationary; latter part, fresh gales; saw a great number of whales, and much kelp and sea-weed.

Dec. 11. Lat. 52° 12′ S.; long. 62° W. Current, N. N. E., ¾ knot per hour. Barometer, 29.38; temperature of air, 42°; of water, 46½°; water, at 10 feet 6 inches depth, 46°. Winds: W. S. W., calm, calm. First four hours, strong gales and very heavy sea. From 4 P. M. until 8 P. M. little more moderate; middle and latter parts, calm; and light baffling airs all round the compass. First part, barometer rose 18, and has remained stationary since; saw several whales, and much kelp and weed.

Dec. 12. Lat. 53° 40′ S.; long. 65° 17′ W. Barometer, 29.1; temperature of air, 44°; of water, 43½°; water, at 10 feet 6 inches depth, 43½°. Winds: calm, N. W., W. All this day clear weather; middle and latter, light winds; saw much weed and several whales; latter part, barometer falling.

Dec. 13. In Straits of Le Maire. Barometer, 28.85; temperature of air, 44°; of water, 44°; water, at 10 feet 6 inches depth, 44°. Winds: W., ——., N. W. First and last part, moderate breeze, clear and rainy alternately; middle part, calms, heavy squalls of two or three minutes' duration, and the wind all round

the compass. At 8 P. M. made Staten Land to the S. S. W.; at noon, Cape Good Success bore W. by S., distant 6 miles. Barometer falling steadily; saw several whales.

Dec. 14. No observation. Barometer, 28.73; temperature of air, 36½°; of water, 41°; water, at 10 feet 6 inches depth, 41°. Winds: N. W., W., S. W. First six hours, good breeze from N. W.; next ten hours, fresh gales, as per log, with occasional short spells of calms; at 4 A. M. commenced a heavy gale from S. W., attended with snow, rain, and hail, and bad sea; wore ship to the W. N. W.; barometer stationary, as per log.

Dec. 15. No observation. Barometer, 29.10; temperature of air, 37°; of water, 42°; water, at 10 feet 6 inches depth, 42°. Winds: S. W., S. S. W., south. First part, very heavy gales; barometer rising; middle part, tremendous gale; latter part, moderate; made sail and wore to the W. S. W.; at 10 A. M. made Staten Land to the N. N. W., distant 18 miles; barometer, rising. All through the day thick weather, snow, rain, and hail.

Dec. 16. No observation. Barometer, 29.25; temperature of air, 42°; of water, 44°; water, at 10 feet 6 inches depth, 44°. Winds: S., calm, N. N. E. First part, light winds and clear weather; middle, calm; latter, moderate breeze and thick rainy weather, with very heavy swell from the eastward. First part, barometer rising, and middle part up to 29.39; at 2 A. M. started down; at 9 A. M. as per log, and at noon 29.14, and still falling.

Dec. 17. No observation. Barometer, 29.03; temperature of air, 39½°; of water, 40½°; water, at 10 feet 6 inches depth, 40°. Winds: N. N. W., W., S. W.; first three hours rainy, and wind from N. N. E.; barometer falling from that time until 10 A. M.; wind veering nearly every hour from W. to S. by W., with strong breeze, light airs, and calms, and the weather looking most of the time very dirty, attended with drizzling rain, sleet, snow, and hail. At 10 A. M. wind jumped suddenly to S. S. E.; at midnight, barometer 29.91, and stationary at 9 A. M. as per log; and at noon 29.15, and rising fast.

Dec. 18. Lat. 56° 43′ S.; long. 66° 02′ W. Current, N. E., 62 miles in two days. Barometer, 29.5; temperature of air, 42°; of water, 42°; water, at 10 feet 6 inches depth, 41°. Winds: S. S. W., W. S. W., N. N. W.; first four hours strong squalls, with snow and rain; middle part, light and baffling, with very fine weather; latter part, strong breeze and cloudy. First part, barometer rising fast; at 10 A. M. near 29.67; latter part, falling.

Dec. 19. Lat. 57° 51′ S.; long. 67° 18′ W. Current, N. E. by E., 1 knot per hour. Barometer, 29.14; temperature of air, 42°; of water, 41°; water, at 10 feet 6 inches depth, 41°. Winds: N. W. by W., W., W. First and middle parts, strong gales, most of the time rain, hail, and snow; mercury fluctuating several times, but rising.

Dec. 20. Lat. 58° 01′ S.; long. 67° 10′ W. Current, N. E., ½ knot per hour. Barometer, 29.54; temperature of air, 39°; of water, 40½°; water, at 10 feet 6 inches depth, 40°. Winds: S. W. by W., S. S. W., S. W. First part, fresh gales and heavy squalls, with snow, rain, and hail; middle, heavy gales at 8 A. M.; latter part, very light all this day, mercury rising steadily.

Dec. 21. Lat. 58° 01′ S.; long. 66° 42′ W. Current, E. N. E., 1¼ knot per hour. Barometer, 29.5;

temperature of air, 41°; of water, 40½°; water, at 10 feet 6 inches depth, 40½°. Winds: W. by S., W. S. W., W.; all this day light airs and baffling, and fine weather, with heavy swell from westward; mercury very steady; at 10 A. M. light breeze from the eastward.

Dec. 22. No observation. Barometer, 29.41; temperature of air, 41°; of water, 42°; water, at 10 feet 6 inches depth, 42°. Winds: E. by N., E. by N., E. by S.; all this day moderate breezes and cloudy weather; mercury fell a little the first part.

Dec. 23. Lat. 56° 24′ S.; long. 75° 19′ W. Current, E. by S., ½ knot per hour. Barometer, 29.53; temperature of air, 40°; of water, 42½°; water, at 10 feet 6 inches depth, 42°. Winds: E. by S., E. by S., E. S. E.; all this day, moderate; last two hours clear, and mercury rising slowly; thus far, I think the barometer has been an infallible guide as to the weather.

Dec. 24. Lat. 54° 50′ S.; long. 78° 06′ W. Barometer, 29.65; temperature of air, 40°; of water, 44°; water, at 10 feet 6 inches depth, 44°. Winds: E., E. N. E., N. E.; all this day light breezes and cloudy. First part, mercury rising; middle part, 29.74; latter part, falling slowly, and wind hauling to the north.

Dec. 25. Lat. 53° 09′ S.; long. 79° 08′ W. Barometer, 29.47; temperature of air, 45°; of water, 45°; water, at 10 feet 6 inches depth, 45½°. Winds: N. N. E., N. N. E., calm, W. First twelve hours good breeze and rainy weather; next four hours calm; last part, light breeze and cloudy.

Dec. 26. Lat. 52° 19′ S.; long. 79° 04′ W. Barometer, 29.44; temperature of air, 46°; of water, 47½°; water, at 10 feet 6 inches depth, 47½°. Winds: N. W., W., W. First part, fresh gales; middle and latter parts, more moderate, but squally.

Dec. 27. No observation. Barometer, 29.7; temperature of air, 49°; of water, 48½°; water, at 10 feet 6 inches in depth, 48°. Winds: W., W. by S., W. N. W.; all this day strong breezes; middle and latter parts, rainy; mercury rising steadily. I intend to touch at Juan Fernandez.

Ship Flying Fish (Edward C. Nickels), New York to San Francisco, forty-eight days out.

Dec. 18, 1852. Lat. 48° 15′ S.; long. 63° 39′ W. Barometer, 29.78; temperature of air, 51°; of water, 50°. Winds: S. W., S. W., N. N. E. Wind, fresh; middle and latter, light.

Dec. 19. Lat. 51° 11′ S.; long. 64° 54′ W. Barometer, 29.90; temperature of air, 48°; of water, 46. Winds: N. N. E. to N. N. W., N. to N. W., S. W. Moderate and cloudy; latter, clear.

Dec. 20. Lat. 54° 56′ S.; long. 65° 07′ W. Barometer, 29.50; temperature of air, 47°; of water, 46°. Winds: S. W., S. S. W. to W., westerly. First part, clear and pleasant; latter, cloudy.

Dec. 21. Lat. 55° 16′ S.; long. ——. Temperature of air, 52°; of water, 45°. Winds: S., E., N. First part, light airs; passed through Straits of Le Maire; middle, nearly calm; latter part, fresh N. E. breezes, with fog; Staten Land bearing N. by W.; true distance, 28 miles.

Dec. 22. Lat. 56° 06′ S.; long. ——. Winds: N. W. to N. E., N. E., N, E. First part, light airs; middle and latter parts, passed Cape Horn, bearing N. ½ E., distant 7 miles; foggy.

Dec. 23. Lat. 55° 08′ S.; long. 74° 29′ W. Barometer, 29.30; temperature of air, 45°; of water,

43°. Winds: N. E. throughout. Fresh breezes, and foggy; St. Ildefonso Island bearing N. E. by N., 18 miles.

Dec. 24. Lat. 51° 55′ S.; long. 79° 35′ W. Temperature of air, 45°; of water, 45°. Winds: E., baffling, N. E. First part, fresh winds and thick weather; middle, light baffling breezes and showers; latter part, N. E. wind.

Dec. 25. Lat. 49° 15′ S.; long. 80° 08′ W. Barometer, 29.50; temperature of air, 48°; of water, 47°. Winds: N., W., W. Strong northwardly winds and rain; wind suddenly hauled to westward, with light rain.

Ship John Gilpin (Justus Doane), New York to San Francisco, forty-six days out.

Dec. 13. Lat. 48° 40′ S.; long. 60° 36′ W. Barometer, 29.32. Winds: W., W. by S., W. by S. Strong breezes, and squally.

Dec. 14. Lat. 51° 05′ S.; long. 63° 58′ W. Barometer, 29.10. Winds: W. by N., S. S. W., S. S. W. First and middle, moderate; latter, squalls and gales.

Dec. 15. Lat. 49° 50′ S.; long. 63° 02′ W. Barometer, 29.65. Winds: S. W., S. W., S. W. by S. Hard squalls and gales.

Dec. 16. Lat. 51° 07′ S.; long. 65° 12′ W. Barometer, 29.55. Winds: S. S. W., S. W., W. by S. Light baffling airs, and calm.

Dec. 17. Lat. 53° 56′ S.; long. 65° 10′ W. Barometer, 29.55. Winds: W. N. W., W. by N., S. S. W. First part, light breezes; middle and latter, gales.

Dec. 18. Lat. 55° 06′ S.; long. 64° 40′ W. Barometer, 29.80. Winds: S. W. by S., W. S. W., N. W. by W. First part, moderate; middle, light; latter, squalls, with rain.

Dec. 19. Lat. 56° 42′ S.; long. 66° 07′ W. Barometer, 29.45; temperature of air, 46°. Winds: N. W. by W., S. W. by W., N. W. by W. Moderate gales and puffy.

Dec. 20. Lat. 56° 20′ S.; long. 66° 32′ W. Barometer, 29.95; temperature of air, 42°. Winds: W. by N., W. by S., S. W. First and middle gales, with hail, rain, and snow; latter, light.

Dec. 21. Lat. 56° 45′ S.; long. 67° 20′ W. Barometer, 29.62; temperature of air, 43°. Winds: S. W., W. N. W., calm. First part, light; middle, light airs and calms; latter, calms and fog.

Dec. 22. Lat. 56° 20′ S.; long. 72° 10′ W. Barometer, 29.45; temperature of air, 46°. Winds: E. S. E., E. by N., E. by N. Light breezes and hazy.

Dec. 23. Lat. 55° 48′ S.; long. 79° 08′ W. Barometer, 29.70; temperature of air, 42°. Winds: E. by N., E. by N., E. Moderate breezes and hazy.

Dec. 24. Lat. 53° 48′ S.; long. 83° 24′ W. Barometer, 29.55; temperature of air, 46°. Winds: E., E. N. E., N. N. E. First, light breezes; latter, fresh breezes and rainy.

Dec. 25. Lat. 51° 41′ S.; long. 84° 07′ W. Barometer, 29.45; temperature of air, 48°. Winds: W. N. W., N., N. W. First part, light; middle part, moderate; latter part, strong breezes and rainy throughout.

Dec. 26. Lat. 48° 32′ S.; long. 83° 40′ W. Barometer, 29.92; temperature of air, 49°. Winds: W.N.W., W., W. Strong breezes, rainy and hazy throughout.

Ship Wild Pigeon (W. Putnam), New York to San Francisco, forty-two days out.

Dec. 9. Lat. 49° 32′ S.; long. 65° 13′ W. Barometer, 29.40; temperature of air, 48°; of water, 48°. Winds: W.N.W., W.N.W., W.S.W. Moderate and fair. At midnight, a blow.

Dec. 10. Lat. 52° 09′ S.; long. 65° 31′ W. Barometer, 29.35; temperature of air, 44°; of water, 46°. Winds: W.S.W., S.W., S.W. First, moderate; second, strong and squally; third, a gale from southwest.

Dec. 11. Lat. 58° 08′ S.; long. 65° 08′ W. Barometer, 29.45; temperature of air, 40°; of water, 45°. Winds: S.W. hauling to W., calm, calm. First part, blowing hard; second and third parts, calm.

Dec. 12. Straits of Le Maire. Barometer, 28.90; temperature of air, 45°; of water, 42°. Winds: W.S.W., N.W., calm. First, moderate and cloudy; second, same; latter, calm and cloudy.

Dec. 13. Lat. 56° 27′ S.; long. 65° 45′ W. Barometer, 28.60. Current, easterly, 24 miles. Temperature of air, 42°; of water, 41°. Winds: N., N.W., N.W. First, light winds. At 10 P.M. a white squall. Second and third parts, moderate.

Dec. 14. Lat. 56° 28′ S.; long. 66° 44′ W. Barometer, 28.40. Current, easterly, 1¼ mile. Temperature of air, 39°; of water, 41°. Winds: N.W. and variable, S.S.E., S.W. First, moderate; middle and latter, squalls. Gales, hail, rain, and snow.

Dec. 15. Lat. 56° 52′ S.; long. 66° 52′ W. Barometer, 28.80; current, easterly, 1 mile per hour; temperature of air, 38°; of water, 40°. Winds: S.W., S.S.W., S.E. First part, hard gale; second part, blowing in hard squalls; third part, moderate.

Dec. 16. Lat. 56° 59′ S.; long. 68° 13′ W. Barometer, 29.00; current, easterly, ¾ mile per hour; temperature of air, 42°; of water, 42°. Winds: calm, calm, N.W. First and second, parts, calm; latter, moderate.

Dec. 17. Lat. 56° 52′ S.; long. 70° 24′ W. Barometer, 28.75; current, easterly, 1 mile per hour. Winds: N.W. by W., S.W., S.S.W. First part, fresh breezes and rainy; second part, hard gale; third part, moderate.

Dec. 18. Lat. 56° 21′ S.; long. 72° 59′ W. Barometer, 29.15; current, easterly, 1 mile per hour. Winds: S.W., W., W.N.W. First part, light; second part, moderate; third part, gale.

Dec. 19. Lat. 59° 20′ S.; long. 73° 29′ W. Barometer, 29.10; current, easterly, 30 miles; temperature of air, 40°; of water, 42°. Winds: W. by S., W.S.W., W.N.W. First part, gale; second part, gale; third part, gale; rainy throughout.

Dec. 20. Lat. 56° 24′ S.; long. 73° 42′ W. Barometer, 29.15; temperature of air, 43°; of water, 42°. Winds: S.W., W.S.W., W. First part, gale and rainy; second part, moderate and rain; third part, moderate and fair.

Dec. 21. Lat. 56° 14′ S.; long. 75° 58′ W. Barometer, 29.40; temperature of air, 45°; of water,

44°. Winds: W. N. W., calm, N. E. First part, light breezes; second part, calm and rainy; third part, moderate and fair.

Dec. 22. Lat. 55° 14′ S.; long. 78° 43′ W. Barometer, 29.25; temperature of air, 47°; of water, 43°. Winds: N. by E., W. N. W., N. E. First and second parts, light breezes and rainy; third parts, moderate.

Dec. 23. Lat. 53° 07′ S.; long. 81° 35′ W. Strong easterly current. Barometer, 29.70; temperature of air, 46°; of water, 44°. Winds: E., S. E. by E., E. S. E.; moderate and rainy.

Dec. 24. Lat. 51° 35′ S.; long. 84° 50′ W. Current, easterly, 45 miles. Barometer, 29.40; temperature of air, 45°; of water, 44°. Winds: E. by S., N. E., N. W. First part, moderate; second part, baffling winds and rainy; third part, strong breezes.

Dec. 25. Lat. 49° 05′ S.; long. 84° 41′ W. Barometer, 29.40; temperature of air, 48°; of water, 46°. Winds: W., W. N. W., N. W.; moderate and rainy.

Ship John Jay (J. B. B. Engleman), New Bedford to San Francisco, seventy-six days out.

Dec. 12. Lat. 48° 56′ S.; long. 62° 53′ W. Barometer, 29.40; temperature of air, 48°; of water, 48°. Winds: W. by N., N. to N. E., W. N. W.; light and baffling.

Dec. 13. Lat. 51° 01′ S.; long. 65° 00′ W. Barometer, 29.10; temperature of air, 49°; of water, 46°. Winds: N. N. E., N., N.; moderate and pleasant.

Dec. 14. Lat. 52° 54′ S.; long. 64° 05′ W. Barometer, 29.24; temperature of air, 44°; of water, 44°. Winds: S. S. W., S. W., S. W. to W. N. W.; moderate and pleasant.

Dec. 15. Lat. 54° 07′ S.; long. 64° 24′ W. Barometer, 29.40; temperature of air, 50°; of water, 45°. Winds: W. S. W., calm, N. N. E.; light airs and middle calm.

Dec. 16. Lat. 55° 24′ S.; long. 64° 20′ W. Barometer, 29.20; temperature of air, 48°; of water, 44°. Winds: N. N. W., N. N. W., N. W.; light breezes and pleasant.

Dec. 17. Lat. 55° 41′ S.; long. 63° 30′ W. Barometer, 29.28; temperature of air, 47°; of water, 42°. Winds: S., calm, N. W. by W. to W. First and third parts, light; middle, calm.

Dec. 18. Lat. 56° 39′ S.; long. 65° 40′ W. Barometer, 28.65; temperature of air, 40°; of water, 39°. Winds: N. N. W., N. by W., N. W. by W. Strong breezes and rainy.

Dec. 19. Lat. 56° 37′ S.; long. 66° 00′ W. Barometer, 28.77; temperature of air, 41°; of water, 40°. Winds: N. N. W., W., W. Light breezes and rainy.

Dec. 20. Lat. 56° 23′ S.; long. 67° 29′ W. Barometer, 29.30; temperature of air, 41°; of water, 41°. Winds: W., N. E. to E. N. E., E. N. E. First part, light; second and third parts, brisk breezes.

Dec. 21. Lat. 57° 04′ S.; long. 72° 29′ W. Barometer, 29.23; temperature of air, 38°; of water, 41°. Winds: E. N. E., E. N. E., E. S. E. Fresh breezes and cloudy.

Dec. 22. Lat. 56° 03′ S.; long. 75° 40′ W. Barometer, 29.30; temperature of air, 40°; of water, 41°. Winds: S. S. E. to S. by W., S. to S. W., S. S. W. First and third parts, light; second, moderate.

Dec. 23. Lat. 55° 16′ S.; long. 76° 30′ W. Barometer, 29.30; temperature of air, 42°; of water, 42°. Winds: S. W., to S. S. W., S. W. Calm, light breezes; latter, calm.

Dec. 24. Lat. 54° 52′ S.; long. 77° 40′ W. Barometer, 29.40; temperature of air, 42°; of water, 44°. Winds: S., calm, calm. First part, light airs; second and third parts, calm.

Dec. 25. Lat. 54° 25′ S.; long. 79° 30′ W. Barometer, 29.00; temperature of air, 44°; of water, 44°. Winds: N. N. W., N. N. W., S. W. by W. Strong winds and squally.

Dec. 26. Lat. 52° 45′ S.; long. 79° 07′ W. Barometer, 29.00; temperature of air, 44°; of water, 44°. Winds: W. S. W., W. by S., W. by S. Strong breezes and rainy.

Dec. 27. Lat. 51° 10′ S.; long. 79° 15′ W. Barometer, 28.90; temperature of air, 46°; of water, 46°. Winds: S. S. W., S. W., N. N. W. Fresh gales and rainy.

Dec. 28. Lat. 49° 50′ S.; long. 78° 50′ W. Barometer, 29.20; temperature of air, 46°; of water, 46°. Winds: S. S. W., S. W., N. W. Fresh gales and rainy.

Dec. 29. Lat. 50° 56′ S.; long. 79° 31′ W. Barometer, 29.08; temperature of air, 46°; of water, 44°. Winds: N. W., N. W. by W., W. S. W. Strong gales and cloudy.

Dec. 30. Lat. 50° 35′ S.; long. 79° 26′ W. Barometer, 29.20; temperature of air, 42°; of water, 44°. Winds: W. S. W., S. W., S. S. W. Hard gales and cloudy weather.

Dec. 31. Lat. 48° 04′ S.; long. 80° 07′ W. Barometer, 29.40; temperature of air, 44°; of water, 46°. Winds: W. S. W., W. by S., W. First and second parts, strong gales; latter, moderate.

Ship Anstiss (Milton P. Hedge), Richmond to San Francisco, 25 days from Cape St. Roque.

Dec. 10, 1852. Lat. 50° 16′ S.; long. 62° 14′ W. Winds: W. S. W., W., and W. S. W. Heavy gales.

Dec. 11. Lat. 50° 44′ S.; long. 62° 22′ W. Winds: W. S. W., S. S. W., and S. W. Moderate gales.

Dec. 12. Lat. 51° 37′ S.; long. 63° 56′ W. Winds: W., N. W., and W. S. W. Fresh and squally.

Dec. 13. Lat. 53° 48′ S.; long. 64° 30′ W. Winds: W. S. W. and W. N. W. Fresh and squally.

Dec. 14. Lat. 54° 30′ S.; long. 63° 00′ W. Wind: baffling. Strong breezes and heavy gales.

Dec. 15. Lat. 54° 43′ S.; long. 62° 38′ W. Winds: S. E., S., and N. Light breezes and rain.

Dec. 16. Lat. 54° 58′ S.; long. 63° 08′ W. Baffling winds.

Dec. 17. Lat. 55° 57′ S.; long. 63° 19′ W. Winds: N., S. W., and W. S. W. Light winds and rain.

Dec. 18. Lat. 56° 42′ S.; long. 65° 18′ W. Winds: S. W. and N. W. Light winds and rain.

Dec. 19. Lat. 57° 44′ S.; long. 66° 28′ W. Winds: N. W., W., and W. Heavy gales.

Dec. 20. Lat. 57° 57′ S.; long. 66° 53′ W. Wind: W. Light breeze.

Dec. 21. Lat. 57° 57′ S.; long. 67° 06′ W. Winds: W., S. W., E. N. E. Light breezes.

Dec. 22. Lat. 57° 10′ S.; long. 71° 58′ W. Wind: E. by N. Strong breezes.

Dec. 23. Lat. 56° 09′ S.; long. 77° 20′ W. Winds: E. by N., E. S. E., E. S. E. Strong breeze.

Dec. 24. Lat. 55° 02′ S.; long. 80° 30′ W. Winds: E. S. E., E., N. N. E. Strong breeze.

Dec. 25. Lat. 54° 24′ S.; long. 82° 30′ W. Winds: N.N.E., W., and W.N.W. Heavy gales.

Dec. 26. Lat. 53° 00′ S.; long. 81° 00′ W. Winds; N. W., N. W., and W. Strong gales.

Dec. 27. Lat. 51° 05′ S.; long. 79° 38′ W. Winds: baffling. Strong winds and squally, with rain.

Dec. 28. Lat. 49° 24′ S.; long. 78° 34′ W. Winds: W.N.W. Strong breezes and squally, with rain.

I have given such copious extracts, with regard to the Cape Horn passage, because I wanted, by practical illustrations and example, to impress navigators with a correct estimate as to its difficulties.

And, still further to illustrate this route, the following table of Cape Horn crossings has been prepared. It shows the crossings according to the month; it shows the time from the parallel of St. Roque, to the parallel of 50° S. in the Atlantic; the longitude in which each vessel crossed the parallel of 50°, 53°, and 56° S., east of the Horn; then, as the course is west, it shows the parallels upon which the meridians of 67°, 71°, and 73° W., are crossed. Now the course is to the northward again, and the table then shows the meridians upon which the parallels of 55°, 53°, and 50° S., in the Pacific are crossed.

The last column shows the time from lat. 50° in the Atlantic, to the same parallel in the Pacific.

Cape Horn Crossings.

NAME OF SHIP.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN.			LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN.			LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN.			FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
		50° S.	53° S.	56° S.	67° W.	71° W.	75° W.	55° S.	53° S.	50° S.	
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
JANUARY.											
Danube	33	63°	64°	69°	56°	56°	57°	77°	80°	80°	23
Contest	23	61	64	67	56	59	57	78	80	81	12
Tingqua	26	64	66	64	57	57	56	80	80	80	14
Alboni	26	64	64	64	57	57	56	76	79	85	16
F. W. Brune	33	64	64	63	60	59	59	84	87	89	21
Cygnet	33	64	65	67	56	57	56	77	80	85	21
Gray Feather	25	61	64	63	57	57	56	76	77	79	19
Golden Gate	20	65	64	67	56	56	55	75	77	79	11
Telegraph	24	60	65	65	57	58	56	76	78	81	15
Trade Wind	22	65	65	67	57	58	59	75	82	81	12
Means	26.5	63.1	64.5	66.6	56.9	57.4	56.7	77.4	80	80.1	16.4
FEBRUARY.											
John Holland	31	65	66	63	58	59	57	76	80	79	26
Kentucky	33	61	65	71	56	56	56	77	78	82	25
Storm	23	57	61	67	57	58	58	77	78	79	12
A. F. Jenness	44	66	66	66	57	58	57	76	78	80	20
John Bertram	25	65	65	63	56	56	57	81	81	84	12
Flying Childers	26	65	65	65	58	58	58	79	80	81	12
Golden West	30	65	66	66	57	57	57	77	78	81	14
Bald Eagle	19	64	65	69	56	57	57	77	79	84	10
Phantom	23	65	66	64	57	58	59	80	79	84	15
Winged Racer	26	66	65	69	57	57	56	81	83	82	14
Anna Kimball	30	66	66	66	57	57	58	78	79	79	17
Means	28	64	65.1	66.3	57	57.4	57.3	78.1	79.4	81.3	16
MARCH.											
Aldebaran	28	66	65	66	56	59	57	77	80	84	28
Esther May	29	64	62	65	58	60	56	77	80	81	23
Lucknow	26	65	66	63	60	58	56	78	81	86	25
Masconoma	32	65	65	66	57	56	56	78			
Tornado	25	65	65	65	56	58	57	77	80	84	13
Eagle	24	64	65	66	57	58	58	78	83	86	13
Celestial	24	63	64	66	56	57	56	77	79	81	18
Amelia	26	63	64	63	59	57	55	78	79	80	26
Phantom	23	65	66	63	57	59	59	80	79	81	14
Stag Hound	22	65	64	65	57	57	55	73	78	78	12
Courser	26	65	65	66	56	57	57	77	78	79	12
Means	26	64.5	64.6	64.9	57.2	57.8	56.5	77.3	79.7	82	18.4

Cape Horn Crossings—Continued.

NAME OF SHIP.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN.			LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN.			LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN.			FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
		50° S.	53° S.	56° S.	67° W.	71° W.	75° W.	55° S.	53° S.	50° S.	
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
APRIL.											
Simoom	29	65°	65°	68°	56°	56°	56°	76°	79°	85°	14
Sea Serpent	21	65	66	66	56	57	57	77	79	81	18
Stag Hound	30	65	64	78	55	55	56	79	80	78	12
Golden Racer	21	55	57	64	57	57	55	75	82	86	19
Paragon	36	62	63	67	56	56	57	81	82	79	16
David Baxter	33	61	63	63	57	57	57	80	80	80	12
Herculean	39	65	64	78							15
Sword Fish	19	57	60	64	58	58	58	83	86	87	17
Astrea	38	57	57	59	57	57	57	81	82	83	21
Gov. Morton	30	62	63	67	56	56	55	79	81	84	11
Burlington	39	62	65	63	57	58	58	80	80	80	15
Francisco	35	63	65	65	56	56	57	77	80	82	28
Means	30.8	61.6	62.6	66.8	56.4	56.6	56.6	78.9	81	82.3	16.5
MAY.											
Surprise	24	63	64	66	58	58	59	79	79	84	22
Competitor	24	64	64	67	56	57	56	79	80	78	15
Empress of the Sea	27	65	65	65	56	57	57	80	80	85	13
Houqua*	31	64	63	65	57	58	58	81	82	83	29
Parthian	25	63	64	67	56	58	58	79	80	81	13
Climax	23	61	65	67	56	56	56	76	78	79	12
Sirocco	34	64	66	67	56	57	58	79	82	80	20
Archer	33	64	64	66	57	57	56	82	84	84	23
Robt. Harding*	33	66	65	65	57	58	55	75	78	78	26
Seaman's Bride	26	64	63	66	57	58	56	81	81	81	15
Lantao	27	67	67	71	56	56	57	79	79	80	11
Hampton	37	65	65	66	57	58	56	78	79	80	21
Hugh Birckhead	34	64	65	67	56	58	58	77	78	79	23
Rosario	28	64	64	65	57	58	56	81	81	81	19
Roscoe	29	65	65	65	57	59	58	81	81	82	22
Means	28.5	64	64.7	66.5	56.5	57.5	57	79.3	80	81	17.6
JUNE.											
Staffordshire	25	62	66	66	56	56	53	73	77	79	14
White Squall	24	64	63	65	57	56	56	76	79	78	11
L. P. Foster*	43	67	67	70	56	56	58	83	83	85	20
Finland	41	64	63	64	57	57	56	81	87	90	14
Golden Era	29	65	65	65	59	59	56	78	79	80	28
North America	20	54	58	61	57	58	54	75	78	80	23
Cohota	27	64	64	63	58	58	56	78	81	84	18
Flying Cloud	27	67	65	66	56	55	54	73	76	78	09
John Land	26	64	63	65	57	58	57	80	80	85	15
Uncle Toby	32	65	65	65	58	58	57	78	80	86	13
Hornet	25	63	65	64	58	59	58	79	79	79	14
Means	27.1	63.2	63.7	64.4	57.3	57.4	55.7	77.1	79.6	81.9	15.9

* Not included in the means.

Cape Horn Crossings—Continued.

NAME OF SHIP.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN.			LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN.			LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN.			FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
		50° S.	53° S.	56° S.	67° W.	71° W.	75° W.	55° S.	53° S.	50° S.	
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
JULY.											
N. B. Palmer . . .	22	56°	55°	67°	57°	58°	56°	77°	78°	78°	19
Southerner . . .	25	64	63	64	56	57	58	83	81	79	26
A. Buckram . . .	37	66	66	68	56	57	56	76	77	80	14
Senator	19	64	65	65	57	57	56	77	80	81	18
Queen of the East .	30	63	63	61	56	56	55	77	78	79	23
White Squall . . .	22	64	64	65	56	58	58	78	79	80	18
Ellen Noyes . . .	28	55	56	64	58	58	57	77	78	79	21
Flying Cloud . . .	23	66	65	68	56	56	55	73	78	80	7
Rome	33	55	55	61	57	56	55	76	79	80	24
Victory	26	57	55	66	57	57	56	76	80	84	17
Means . . .	26.5	61	60.7	64.9	56.6	57	56.2	77	78.8	80	18.7
AUGUST.											
E. Mallory	35	63	65	67	57	57	56	78	79	88	13
Pelican State . . .	31	65	66	64	57	57	56	76	82	83	20
White Swallow . .	30	64	63	63	57	58	57	76	76	79	17
Corinne	38	64	65	63	59	60	59	81	84	85	21
Wild Ranger . . .	27	62	63	64	57	57	55	76	77	80	17
Mermaid	31	65	65	65	57	57	57	78	79	80	13
Samoset	29	62	64	64	57	57	57	78	80	83	12
Fenelon	40	63	67	65	56	57	55	75	76	81	18
Union	28	64	65	63	57	58	58	78	81	84	13
Carioca	31	65	64	64	56	58	56	77	81	84	11
Means . . .	32	63.7	64.7	64.2	56.3	57.6	56.6	78.3	79.5	81.9	15.5
SEPTEMBER.											
Albany	32	63		66	56	56	55	75	77	79	16
Z. D.	37	67	67		57	56	57	71	80	81	18
Sarah Snow . . .	38	65	65	65	57	59	60	79	81	82	17
Carrington . . .	28	65	65	66	57	58	56	82	83	83	21
Defiance	32	65	67	70		56	56	85	84	83	22
Eagle	23	51	54	59	57	59	61	83	84	85	18
Queen of Clippers .	26	65	65	65	56	56	55	76	80	82	12
John Bertram . .	25	65	66	67	57	56	57	79	85	86	14
Sovereign of the Sea	19	64	66	67	56	56	56	78	78	79	9
Jamestown . . .	21	64	65	66	56	57	57	79	82	83	17
Means . . .	28.1	64	65	66	56	57	57	79	81	82	16.3

Cape Horn Crossings—Continued.

NAME OF SHIP.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN.			LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN.			LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN.			FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
		50° S.	53° S.	56° S.	67° W.	71° W.	75° W.	55° S.	53° S.	50° S.	
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
OCTOBER.											
Seaman	20	65°	65°	69°	55°	57°	58°	77°	76°	77°	24
Louis Philippe	30	63	64	65	56	56	58	76	78	80	22
Sea Witch	20	64	64	67	56	56	55	77	79	80	14
Typhoon	21	64	65	66	56	57	56	76	79	77	10
Raven	18	64	66	69	56	56	56	76	82	80	19
Schooner Clifton	49	64	64	66	57	57	57	81	82	82	16
S. D. Horton	27	66	66	66	57	59	57	80	76	80	33
Matilda	41	65	64	67	56	58	58	76	78	79	32
Samuel Russell	26	64	65	68	56	57	57	78	78	79	15
Winged Arrow	21	67	67	67	56	57	58	84	83	83	20
Means	27.3	65	65	67	56	57	57	78	79	80	20.5
NOVEMBER.											
Thomas W. Sears	28	65	66	65	59	58	56	77	81	85	21
Monsoon	21	63	67	67	56	58	59	78	78	80	17
John Wade	20	64	64	67	56	57	56	76	78	82	17
Senator	20	63	65	63	57	57	56	76	78	81	24
Revere	24	53	56	66	57	57	59	78	80	83	17
Tigris	30	62	64	65	56	58	59	79	81	82	18
Fanchon	31	64	65	64	57	56	55	75	77	79	22
White Squall	28	65	65	66	57	58	54	73	78	81	23
Comet	20	65	65	66	56	58	56	76	81	84	12
Delegate	26	65	66	69		57	57	78	79	81	22
Means	24.8	63	65	66	57	57	57	76	79	82	19.3
DECEMBER.											
Westward Ho	21	63	66	64	57	56	55	73	80	82	13
Anstiss	24	62	64	64	58	57	56	80	81	79	18
Flying Fish	24	64	65	66	55	56	55	74	76	79	7
John Gilpin	19	64	65	66	57	56	57	79	83	84	11
Wild Pigeon	23	65	65	66	56	56	56	79	82	85	16
John Jay	30	65	64	64	56	57	56	76	79	79	19
J. E. Donnell	34	61	63	65	56	56	55	77	78	79	13
George Raynes	26	64	64	65	56	56	55	75	78	80	11
Tigris	30	62	64	65	56	58	59	78	80	82	18
Seaman	23	62	65	66	57	57	54	75	75	78	12
Adelaide	29	61	64	66	58	58	56	78	79	79	19
Means	25.8	63	64.5	65.4	56.6	56.6	55.9	76.7	79.2	80.5	14.3

There are some ships whose passages, to latitude 50° in the Atlantic, are too long to be taken into the average. They make such bad time as to constitute an exception from the generality. Such is the A. F. Jenness, with her 44 days in February. She, it will be recollected, is among the September (p. 538) crossings to St. Roque. Her time then, from the United States to the line, was 77 days; and in the count was rejected from the means.

From the parallel of Cape St. Roque to the parallel of 50° south, at the usual crossing-place for the Cape Horn trader, is about 2,900 miles; not quite the distance from New York to Liverpool.

Now the thing in this table, best calculated first to arrest the attention of the navigator, is perhaps the length of the time between these parallels.

From the average crossing of 50° in the Atlantic to the average crossing of the same parallel in the Pacific, after having doubled the cape, is nearly half the length of the distance from the St. Roque parallel to the Atlantic crossing of 50° south; and the time occupied around the cape is nearly in the same ratio.

The average distance, made good against the current around Cape Horn, is 84 miles a day. The average distance from the parallel of St. Roque to that of 50°, through a mild climate, and with no such opposing current, is 105 miles the day. And the average distance made good by the "liners," from Liverpool to New York, is 95 miles a day.

These Cape Horn crossings are derived from the mean of 125 passages taken at random. They therefore, it is supposed, give us a fair average. So it appears that the passage from England to New York, under canvas, in the winter time, is nearly as difficult as the passage around the Horn.

It is, however, useless to go into a discussion of this table of crossings here. Every navigator can do that for himself. It is only necessary to call his attention to the very tedious time which navigators have from the parallel of St. Roque to that of 50° S., how nearly all vessels pursue the same route, and how those vessels that go east of the Falklands, though they reach 50° sooner, lose all they gain in getting west after clearing those islands.

Take as an instance the four which did this in July. The average time to 50° south in the Atlantic is 27, and thence around the Horn 20 days. The average of the six inside ones for that month is 26 and 17 days, or a gain of 4 days by passing inside of the Falkland Islands.

This table also shows the best months for doubling the Horn. They are our winter and summer excepting July. October appears to be the most unpropitious month for the passage.

These tables afford the navigator, who is running for a quick passage, fresh points of departure in the middle of the ocean. Here he can compare rates with those who have preceded him at the same season of the year, and see how much he has to gain to come up with the foremost among them, or how much he has to spare, and still hold his own with the best of them.

THE BAROMETER OFF CAPE HORN.

In 1831, I doubled Cape Horn in the U. S. ship Falmouth. I was master of the ship, and it did not escape my attention that there were certain anomalies of the barometer in those regions. I found the barometric pressure off and about Cape Horn not only much less than it is at the sea-level generally, but I observed that certain fluctuations of the barometric column "off the Horn" did not, as in other parts of the sea, always indicate changes in the weather.

I communicated a paper upon this subject to the *American Journal of Arts and Sciences*,* which was published in that journal in 1834, and from which the following extract is taken:—

"The barometer has not been found to be of much practical utility off Cape Horn; how useful soever it may be in middle latitudes, by indicating the approach of hurricanes, it is no index to the wind in the high latitudes to the south of Cape Horn. He who, in the Chinese seas, is warned by the barometer of the approaching typhoon, and can foretell the coming of a gale by the height of the mercury in it, finds that off Cape Horn the same indications are frequently followed by moderate breezes, and even by calms. Here, the mercury, below the mean height of lower latitudes, becomes very unsteady, falling and rising several inches in a few hours. During the strength of a gale, sometimes it is observed to rise; at other times, it falls, or remains in *statu quo*. Its mean height, south of the latitude of Cape Horn, is 29.03 in.

"As the Pacific coast of Terra del Fuego and Patagonia is approached with the wind from the westward, the mercury in the barometer ascends. When the wind is strong, it rises above thirty inches, and close under the land, with fresh westerly gales, it frequently stands above 30.50 in.

"From lat. 45°, embracing a region towards the south of twelve or thirteen degrees in breadth, the most prevalent winds are from the westward. Vessels entering this region from the south have a rise in the barometer, when the wind is on the land. The rise is generally observed to commence about the latitude of the cape, continuing to increase as the land is neared; and, when the winds are fresh, a greater accumulation of atmosphere is shown by a higher range of the mercury.

"The result of my own barometrical observations, compared with others to which I have had access, shows that within this region the barometer stands higher when the winds are from the westward, than it does, *cæteris paribus*, between the same parallels in the Atlantic. The difference is nearly as 29 to 30, and increases as the land is approached. This accumulation of atmosphere is caused from the obstruction which the mountains of Patagonia, and the highlands of Terra del Fuego afford to the winds in their passage across the continent towards the Atlantic."†

My opportunities for investigating this subject in 1831, 1832, were not as great as they now are. I determined, therefore, to review the question of mean height, as well as to re-examine the opinions of navigators concerning the barometric indications as to the weather off the cape. I thereupon requested

* Vol. XXVI. p. 54.

† On the Navigation of Cape Horn, by M. F. Maury, P. Mid. U. S. Navy, Vol. XXVI. Am. Journ. Sciences.

Mr. O. C. Badger, P. M. U. S. Navy, to extract, from the first Cape Horn abstracts that he should take up, the opinions therein expressed with regard to the barometer. In a little while he brought me in a number, among which but three, viz. Capt. Hull, of the Charles Mallory, Capt. Littlefield, of the Alboni, and Capt. Scott, of the Adelaide Metcalf, spoke in favor of it. Capt. Hull says: "My barometer tells the weather here to a charm." Capt. Littlefield says: "Never, in one instance, has my barometer deceived me;" and Capt. Scott remarks: "Thus far, I think, the barometer has been an infallible guide as to the weather."

I have also, since, received the following log of the ship *Queen of Clippers* (John Zerega), New York to San Francisco.

"Sept. 2. Lat. 56° 08′ S.; long. 65° 27′ W. Barometer at noon, 28.70; temperature of air, 36°; of water, 40°. Winds: first part, W. N. W.; middle part, S. S. W.; latter part, W. by S. Commences light winds and beautiful weather; at 2 P. M. heavy tide rips, nearly turn the ship round with the wheel hard up. At 9 P. M. light wind from S. W., wore ship. At 10 P. M. calm, squall gathering from S. S. W.; in royals, and clewed up everything except topsails and foresail; but before we got through, it struck us, and I was glad that I was so well prepared for it. It blew very hard for three hours; close reefed fore and mizzen topsails, and double reefed main topsail and mainsail. Latter part, heavy gales and hail; ship under the same sail. We seem to be pursued by contrary winds. (I see, in your book of *Directions*, that some of the captains state that they do not consider the barometer as a guide in high southern latitudes; but I differ from them, although I may not have had as much experience as some of them, having been 13 years at sea, of which time I have been captain six years.) I think, if the glass falls three or four-tenths in a few hours, it is almost positive that it will be succeeded by a gale or very heavy gust, which will last several hours, although the simple fact that the barometer falls does not, as a natural consequence, predict wind; it only shows that there is a commotion in the atmosphere in your vicinity, which may be succeeded by wind or rain, but I think more likely by the former. If you would be so kind as to write me, on my next voyage, a particular track which I should follow, you would oblige me very much; also the mistake which I made on this voyage, and, if you please, I should like to hear your opinions concerning the barometer."

All the other opinions are adverse; I quote a few of them:—

"The barometer remains low all the time; it appears to be of no use here."—*D. C. Landis, ship F. W. Brune.*

"Barometer useless."—*W. L. Phinney, ship Kentucky.*

"The mercury here appears to be very lively—will rise and fall from 30.10 to 29.16 rapidly; but it is to be observed that this variation is not attended with the same degree of increase and decrease of wind that we experience elsewhere. Consider the barometer here of very little use."—*T. Dahlgren, barque Byron.*

"Barometer, rising; but find it no guide whatever."—*S. M. Hudgins, barque Hugh Birckhead.*

"Barometer, unsteady; squalls the same, without any apparent effect on the barometer. I do not trust to it."—*Charles A. Ranlett, ship Surprise.*

"The mercury fell this day 1.42 in., and no wind to speak of."—*W. E. Putnam, ship Empress of the Sea.*

"I watch the barometer closely; but do not think it is to be depended on here as in the North Atlantic Ocean."—*Samuel Harding, ship Robert Harding.*

"My barometer has been almost useless since I was in the latitude of the Rio de la Plata. The heaviest gales I had, it ranged from 29.15 to 29.40, and it has been as low as 28.35 with a whole sail breeze. It has, however, invariably fallen for a northerly wind, and risen for a southerly one. It has ranged during the last six weeks from 28.35 to 30."—*Oliver H. Saunders, ship B. Howard.*

"I have never known the barometer to range so low, and know not what to make of it."—*B. Buxton, ship Union.*

"A most extraordinary fluctuation in the barometer, from 30.3 in. to 29.3 in., the weather and appearance giving no indication of storm or rain."—*Robert McCerran, ship Defiance.*

"The barometer continues to fall, although the wind is southwest. I have always seen it rise with the wind from that quarter."—*W. B. Daniels, ship Seaman.*

"The barometer ranges the highest with the wind W. S. W., and lowest from the northward. It either accompanied or followed the change, never preceded it."—*John Gillan, barque Delegate.*

"I do not see that it (the barometer) is a guide to be depended upon. Certainly, my experience, this passage, would show its fall followed by delightful weather."—*R. F. Coffin, ship Senator.*

These opinions fully sustain the opinion which my own observations and experience induced me to express twenty years ago.

The anomalies, however, of a mean low pressure were well deserving of a close investigation. I therefore requested Mr. A. A. Semmes, Passed Midshipman of U. S. Navy, to arrange from the log-books of the office, the following tables to show the average height of the barometer off Cape Horn, and in the trade-wind region north and south, both in the Atlantic and Pacific Oceans.

With regard to these tables, I should remark that the barometer has been entered in the tables without any correction whatever; and that the barometer to which the tables refer, is the common mercurial marine barometer.

Though this instrument, as at present used and constructed for the sea, abounds with sources of error, there is but one of the errors arising from the many sources, for which the correction may be applied, and that is for temperature.

Every navigator knows that mercury is one of the most expansible of metals, and that a column of this fluid, for instance, that is exactly thirty inches long at the temperature of 80° will not be exactly thirty inches long at any other temperature, say that of zero. Its absolute weight will be just as much at the one

temperature as at the other; and, therefore, the atmospheric pressure remaining the same, it is easily understood how the height of the barometer will change with every change of temperature.

Inasmuch, therefore, as the temperature of the trade-winds is higher than the temperature of the gales off Cape Horn, the barometer in the *open air* ought to show a greater apparent pressure in the former than in the latter region. This difference would amount, on the average, only to the expansion of the mercurial column due the change of temperature. This difference of column would probably not amount to as much as 0.2 inch (two-tenths of an inch), if the Cape Horn barometer were kept in the open air; but generally it is not so kept. It probably does not amount, in reality, to more than 0.05 inch, if so much; for the usual place for the barometer is the captain's cabin, and there the temperature to which it is subjected is probably not more than a few degrees at most below that of the trade-winds. The stove in the cabin, the heat of the crew below, all tend to lessen, in the cabin, the difference of temperature between winter and summer.

Nevertheless, if navigators would always require a thermometer to be attached to the barometer (or would not purchase a barometer without an attached thermometer), and would note it also whenever the barometer is recorded, the correction for temperature, be it much or little, might be applied. This correction cannot be applied here, because navigators are not in the habit of observing the attached thermometer.

Now, here is a most important and interesting physical phenomenon, which cannot be properly or thoroughly investigated for the want of a marine barometer capable of giving correct absolute determinations. Nay, we are embarrassed and crippled in the investigation for the want of the readings of the attached thermometer. If we had these, we could show, from the observations we have, very nearly the exact difference between the mean height of the barometer in the trade-winds and off Cape Horn.

I mention this to illustrate the importance of a nicer and more accurate system of observations, as recommended by the Brussels Conference.

Let us return to the tables.

Now, as the barometers in these tables, which show the pressure in the trade-winds, are the identical barometers which show the pressure off Cape Horn also—they require no correction, save that of temperature, to show the difference between the absolute barometric pressure in the trade-winds, and off Cape Horn. If the barometer have an error of 0.2 in., or one of any other value too much or too little in the trade-winds, it carries precisely the same error off Cape Horn. These tables, therefore, though they do not show truly, because of the undetected errors of the common marine barometer, the real pressure of the atmosphere, either in the trade-winds or off Cape Horn, yet they do show correctly, or very nearly so, the *difference* of pressure in those regions.

The difference is truly remarkable, and is well worthy of farther investigation.

Barometric Anomalies off Cape Horn and in the Trade-Winds.

NAME OF SHIP.	N. E. TRADES.						CAPE HORN.			S. E. TRADES.					
	ATLANTIC.			PACIFIC.						ATLANTIC.			PACIFIC.		
	Month. *	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days
JANUARY.															
Emily Miner	I–II.	30.07	5	VII.	29.95	5	IV.	†*a* 29.20	4	II.	29.83	5	VI.	30.02	5
Amelia	I–II.	29.80	4	V.	29.72	4	III.	29.36	5	II.	29.86	4	IV.	29.72	4
Rattler	I.	29.65	5	IV–V.	29.94	4	III.	28.80	5	II.	29.84	4	IV.	29.88	6
Tornado	I.	29.95	5	V.	29.92	4	III.	28.87	4	II.	29.86	4	IV.	29.85	4
John Stuart	I.	29.91	4	V.	30.05	5	II.	29.65	5	I.	29.84	4	IV.	29.88	4
Celestial	I.	29.66	4	V.	29.81	4	III.	29.00	4	II.	29.65	4	V.	29.80	4
Phantom	I.	29.95	4	V.	29.92	5	II–III.	29.56	5	II.	29.90	5	V.	29.80	4
Aldebaran	I.	30.13	5	V.	30.26	5	III.	29.89	6	II.	30.00	5	IV.	30.10	4
Lucknow	I.	30.00	4	V.	29.94	5	III.	29.21	3	II.	29.87	5	V.	29.90	4
Astrea	I.	29.68	5	VI.	29.80	5	IV.	28.97	4	II.	29.52	5	V.	29.64	5
Huricane	I.	30.04	4	III.	29.99	5	II.	29.29	4	I.	30.02	4	III.	30.04	5
			49			51			49			49			49
Means		29.90			29.94			29.26			29.84			29.93	
FEBRUARY.															
Burlington	II.	30.02	4	VI.	30.16	6	IV.	29.10	4	II.	30.00	6	V.	30.02	5
Francisco	II.	30.00	4	VII.	30.30	4	IV.	‡*a* 30.00	5	II.	29.97	4	V.	30.10	3
Kate Hayes	II.	30.04	4	VI.	30.05	4	IV.	‡*b* 28.88	5	III.	30.05	4	V.	30.16	6
Susquehanna	II.	30.16	5	V.	30.00	5	III.	29.26	4	II.	30.06	5	IV.	30.06	5
Stag Hound	II.	30.15	4	V.	29.92	5	III.	29.07	4	II.	29.92	4	IV.	30.10	5
Tagus	II–III.	30.02	5	VII.	30.32	5	IV.	‡*c* 29.82	4	III.	30.13	5	VI.	30.34	5
Helen McGaw	II.	30.28	4	VII.	30.04	4	V.	29.04	4	III.	30.12	4	VI.	30.15	4
Delia Maria	II.	30.02	5	VI.	30.20	5	IV.	29.50	4	III.	30.07	5	V.	30.17	4
Venice	II.	30.08	5	VII.	30.00	5	V.	‡*d* 28.68	5	III.	29.98	4	VI–VII.	29.99	4
Diadem	II.	29.82	5	VI.	30.06	5	III.	‡*e* 28.66	5	II.	29.80	5	V.	29.95	5
A. Chiseborough	II.	29.78	5	V.	29.76	5	III.	28.92	4	II.	29.82	4	IV.	29.77	5
Simoom	II.	29.68	5	V.	29.74	4	IV.	28.56	4	II.	29.50	5	IV.	29.79	4
Star of the Union	II.	29.85	4	V.	29.98	5	IV.	29.08	4	III.	29.84	4	IV–V.	29.88	4
Golden Rover	II.	30.10	5	V.	30.05	4	IV.	29.19	4	III.	30.17	4	V.	30.10	4
			64			66			60			63			63
Means		30.00			30.04			29.13			29.96			30.04	
MARCH.															
Flying Eagle	III.	30.10	4	VII.	29.90	5	V.	§*a* 29.47	6	IV.	30.00	4	VII.	30.05	6
Ariana	III.	29.92	5	VII.	29.97	5	V.	29.30	6	III.	29.82	5	VI.	29.94	5
Surprise	III.	29.93	4	VI.	30.09	4	V.	28.73	4	IV.	29.88	4	VI.	29.89	4
Swordfish	III.	29.72	4	V.	29.83	4	IV.	28.46	4	III.	29.73	4	V.	29.61	5
Houqua	III.	30.09	5	VII.	30.00	4	IV.	29.74	4	III.	29.96	4	VI.	30.01	5
Gov. Morton	III.	29.59	4	V.	29.70	4	IV.	29.22	4	IV.	29.56	4	V.	29.72	5
Sirocco	III.	30.20	4	VI.	30.12	5	IV.	29.60	4	III.	30.17	4	V.	30.37	4
Sarah Boyd	III.	30.16	5	VIII.	30.12	5	V.	§*b* 28.73	5	IV.	30.00	5	VIII.	29.95	4
Sherwood	III.	30.06	5	VII.	30.00	4	V.	29.16	5	IV.	29.99	5	VI.	30.00	4
Tornado	III.	29.95	4	VI.	29.83	5	IV.	28.42	4	III.	29.78	4	VI.	29.85	5
Francis	III.	30.00	4	IX.	29.70	4	V.	29.06	4	III.	30.00	4	VIII.	29.70	5
Wallace	III.	30.00	5	VI.	29.95	4	IV–V.	§*c* 29.05	4	IV.	30.20	3	V.	30.16	5
Chenango	III.	30.00	5	VII.	29.95	6	V.	29.42	5	IV.	29.92	5	VI.	30.07	4
Stephen Larman	III.	29.99	4	VII.	30.09	5	V.	29.74	5	IV.	29.91	5	VI.	30.05	5
Rose Standish	III.	29.90	4	VII.	30.00	6	V.	§*d* 29.02	5	IV.	29.90	4	VI.	30.00	6
Louisa Bliss	III.	29.85	5	VIII.	29.85	4	V.	29.56	5	III.	29.78	6	VI.	29.86	6
Stag Hound	III.	30.00	6	VI.	30.22	5	V.	29.32	4	IV.	30.02	4	V.	30.00	6
Sea Serpent	III.	29.95	4	VI.	29.99	4	V.	29.07	4	IV.	29.82	4	VI.	30.00	4
			81			83			82			78			88
Means		29.97			29.96			29.18			29.91			29.96	

* January being I., December XII. See p. 88.

† *a.* S. W. gales.

‡ Gales for the most part. *a.* W. to S. S. W. *b.* N. to S. round by W. *c.* S. to W. *d.* W. N. W. to S. W. by S. *e.* W. to W. S. W.

§ Gales for the most part. *a.* N. W. to S. W. gales. *b.* N. N. W. to S. W. *c.* W. S. W. to S. W. *d.* S. S. E. to W. S. W.

Barometric Anomalies off Cape Horn and in the Trade-Winds—Continued.

NAME OF SHIP.	N. E. TRADES.						CAPE HORN.			S. E. TRADES.					
	ATLANTIC.			PACIFIC.						ATLANTIC.			PACIFIC.		
	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days
APRIL.															
Thomas B. Wales	IV.	30.12	6	VII.	30.06	4	V.	29.81	5	IV.	30.05	6	VI.	30.06	5
Queen of the East	IV.	29.95	4	VIII.	29.42	5	VI–VII.	28.90	5	V.	29.68	4	VII.	29.82	5
" "	IV.	29.92	5	VIII.	29.42	5	VI.	29.40	4	V.	29.68	5	VII.	29.82	5
Harriet Hoxie	IV.	29.87	4	VII.	30.74	4	V.	29.18	4	IV.	29.72	4	VII.	29.75	3
White Squall	IV.	30.41	4	VII.	30.02	4	VI.	29.58	4	V.	30.52	5	VI.	30.12	4
Horsburgh	IV.	30.19	4	VII.	30.04	5	V.	29.46	4	IV.	30.01	5	VI.	30.09	4
Raduga	IV.	29.92	4	VIII.	30.10	5	VI.	30.04	6	V.	29.92	5	VII.	30.00	5
Lion	IV.	29.81	5	XII.	29.98	5	II.	29.05	4	III.	29.89	4	I.	29.96	5
R. C. Winthrop	IV.	30.10	4	VII.	30.08	5	VI.	29.22	5	V.	30.38	5	VII.	30.08	5
Competitor	IV.	29.83	4	VII.	30.00	6	V.	29.43	3	IV.	29.92	5	VI.	30.00	4
Empress of the Seas	IV.	29.90	4	VI.	30.10	5	V.	29.50	4	IV.	29.89	5	VI.	29.96	5
Parthian	IV.	29.64	5	VII.	29.82	5	V.	29.05	4	IV.	29.65	4	VI.	30.10	6
Means		29.98	53		29.93	58		29.35	52		29.94	57		29.98	56
MAY.															
Fenelon	V.	29.90	5	XI.	30.02	4	VIII.	29.60	4	VI.	29.92	5	X.	30.37	4
N. B. Palmer	V.	30.02	5	VIII.	30.16	6	VII.	28.84	5	VI.	29.88	6	VII.	30.15	4
Staffordshire	V.	29.86	6	VIII.	29.96	5	VII.	*a 28.82	4	VI.	29.95	4	VI.	30.10	4
Tartar	V.	29.84	4	VIII.	29.90	5	VI.	29.08	5	V.	29.84	4	VII.	29.89	7
Means		29.90	20		30.01	20		29.08	18		29.90	19		30.13	19
JUNE.															
Witch of the Wave	VI.	30.16	4	VIII.	30.10	3	VII.	29.55	4	VI.	30.00	4	VIII.	30.00	5
Carioca	VI.	30.01	5	IX.	29.85	4	VIII.	28.98	4	VI.	29.96	4	VIII.	29.65	5
F. Copeland & Co.	VI.	30.30	5	IX.	30.17	4	VIII.	29.50	5	VI.	30.25	4	IX.	30.14	5
Union	VI.	30.20	4	IX.	29.87	5	VIII.	†a 28.50	4	VI.	29.73	4	VIII.	29.95	4
Messenger	VI.	30.00	4	IX.	29.96	5	VII.	29.28	4	VI.	30.02	5	VIII.	30.03	5
Samoset	VI.	30.42	4	IX.	30.10	4	VIII.	29.70	4	VII.	30.24	5	IX.	30.26	5
Means		30.18	26		30.01	25		29.25	25		30.03	26		30.00	29
JULY.															
Defiance	VII.	29.82	5	XI.	30.05	4	IX.	29.06	4	VIII.	30.00	4	X.	29.88	6
Matilda	VII.	30.51	4	XII.	30.47	6	X.	‡a 29.82	9	VIII.	30.52	5	XI.	30.50	6
Raduga	VII.	29.58	5	XII.	29.80	5	X.	‡b 29.38	4	VIII.	29.58	5	X.	30.00	4
Means		29.97	14		30.11	15		29.42	17		30.03	14		29.96	16
AUGUST.															
Raven	VIII.	29.80	4	XI.	29.90	5	IX.	29.60	4	IX.	29.95	4	X.	30.06	5
Fancy	VIII-IX.	30.00	4	II.	30.20	5	XI.	§a 28.72	5	IX.	30.00	5	I.	30.10	5
Wessacumcon	VIII.	30.05	5	I.	29.93	5	X.	28.78	6	IX.	30.07	5	I.	30.03	5
Means		29.95	13		30.01	15		29.06	15		30.01	14		30.06	15

* Gales for the most part. *a.* S. to W.

† Gales for the most part. *a.* N. W. to W. S. W.

‡ Gales for the most part. *a.* W. N. W. to W. S. W. *b.* S. W. to W.

§ Gales for the most part. *a.* S. S. W. to N. W. round by W.

Barometric Anomalies off Cape Horn and in the Trade-Winds—Continued.

NAME OF SHIP.	N. E. TRADES.						CAPE HORN.			S. E. TRADES.					
	ATLANTIC.			PACIFIC.						ATLANTIC.			PACIFIC.		
	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days
SEPTEMBER.															
Delegate	IX.	30.07	3	I.	30.02	5	XI.	*a 29.11	5	X.	30.08	5	I.	30.02	6
Chas. Mallory	IX.	29.80	3	XII.	29.88	4	XI.	28.73	4	X.	29.87	4	XII.	29.97	4
Malay	IX.	30.14	4	XII.	30.19	6	XI.	29.05	4	X.	30.16	4	XII.	30.17	4
Robt. Pulsford	IX.	29.91	4	I.	29.90	3	XI.	28.87	5	X.	29.90	5	XII.	30.00	5
U. S. S. Vandalia	IX.	30.12	4	III.	29.98	5	XII.	29.27	4	X.	30.08	4	II.	29.89	4
Means		30.01	18		29.99	23		29.01	22		30.02	22		30.01	23
OCTOBER.															
Comet	X.	29.99	3	II.	29.96	4	XI.	29.45	5	XI.	29.90	3	I.	29.90	4
Golden City	X.	29.78	3	XII.	29.67	5	XI.	†b 28.53	4	X.	29.70	6	XII.	29.81	4
Wild Pigeon	X.	30.17	4	I.	30.30	5	XII.	†a 29.05	4	IX.	30.17	4	I.	30.25	6
Ambassador	X.	29.88	4	I.	30.00	5	XII.	29.17	5	X.	29.91	5	I.	29.95	4
Acasta	X.	30.00	5	III.	30.00	5	I.	29.03	6	XI.	30.00	4	III.	30.00	4
Comet	X.	30.17	4	I.	30.16	5	XI.	29.34	4	X.	30.05	5	XII.	30.07	5
Genesee	X.	30.03	3	III.	30.25	5	I.	29.75	4	XI.	29.96	4	II.	30.23	5
Tornado	X.	29.77	3	VIII.	29.81	4	IX.	29.49	4	X.	29.77	4	VIII.	29.86	4
Senator Borland	X.	29.97	5	I.	29.95	4	XI.	29.40	4	X.	29.95	4	XII.	30.20	4
Realm	X.	29.76	4	II.	29.65	5	XII.	29.33	4	XI.	29.65	4	I.	29.85	4
Means		29.95	38		29.97	47		29.25	44		29.91	43		30.01	44
NOVEMBER.															
Flying-Fish	XI.	29.99	5	I.	29.80	4	XII.	29.52	4	XI.	30.00	3	I.	30.12	4
Wild Pigeon	XI.	30.15	5	I.	30.02	4	XII.	‡a 28.71	5	XI.	30.00	5	I.	30.21	5
Trade-Wind	XI.	29.93	4	II.	30.01	6	I.	29.35	4	XII.	29.88	4	II.	29.95	4
Hazard	XI.	29.89	4	II.	29.90	3	I.	29.39	5	XII.	29.90	4	II.	29.90	5
Newton	XI.	29.87	4	III.	29.91	5	I.	29.43	5	XII.	29.93	5	II.	29.95	5
Flying Dutchman	XI.	30.00	5	I.	29.93	5	XII.	29.07	5	XI.	30.01	5	I.	29.99	3
R. C. Winthrop	XI.	29.65	4	III.	29.54	4	I.	29.35	5	XII.	29.63	5	II.	29.53	4
Swordfish	XI.	29.80	4	I.	29.96	5	XII.	28.95	4	XII.	29.75	4	I.	30.09	4
Imaum	XI.	30.04	5	III.	30.07	4	I.	‡b 29.08	5	XI.	29.96	5	II.	30.00	5
Means		29.92	40		29.91	40		29.10	42		29.90	40		29.97	39
DECEMBER.															
Europe	XII.	29.96	9	III–IV.	29.93	19	II.	28.92	14	XII–I.	29.87	6	III.	29.85	11
George Brown	XII.	29.93	4	III.	29.80	5	II.	29.34	5	XII.	29.80	4	III.	29.83	5
Lucia Field	XII.	29.74	5	III.	29.71	5	I.	29.43	5	XII.	29.74	5	III.	29.75	5
Southerner	XII.	29.88	4	IV.	29.84	5	II.	§a 29.32	4	I.	29.95	5	III.	29.93	6
Uriel	XII.	29.84	5	IV.	29.70	6	II.	§d 29.10	5	XII.	29.84	5	III.	29.80	9
Elsinore	XII.	30.28	4	V.	30.30	5	III.	29.42	4	I.	30.05	4	IV.	30.21	4
Tingqua	XII.	29.97	2	II.	30.00	4	I.	29.24	5	XII.	29.92	4	II.	29.95	4
Gray Feather	XII.	29.89	5	II.	29.98	5	I.	29.27	4	XII.	29.91	4	II.	29.90	4
Golden Gate	XII.	30.12	5	III.	30.00	5	I.	29.38	5	XII.	30.00	5	II.	30.06	5
Telegraph	XII.	29.85	4	II.	29.98	5	I.	§e 28.96	5	XII.	29.95	5	II.	30.83	5
Seaman	XII.	30.12	6	II.	30.17	5	I.	§b 29.57	4	XII.	30.09	5	II.	30.25	5
Surprise	XII.	29.94	4	III.	30.06	5	I–II.	§c 29.55	4	I.	29.95	5	II.	29.96	5
Means		29.96	57		29.96	74		29.29	64		29.91	57		30.02	68
Mean of all		29.97			29.99			29.20			29.95			30.01	
Whole No. of days			473			517			490			482			509

* Gales for the most part. *a.* W. N. W. to W. S. W. † Gales for the most part. *a.* W. to S. W. *b.* S. W.

‡ Gales for the most part. *a.* N. to S. S. W. round by W. *b.* W. N. W. to W. S. W.

§ Gales for the most part. *a.* W. to W. S. W. *b.* W. by S. to W. by N. *c.* S. W. to S. *d.* W. to S. W. *e.* S. W. to W. N. W.

Mean Monthly Height of the Barometer—

MONTH.	IN N. E. TRADES OF THE				OFF CAPE HORN.		IN S. E. TRADES OF THE			
	ATLANTIC.		PACIFIC.				ATLANTIC.		PACIFIC.	
	Bar.	Days of observation.	Bar.	Days of observation.	Bar.	Days of observation.	Bar.	Days of observation.	Bar.	Days of observation.
January . . .	29.90	49	30.00	50	29.34	64	29.96	22	30.04	55
February . . .	30.00	64	29.98	42	29.24	43	29.88	74	30.03	60
March	29.97	81	29.95	53	29.17	53	29.97	65	29.90	45
April	29.98	53	29.85	34	29.17	66	29.91	76	29.93	49
May	29.90	20	29.93	73	29.24	91	30.00	28	29.97	69
June	30.18	26	30.05	57	29.37	29	29.96	36	30.03	98
July	29.97	14	30.07	91	29.12	17	30.24	5	29.94	40
August	29.95	13	29.84	47	29.26	21	30.03	14	29.88	32
September . . .	30.01	18	29.94	26	29.38	12	30.01	14	30.20	10
October	29.95	38			29.33	19	29.95	46	30.08	19
November . . .	29.92	40	29.99	13	29.02	40	29.99	37	30.50	6
December . . .	29.96	57	30.00	31	29.13	35	29.88	65	30.04	26
Means . .	29.97	473	29.96	517	29.23	490	29.98	482	30.05	509

One of the aims kept constantly in view during the preparation of these tables, was to follow the same ship with its barometer through the trade-winds of the Atlantic, around Cape Horn, and thence through the trade-winds of the Pacific, so that the barometric differences off Cape Horn might be true.

If, therefore, the vessel passed through the N. E. trades of the Atlantic in January, for instance, it would be some months after before she would arrive with the same barometer in the N. E. trade-wind region of the Pacific. Hence, the barometers are arranged by the months, in their order only, for the N. E. trades of the Atlantic. The months for the other regions are denoted by Roman numerals—XII. for December; I. for January; and so on in order of the months.

The low state of the barometer in the trade-winds of the Atlantic, and especially in the N. E. trade-winds, will not escape attention. The S. E. trade-winds of the Pacific give the highest barometer.

In the Atlantic, both systems of trade-winds, but the northern the most, are interfered with by the continent of Africa with its heated plains. These plains turn those winds back from their regular course, and therefore tend to lessen the pressure.

I know not how better to illustrate this than by referring to a canal which has a gentle current, and the water of which we will liken to the flow of the trade-winds.

Now, suppose that, up-stream from the observer, some agent, a pump, for example, be set to work upon the canal, and that it be pumping up vast quantities of water from the canal, as those heated plains of Africa pump up volumes of air from the trade-winds—for that those plains do cause vast columns of atmosphere to ascend there is no doubt, which ascending columns are, to a great extent, drawn from the trade-wind region—what would be the effect? The level of the water in the canal would be changed; *its* barometric pressure would be diminished as it commenced to flow back, very much in the same way that the barometric pressure of the trade-winds is diminished when they are turned back, and become monsoons.

The same sort of agent from the plains of Texas, New Mexico, &c., is at work upon the N. E. trade-winds of the Pacific, producing there the monsoons of Central America.

Now there is no heated plain in the rear of the S. E. trades of the western Pacific, no *vis a tergo* there which is capable of converting those winds into a monsoon, or of changing their direction. Hence the normal barometrical *status* there—its excess in comparison with that of other trade-winds.

We may explain this in another way; but it amounts to the same thing whether we say the effect is produced in the manner just explained, or whether we say it is produced by the greater amount of atmospherical rarefaction caused by the great extent of heating surface on the land in the northern hemisphere, in comparison with that in the southern.

But the Cape Horn anomaly—the difference of nearly an inch (0.8 inch), in the mean height of the barometer off Cape Horn and in the trade-winds—how is that to be accounted for?

The chapter on the "Barometric Anomalies of the Andes," p. 240, fifth edition of this work, treats of the converse of this anomaly, but alludes to the probability of an average low barometer on the western side of those mountains.

After much reflection, no new and complete explanation of this phenomenon suggests itself. The explanation which was proposed by me in Silliman's *Journal*, 1834, seems, after a most careful review, to be the most plausible of any that I am prepared to suggest.

From about 45° S. to the parallel of Cape Horn, lies the belt in which the westerly winds of the southern hemisphere prevail with such trade-wind like regularity.

The Southern Andes stretch themselves perpendicularly across this belt. They obstruct these winds and cause a piling up of the atmosphere, not unlike the piling up of the water which is produced by a sunken rock in a strong tide way.

I take Pot Rock, in Hurlgate, as an illustration, and because most American navigators will recollect it. Pot Rock was some feet below the surface, 8 or 10, yet such was the effect produced by it, in arresting the waters which the powerful tides caused to sweep over it, that there was always to be seen when the tide was at its strength, an elevation or piling up of the water above—up stream from—the rock. It was a sort of recast or mould of the rock in the water.

The greatest elevation in the water was not immediately over the rock, but it was a little up stream, *i. e.* to windward of it. Nor was the greatest depression in the water immediately over the rock; it was a little down stream, that is, to leeward of it.

There was also another depression not so great as this, it is true, but still it was a depression; it was above, or up stream from, the piling up.

Similar elevations and depressions, but on a scale much more grand, do I suppose the Andes to create in the air, by reason of the obstructions afforded by these mountains to the great atmospherical currents.

In considering the courses which combine to make this low barometric pressure off Cape Horn, the effect, however small, which is due increase of attraction on one hand, and a diminution of superincumbent atmosphere on the other, should not be forgotten.

Owing to the figure of the earth, the flattening in at the poles, the navigator, with his barometer, is several miles nearer to the centre of attraction when he is off Cape Horn, than he is, when at the equator. Being nearer to the centre, the force of attraction is greater; and if it were possible to weigh the mercury in the tube of his barometer at the two places, he would find that 290 ounces, for instance, at the equator, would weigh 291 at Cape Horn; in other words, that his mercury is heavier off Cape Horn than at the equator; here, then, is one of the causes, though it be a slight one, which may assist in keeping the barometer down, off Cape Horn.

Another one arises from the decrease in the volume of superincumbent atmosphere, on account of those agents which make the earth flat at the poles.

Suppose, for instance, that we were removed from the earth, and that, instead of seeing its shape, according to the outlines which the land and water present, we could see its shape with its aerial covering on; we should find that the difference between the equatorial and polar diameters of this covering would be greater than the difference between the equatorial and polar diameters of the earth, as measured from the sea level.

But these two causes—increase of attraction and oblateness, do not appear practically to affect, by any considerable quantity, the mean height of the barometer in corresponding latitudes north; for instance, at St. Petersburg, in latitude 59° 56′ N., the mean height of the barometer, reduced to the temperature of 62°, is 29.97.

Upon a review of the whole subject, therefore, and without going into the question as to the precise effects due temperature, and the figure of the earth, we are still left to infer that the barometric anomalies about Cape Horn are owing, to a considerable extent, at least, to the effect of local agencies and causes.

I hope navigators will not let this subject rest; that they will continue to direct their attention to it, and to let me have the benefit of farther and careful observations touching the indications of the barometer off Cape Horn. That they may the better be able to do this, they should bear in mind that the barometric pressure off Cape Horn at 29, is the barometric pressure elsewhere, of 30; and that when they see the barometer off Cape Horn sink down to 28, it is no more significant of a gale, than a barometer at 29 is in the North Atlantic. Perhaps, if South Sea navigators will bear this fact in mind, and count the changes above and below 29, instead of 30, this instrument may redeem its lost character off Cape Horn.

ROUTE TO CALIFORNIA.

We have now brought the great highway around Cape Horn, to another turning off place or fork of the road.

At 50° S., in the Pacific, the South American bound traders part company with the California fleet. Here, or near by, they all, whether bound for Valparaiso, Callao, Guayaquil, or the *Intermedios*, turn off; they have sailed under our guide and in company with us so far, but now they all leave the great California trail to make the best of their way each to the port of destination. With flowing sheets, and fair winds,

the course is plain. Not a word in addition to what the Pilot Charts contain can be said to make the way plainer to them, except the oft-repeated caution, to go straight across the calm belt of Capricorn, turning neither to the east nor to the west, until it be crossed, and the navigator finds himself fairly within the trade-wind region beyond.

The Valparaiso bound vessel should hug the shore close enough to make the land to the southward of her port; those for Callao, &c., keeping straight on.

The California bound vessels should aim to enter the S. E. trade-wind region of the Pacific as far to the west, provided they keep this side of 115° or 120°, as they well can; they should not fight with head winds, to make westing; nor should they turn much from the direct course when the winds are fair. But when winds are dead ahead, stand off to the westward, especially if you be south of the trade-wind region. Having crossed the parallel of 35° S., and taken the trades, the navigator, with the wind quartering and all sails drawing, should now make the best of his way to the equator, aiming to cross it between 105° and 125°, according to the season of the year, and the directions and the tables hereinafter given.

I wish here to call the attention of navigators to the winds they are to expect between the parallel of 50° S., in the Pacific and the equator, especially as it regards their reliability.

In the table of Cape Horn Crossings (p. 680), are given the times from the parallel of 7° S., to the parallel of 50° S., in the Atlantic. The distance between the two parallels there is about 2,900 miles; the average time 27.6 days, and the mean daily run, 105 miles.

The distance from 50° S., in the Pacific, to the usual crossing-place on the line—California track—is about 3,500 miles, the average time 27.8 days, and the mean daily run, 126 miles.

The winds between 50° S. and the equator are so much more strong, steady, and reliable, as the barometer would lead us to expect, on the Pacific, than they are on the Atlantic side of the continent, that the ratio between them in these respects is as 2,900 to 3,500, for it is as easy to make 3,500 miles with them in one ocean, as it is 2,900 in the other.

An examination of the mean monthly passages, from crossing to crossing, will also show a greater regularity, implying thereby more stable winds.

The greatest monthly average on the east side is 32 days in August; on the west, 24.8 in November—extreme difference, 7.2 days.

The greatest monthly average on the west side is 31 days; the least, 24 days—extreme difference, 7 days.

But a comparison of the tables for a moment only, will show with how much more regularity as to time the passages are made on the one side than they are on the other.

The following communication from Captain Frank Smith, of the Messenger, throws light on what I have already said, and has a bearing upon something that I have to say.

"You will herewith receive my abstract logs of ships Messenger and Susquehanna, on voyages 'round the world.' I am sorry neither of them have been kept as full as you have desired, neither of my ships being provided with *hold cocks;* and I have noted none of my observations for variation of the compass; as, although

my attention was at all times directed to the subject, I have rarely found any difference from that marked on the late Charts. In the observations noted, I have aimed at correctness and brevity. Should you take occasion to examine the Messenger's log, you will perceive I have had more than a reasonable, or usual share, of unfavorable winds, light airs, and calms, the *round voyage*, but more especially between New York and San Francisco. I aimed, by the aid of your Charts and Instructions, at maintaining good positions and improving all chances; you will notice, being jammed by a northwester along the coast of Chili, forcing me 10° of long. to the eastward in 6 days. I entered the S. E. trades in 78½° W.; being so far to the eastward, I was induced to follow your proposed track across the equator, and crossed in 102½° W., but I think it too far east, as it is certainly within the influence of some cause producing a *calm space* at that season of the year (September); you will find my remarks at some length, noted in the log, and trust you will make proper allowance for my apparent petulance in complaining, and presumption in expressing an opinion differing from yours, when mine is founded on a limited personal observation, while yours is the result of a mass of information from a multitude of *personal observations*, each of which may be entitled to the same amount of credit as my own. But it requires more than *human powers* of patient endurance, to be from 20 to 25 days becalmed, north of the equator, in the Pacific, on board of a clipper ship, bound to California, when your imagination paints all your competitors passing you to the westward with a breeze; and when I arrived at San Francisco, I found ships in port that had crossed the equator to the westward, days after I did, one of which crossed to the westward of 120° W. Nothing would induce me again to attempt a passage to the eastward of 100° or 115° W.; the very thought of my helpless situation there still gives me the shuddering *horrors*. I think the last 7 or 8 months past, must have been an extraordinary period of tranquillity in all the regions I have passed through. I heard many remarks and complaints of *calm and light airs*, both in California and China, and since I entered the S. E. trades above referred to, I have been over 6 months at sea, 'running down' nearly all the trade-winds that blow, together with the N. E. monsoons of the China Sea, in the season of their strength, and yet I have experienced, in all that *time* and *space*, but 14 days with wind sufficient to keep my *canvas* from *slating* against the *mast*, and only two days in which my skysails where furled throughout the 24 hours.

"I deem it but proper to say, ere I close, that I feel myself (in common with the great maritime interests of our country), greatly indebted to your invaluable researches, and the great skill you have developed in laying such a mass of information before us, in such an available form, as we have in your Charts; and I trust your flattering success continues to animate you, and that you will make us in due time as familiar with the Great Pacific and Indian Oceans as you have with the Atlantic. That old and beaten track has been brought out of *darkness* into marvellous light, and I expect many important errors have possession of our minds, with regard to the others, which your researches are destined to dispel; and your beautiful theory on the circulation of the atmosphere gives a charm to its study, that cannot fail to excite such an interest on the subject as will make every thinking sailor more attentive and observant of the great laws of nature in action around him. Here I suppose I should close, as I have already wrote more perhaps than you will have leisure or disposition to read; yet, if I felt free to ask questions, and time and place admitted of it, I should

be a very teasing *pupil*, as, in the study of your important labors, many suggest themselves to me. For instance, in what latitude, at different seasons, should we look for the southern edge of the S. E. trades in the Pacific; and if they don't prevail farther to the southward, near the coast of South America, than out to the westward in the open sea? As, in the Susquehanna, in April, 1851, in long. from 87° to 92° W., I had a succession of northers for 7 or 8 days, between lat. 30° and 20° S., while ships to the eastward of me, in the same month, got the S. E. trades in 29° or 30° S. And again, what is the chance of a passage from the west coast of North America to China, in a high latitude, corresponding with packet route from the British Channel to the United States? The length of this admonishes me; but one thing more: What influence has the moon or its phases on the wind? I have been, and continue in the habit of looking for and calculating upon its influence, upon wind and weather, especially, in the *tropic*, in *trade-winds*, and near the land, during full and change; and when studying your Track Chart, with the view of profiting by the experience of others, I always feel the want of some mark on each track by which the moon's age could be known; as, for example, its quarterings, so noted as to express the ship's position at the time of their occurrence; then the student, by counting backwards or forwards, could inform himself of the desired particular. Excuse my tediousness, and allow me to conclude with the expression of my sincere hopes that your very laudable zeal, in the pursuit of so useful and patriotic an object as your labors tend to advance, will meet a high and just reward."

Ship Messenger (Frank Smith), New York to California.

"June 16, 1852. Lat. 11° 00′ N.; long. 34° 39′ W. Barometer, 30.00; temperature of air, 79°; of surface, 78°. Winds: during the day, E. by N. First part, fine breezes; middle and latter parts, light winds. The sea has been heaving up in rips, and splashing to windward, very much like a weather tide, or current.

June 22. Lat. 4° 27′ N.; long. 27° 53′ W. Barometer, 30.05; temperature of air, 80°; of surface, 79°. Winds: S. by W., S. by W., and S. by E. Begins moderate and clear; middle, light airs and cloudy; latter part, moderate and clear. At the beginning, I tacked and stood to the westward, in the hope of coming up on that track before I reached the long. 30° W. As I found myself in 25° 43′ W., and nearly 6° north, I was apprehensive, if I stood farther to the eastward, I might run out of the wind, and be baffled with calm and light airs; and I prefer running, for a change, to waiting a wind; and I consider it better to beat to windward in short tacks to the west of 25°, than to risk the calms to the east. [A sound conclusion.]

July 20. Lat. 42° 31′ S.; long. 58° 21′ W. Barometer, 29.75; temperature of air, 52°; of surface, 43°. Began with a breeze from the west, which gradually canted to N. W., and freshened to a ten-knot breeze; but before midnight it died away to a calm, and light airs from northward, northward and eastward, and east. This wind, for three days, has drawn gradually around the compass against the sun, from N. E. and E. to S. and W., N. W., and E. N., which I take it is unusual weather. Since passing the parallel of St. Catharine's, have experienced more light and baffling weather than I have encountered for a long

time; and what makes it more strange, we have had a new moon during the interval. It is now four days old. [The moon has nothing to do with it.]

August 2. Lat. 57° 28′ S.; long. 74° 05′ W. Barometer, 28.60; temperature of air, 38°; of surface, 38°. Winds: N., N. W., and N. W. Began with northerly winds, which soon increased to a gale. I run the ship to S. W., taking in sail as required; at 4 P. M. found it necessary to heave the ship to under close-reefed main-topsail, and fore-topmast staysail, from 3 until 8 P. M., and afterwards in squalls, until midnight, it blew a terrific gale; its force seemed irresistible; its sound was deafening, and to look upon it was bewildering. Its strength seemed broken at 8 P. M., or four hours after it commenced. But the squall which followed, when accompanied by hail, seemed sufficient to *flay* everything it met with. I found the barometer of signal advantage to me, as its indications prevented my making or carrying sail, as I should have done if I had not been influenced by it. I was just in time in getting sail off my ship. The barometer fell to 28.60, and there remained during the gale. At meridian, both gale and sea had moderated, when glass rose to 28.90.

Aug. 16. Lat. 32° 48′ S.; long. 80° 10′ W. Barometer, 30.05; temperature of air, 59°; of surface, 56°. Winds during the day, N. W. In looking back, I find this the seventieth day since we have had a wind with which the ship lay her course throughout the day; and this is my seventy-sixth day out—under the circumstances, a short passage to Valparaiso.

Aug. 18. Lat. 24° 01′ S.; long. 80° 36′ W. Barometer, 30.00; temperature of air, 61°; of surface, 60°. Winds: N. W. to W. N. W., W. N. W., S. E. Moderate, light winds throughout, with a floating fog drenching like a rain, and flying very low, as the blue sky was always visible over head. The S. W. swell increased to such enormous magnitude as to attract my particular notice, and I endeavored to estimate its height and distance between the ridges (or caps of the rollers), and I think they were 800 yards apart; and when between, in the trough, the next ridge, beyond those forming the trough, could not always be seen at an elevation of twenty-five feet above the sea.

Aug. 29. Lat. 21° 09′ S.; long. 83° 07′ W. Barometer, 30.10; temperature of air, 64°; surface, 62°. Winds during the day, S. E.

This has been the first day for seventy-three days that I have had the privilege of recording a fair wind throughout the 24 hours, and this has to be but a light one, but steady. The first 20 hours were overcast, but the last four beautiful and clear; the heavy S. W. swell subsiding, from which I am flattered with the hope we are entering the trades."

Between the equator and 10° or 12° N., according to the season of the year, the California-bound navigator may expect to lose the S. E. and to get the N. E. trade-winds.

He will find these last nearest the equator in January, February, and March; but in July, August, and September, he will sometimes find himself to the north of the parallel of 15° N., before he gets fairly into the N. E. trades. And sometimes, especially in summer and fall, he will not get them at all, unless he keeps well out to the west. Having them, he should steer a good rap full at least, aiming, of course, to cross the

parallel of 20° N., in about 125° W., or rather, not to the east of that, particularly from June to November. His course, after crossing 20° N., is necessarily to the northward and westward until he loses the N. E. trades. He should aim to reach the latitude of his port without going to the west of 130° W., if he can help it, or approaching nearer than 250 or 300 miles to the land until he passes out of the belt of the N. E. trades and gets into the variables, the prevailing direction of which is westerly.

"Where shall we take the S. E. and lose the N. E. trades on the passage to California?" is an important question for the navigator to have answered, who is striving for a short passage on the west coast of South America. From the parallel of Cape Horn up to the belt of light winds and calms, through which you generally pass before getting into the S. E. trades, the prevailing winds are westwardly winds, having northing more frequently than southing in them.

Between the northwest coast and the meridian of 130° W., from 30° to 40° N., the prevailing direction of the wind in summer and fall is from the northward to the westward inclusive; whereas, to the west of 130°, and between the same parallels, the N. E. trades are the prevailing winds of these two seasons. There is a marked difference in the direction of the winds on the opposite sides of the meridian of 130° W. in the North Pacific. The cause of this difference has been completely unmasked by the researches connected with these Charts. The agent which produces it has its seat in the arid plains of New Mexico, Northern Texas, and the regions round about. At this season of the year, the prevailing winds in the western part of the Gulf of Mexico are from the southward and eastward; *i. e.* towards that great centre of rarefaction. At this season of the year, too, the prevailing winds in the Pacific, off the coasts of Central America, are from the southward, and also towards the same centre of heated plains and ascending columns of air; and we have seen that off the coasts of California, between the parallels of 35° and 40° N., the prevailing winds of this season are from the northward and westward—also towards this great inland "blow hole." In it, is seated a monsoon agent, whose influence is felt for more than a thousand miles out to sea, drawing back the N. E. trades of the Pacific, and converting them into a southwardly monsoon for half the year; deflecting the N. E. trades of the Gulf of Mexico, and converting them into a southeasterly monsoon, during the same season; and so influencing the prevailing S. W. winds off our Northwest Pacific coast, that they, too, are almost made to blow a northwesterly monsoon.

Therefore, vessels bound to San Francisco, should not, unless forced by adverse winds, go any farther beyond the meridian of 130° W. than they can help.

Supposing that vessels generally will be able to reach 30° N. without crossing the meridian of 130° W., the distance per great circle from Cape Horn to its point of intersection with that parallel is about 6,000 miles.

And supposing, moreover, that California bound vessels will generally, after doubling Cape Horn, be able to cross the parallel of 50° S., between the meridians of 80° and 100° W., their shortest distance in *miles* thence to 30° N., at its intersection with the meridian of 130° W., would be to cross 40° S. in about 100° W.; 30° S. in about 104°; 20° S. in about 109°; the equator in 117° W.; and 30° N., about 130° W. (126° if you can). By crossing the line 10° farther to the east, or 10° farther to the west of 117°, the

great circle distance from Cape Horn to the intersection of 30° N. with 130° W., will be increased only about 150 miles.

Navigators appear to think that the turning-point on a California voyage, is the place of crossing the equator in the Pacific. But the crossing which may give the shortest run thence to California, may not be the crossing which it is most easy to make from the United States; and it is my wish to give, in these *Sailing Directions*, the routes which on the average will afford the shortest passages to vessels that have doubled Cape Horn and are bound direct to California.

First, therefore, let us see which crossings of the equator in the Pacific give the shortest runs on the average thence to San Francisco; then, let us find out which of these crossings it is most easy to reach from Cape Horn, and then, by comparing the two, we may be able to lay down the best route from Cape Horn to California.

Independent of the information that has been elicited by these investigations connected with the *Wind and Current Charts*, but little was known by navigators as to the winds and currents after doubling Cape Horn, on the California route.

Navigators knew, indeed, that on that route they had to cross the belt both of the S. E. and of the N. E. trade-winds. But in what longitude to cross them; between what meridians are these trade-winds most constant, steady, and fresh; and between what meridians is it less difficult to cross the belt of equatorial calms which separate these two systems of trade-winds; and when, at what distance from the coast, are the light airs and calms of the horse latitudes, which are found on the polar borders of the S. E. as well as of the N. E. trades, less vexatious? These are some of the questions to which definite answers had to be given, before it could be asserted with confidence that this or that is certainly the best route to California.

The Pilot Charts, the Track Charts, and proper attention to the tables I am about to give, will tell this to all who consult them diligently.

Having exhausted my materials for Pilot Charts of this route, I have, with the assistance of Lieuts. George Minor and Robert H. Wyman, overhauled the whole series of log-books in my possession for California passages. From them is derived the following tables of California Crossings, giving the name of the vessel; the year; the number of days' passage from the U. S. generally, to the equator in the Pacific; the place and month of crossing the equator; and the number of days thence to California. The crossings on the equator, and of various parallels of latitude, are also given.

Crossings in the Pacific, from 50° S. to the Equator.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
		Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
	JANUARY.									
Hazard	28, 1851	77 00	81 00	83 00	84 00	86 00	109 00	Feb. 21, 1851	24	24
Helena	28, "	78 00	83 00	87 00	91 00	94 00	110 00	" 19, "	22	21
Russell	8, 1850	83 00	83 00	84 00	85 00	89 00	110 00	" 7, 1850	30	37
Cygnet	27, "	84 00	83 00	79 00	81 00	87 00	111 00	" 26, "	30	29
R. C. Winthrop .	31, 1851	82 00	86 00	87 00	90 00	92 00	110 00	Mar. 3, 1851	31	29
Potomac . . .	31, "	80 00	79 00	79 00	83 00	88 00	111 00	" 3, "	31	32
Swordfish . . .	2, 1852	80 00	90 00	94 00	95 00	98 00	110 00	Jan. 21, 1852	19	20
Seaman	28, 1851	79 00	83 00	88 00	92 00	97 00	118 00	Feb. 20, 1851	23	18
Acasta	31, "	82 00	86 00	87 00	91 00	92 00	121 00	Mar. 10, "	38	28
Trade-Wind . .	13, 1853	81 00	87 00	95 00	96 00	99 00	112 00	Feb. 7, 1853	25	16
Contest	19, "	81 00	82 00	84 00	88 00	91 00	111 00	" 9, "	21	16
Tingqua . . .	27, "	80 00	80 00	83 00	85 00	84 00	106 00	" 19, "	23	27
Gray Feather . .	26, "	79 00	81 00	84 00	89 00	89 00	110 00	" 18, "	23	25
Realm	2, "	83 00	85 00	84 00	88 00	92 00	113 00	" 7, "	36	36
Capitol	4, "	81 00	77 00	75 00	73 00	77 00	113 00	" 7, "	34	20
Golden Gate . .	29, "	79 00	79 00	80 00	81 00	82 00	104 00	" 24, "	26	24
Telegraph . . .	25, "	81 00	83 00	85 00	88 00	90 00	110 00	" 17, "	23	21
Samoset. . . .	10, 1851	78 00	81 00	82 00	86 00	86 00	108 00	" 18, 1851	39	27
Average . . .		80 08	82 13	84 24	87 00	89 00	110 30		27.7	25.0
	FEBRUARY.									
*Whiton . . .	16, 1847	80 00	77 00	79 00	80 00	82 00	93 00	Mar. 13, 1847	25	42
Geo. Brown . .	13, 1851	80 00	86 00	88 00	89 00	91 00	105 00	" 14, 1851	29	22
Whiton	11, 1849	84 00	76 00	74 00	78 00	87 00	109 00	" 15, 1849	32	28
Samuel Appleton	26, 1851	79 00	83 00	88 00	90 00	93 00	109 00	" 23, 1851	25	18
*Uriel	28, "	78 00	82 00	85 00	86 00	90 00	110 00	" 30, "	30	34
Surprise . . .	8, "	79 00	82 00	83 00	86 00	88 00	110 00	" 3, "	23	17
Hannibal . . .	23, 1850	95 00	84 00	89 00	93 00	98 00	115 00	" 22, 1850	27	29
Southerner . .	27, 1851	80 00	85 00	90 00	87 00	88 00	117 00	" 30, 1851	31	28
Newton	4, "	81 00	80 00	79 00	79 00	85 00	117 00	" 10, "	34	26
Canton	28, 1850	85 00	88 00	89 00	94 00	97 00	118 00	" 28, 1850	28	29
Lucia Field . .	5, 1851	78 00	83 00	87 00	91 00	95 00	119 00	" 19, 1851	42	31
Europe	17, 1852	80 00	78 00	76 00	77 00	81 00	100 00	" 17, 1852	28	35
Lantao	23, 1851	81 00	84 00	88 00	92 00	94 00	118 00	" 21, 1851	26	20
*A. F. Jenness .	25, 1853	80 00	76 00	73 00	73 00	78 00	100 00	Apr. 12, 1853	46	54
Kentucky . . .	17, "	83 00	96 00	103 00	107 00	110 00	113 00	Mar. 26, "	37	25
Golden West . .	24, "	81 00	77 00	79 00	84 00	89 00	107 00	" 24, "	28	23
John Bertram . .	17, 1852	84 00	89 00	94 00	95 00	96 00	110 00	" 8, 1852	20	18
Danube	18, 1853	80 00	82 00	83 00	86 00	91 00	110 00	" 23, 1853	33	26
Anna Kimball .	19, "	79 00	83 00	83 00	88 00	92 00	114 00	" 22, "	31	22
Cygnet	6, "	85 00	84 00	83 00	88 00	91 00	109 00	" 8, "	30	30
*Thos. Church .	18, "	78 00	79 00	76 00	79 00	81 00	111 00	" 30, "	48	46
Winged Racer .	13, "	82 00	81 00	84 00	89 00	93 00	106 00	" 7, "	22	21
Flying Childers .	19, "	81 00	83 00	83 00	86 00	92 00	117 00	" 19, "	28	22
Living Age . .	8, "	79 00	81 00	82 00	87 00	92 00	112 00	" 12, "	32	20
Bald Eagle . . .	23, "	85 00	95 00	99 00	97 00	100 00	111 00	" 23, "	28	19
F. W. Brune . .	1, "	90 00	95 00	96 00	98 00	100 00	107 00	" 2, "	29	29
Storm	20, "	79 00	82 00	83 00	88 00	91 00	110 00	" 17, "	25	28
Alboni	1, "	85 00	94 00	96 00	98 00	102 00	114 00	Feb. 27, "	26	30
*Sartelle . . .	10, 1852	80 00	74 00	80 00	81 00	84 00	107 00	Mar. 10, 1852	28	39
Average . . .		82 27	79 17	80 04	85 02	91 36	110 16		28.8	24.4

* Not included in the average.

Crossings in the Pacific, from 50° S. to the Equator—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
		Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
	MARCH.									
Hurricane . . .	4, 1852	81 00	80 00	82 00	85 00	88 00	103 00	Mar. 22, 1852	18	24
Great Britain . .	25, "	79 00	81 00	74 00	74 00	78 00	104 00	Apr. 28, "	34	30
Sartelle	2, 1850	79 00	80 00	80 00	82 00	85 00	109 00	Mar. 28, 1850	26	34
Howard	5, 1852	80 00	80 00	80 00	83 00	88 00	110 00	" 29, 1852	24	25
Wisconsin . . .	27, "	84 00	83 00	78 00	78 00	82 00	106 00	Apr. 22, "	26	30
Hermann . . .	27, 1850	81 00	76 00	76 00	82 00	87 00	109 00	May 11, 1850	45	37
Daniel	26, 1851	77 00	78 00	77 00	82 00	87 00	113 00	Apr. 28, 1851	33	33
Isette	5, 1850	84 00	87 00	88 00	90 00	92 00	110 00	May 10, 1850	66	37
Stag Hound . .	30, 1851	79 00	77 00	74 00	75 00	81 00	113 00	" 4, 1851	34	21
Isabelita Hyne .	26, "	83 00	81 00	83 00	84 00	88 00	116 00	Apr. 23, "	28	24
Maria	14, "	78 00	77 00	78 00	82 00	85 00	117 00	" 16, "	33	32
Samuel Russell .	17, 1850	84 00	83 00	82 00	81 00	84 00	119 00	" 15, 1850	29	20
Esther May . .	31, 1853	81 00	91 00	93 00	99 00	105 00	113 00	" 28, 1853	28	33
John Holland . .	15, "	79 00	84 00	83 00	82 00	84 00	102 00	" 16, "	32	24
Rattler	18, "	82 00	90 00	90 00	94 00	97 00	114 00	" 16, "	29	23
Golden Eagle . .	30, "	79 00	90 00	97 00	98 00	103 00	113 00	" 20, "	21	19
Eagle	8, "	87 00	92 00	100 00	103 00	104 00	116 00	" 8, "	31	22
Tornado . . .	13, "	84 00	91 00	99 00	96 00	98 00	118 00	" 10, "	28	22
John Stuart . .	14, "	82 00	94 00	99 00	102 00	103 00	112 00	" 10, "	27	24
Celestial	18, "	82 00	83 00	84 00	86 00	91 00	109 00	" 15, "	28	23
Phantom . . .	13, "	84 00	94 00	101 00	105 00	106 00	113 00	" 6, "	24	15
Walter (Schr.) .	11, "	81 00	83 00	87 00	89 00	94 00	108 00	" 9, "	29	25
Susquehanna . .	29, 1851	78 00	80 00	83 00	86 00	90 00	113 00	May 1, 1851	33	30
Elsinore . . .	30, "	81 00	85 00	94 00	91 00	89 00	108 00	" 7, "	38	31
Courser	9, 1852	79 00	80 00	83 00	87 00	92 00	105 00	Mar. 28, 1852	19	31
Average . . .		81 08	83 35	85 15	89 56	93 10	110 00		29.6	26.8
	APRIL.									
Ocean Bird . . .	17, 1849	81 00	76 00	78 00	79 00	78 00	99 00	May 23, 1849	36	38
Anonyma . . .	25, "	78 00	78 00	82 00	86 00	87 00	103 00	" 23, "	28	34
Aurora	18, "	81 00	79 00	73 00	75 00	75 00	110 00	" 30, "	42	31
*New Castle . .	28, "	79 00	78 00	74 00	77 00	80 00	109 00	June 11, "	44	54
F. Depau . . .	4, 1850	78 00	77 00	73 00	74 00	81 00	113 00	May 20, 1850	46	27
Diadem	7, "	81 00	74 00	74 00	89 00	82 00	116 00	" 22, "	45	36
Tornado . . .	24, 1852	83 00	80 00	81 00	85 00	88 00	108 00	" 18, 1852	24	44
Kate Hayes . .	24, "	79 00	76 00	74 00	78 00	82 00	109 00	June 3, "	40	32
Sea Serpent . .	13, 1853	81 00	87 00	85 00	85 00	88 00	102 00	May 5, 1853	22	27
A. Chiseborough .	1, "	78 00	85 00	88 00	91 00	95 00	114 00	Apr. 26, "	25	32
Simoom	12, "	88 00	97 00	94 00	91 00	92 00	106 00	May 5, "	23	27
Aldebaran . . .	1, "	85 00	90 00	92 00	98 00	103 00	110 00	Apr. 27, "	26	35
Lucknow . . .	2, "	88 00	99 00	108 00	105 00	103 00	118 00	May 6, "	34	28
Star of the Union	14, "	84 00	93 00	87 00	86 00	88 00	106 00	" 5, "	21	27
Astrea	17, "	84 00	89 00	93 00	96 00	99 00	114 00	" 19, "	32	37
Golden Rover . .	15, "	86 00	93 00	92 00	90 00	91 00	109 00	" 7, "	22	33
Amelia	1, "	81 00	83 00	87 00	96 00	107 00	116 00	Apr. 28, "	27	26
Swordfish . . .	15, "	88 00	91 00	84 00	84 00	89 00	114 00	May 7, "	22	24
Gov. Morton . .	17, "	84 00	87 00	89 00	93 00	96 00	109 00	" 15, "	28	26
Average . . .		81 15	84 35	86 00	89 18	92 00	109 35		30.2	31.3

* Not included in the average.

Crossings in the Pacific, from 50° S. to the Equator—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF—					Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
		50° S.	40° S.	35° S.	30° S.	25° S.				
		Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
	MAY.									
Sweden	29, 1849	80 00	88 00	89 00	90 00	84 00	102 00	June 26, 1849	28	38
Sherwood . . .	30, 1851	81 00	86 00	89 00	91 00	97 00	109 00	" 25, 1851	26	40
Ino	24, "	78 00	81 00	82 00	79 00	82 00	109 00	" 19, "	26	34
Edgar	29, 1850	78 00	77 00	73 00	73 00	78 00	108 00	July 2, 1850	34	39
Henry Pratt . .	1, "	79 00	80 00	78 00	79 00	84 00	110 00	June 7, "	37	41
Archibald Gracie	7, "	83 00	86 00	85 00	85 00	87 00	111 00	" 11, "	35	36
Delia	6, 1851	87 00	91 00	87 00	84 00	85 00	114 00	" 10, 1851	35	34
Arcole	5, "	84 00	98 00	99 00	100 00	102 00	117 00	May 31, 1850	26	30
Kensington . .	3, 1850	81 00	88 00	88 00	89 00	90 00	123 00	June 24, 1851	52	39
Sea Serpent . .	8, 1852	79 00	78 00	79 00	76 00	76 00	102 00	" 6, 1852	29	24
Stag Hound . .	9, "	82 00	88 00	88 00	85 00	81 00	100 00	" 1, "	23	32
Michael Angelo .	31, "	86 00	85 00	83 00	82 00	86 00	102 00	" 27, "	27	35
Rose Standish . .	19, 1850	78 00	81 00	80 00	81 00	87 00	113 00	" 20, 1850	32	44
Ariana	23, 1853	84 00	82 00	83 00	82 00	84 00	117 00	July 1, 1853	39	40
Forrest	9, 1849	82 00	84 00	84 00	83 00	82 00	104 00	June 6, 1849	28	30
Wallace	10, 1852	81 00	84 00	84 00	82 00	82 00	112 00	" 13, 1852	34	38
Eastern State . .	10, "	84 00	82 00	80 00	80 00	85 00	101 00	" 8, "	29	34
Stephen Larman .	24, "	84 00	83 00	88 00	88 00	89 00	112 00	" 19, "	26	34*
Morgan Dix . .	10, 1850	79 00	80 00	83 00	82 00	83 00	110 00	" 13, 1850	34	37
Gov. Morton . .	21, 1852	81 00	87 00	89 00	87 00	85 00	102 00	" 12, 1852	22	32
Vandalia . . .	1, 1850	83 00	86 00	87 00	87 00	88 00	108 00	" 2, 1850	32	34
Stag Hound . .	1, 1853	78 00	78 00	79 00	79 00	79 00	116 00	" 5, 1853	35	26
Surprise	20, "	84 00	85 00	88 00	91 00	99 00	111 00	" 7, "	18	32
Empress of the Seas	20, "	85 00	84 00	85 00	86 00	91 00	116 00	" 10, "	21	32
Houqua	24, "	83 00	86 00	91 00	98 00	101 00	115 00	" 21, "	28	24
Paragon	21, "	80 00	83 00	88 00	87 00	86 00	113 00	" 18, "	37	42
Parthian . . .	26, "	81 00	83 00	84 00	82 00	88 00	110 00	" 25, "	30	28
Climax	27, "	79 00	80 00	81 00	81 00	86 00	107 00	" 24, "	28	27
Sirocco	13, "	80 00	77 00	75 00	78 00	81 00	111 00	" 11, "	29	29
New York . . .	4, "	80 00	86 00	87 00	86 00	85 00	107 00	" 3, "	30	35
Archer	18, "	84 00	92 00	93 00	95 00	99 00	115 00	" 8, "	21	37
Rascal	24, "	82 00	80 00	82 00	80 00	82 00	110 00	" 27, "	34	27
Herculean . . .	6, "	80 00	85 00	85 00	83 00	83 00	109 00	" 8, "	33	45
Robert Harding .	24, "	77 00	81 00	83 00	80 00	90 00	116 00	" 28, "	35	39
Seaman's Bride .	24, "	81 00	83 00	83 00	88 00	92 00	115 00	" 19, "	26	29
Lantao	26, "	79 00	80 00	81 00	80 00	78 00	106 00	" 23, "	28	30
Hampton . . .	24, "	79 00	80 00	79 00	77 00	76 00	102 00	" 29, "	36	40
Hugh Birckhead .	20, "	79 00	78 00	78 00	81 00	86 00	109 00	" 17, "	28	33
Average . . .		81 45	85 05	87 15	88 30	91 00	110 00		30.3	30.4

* San Diego.

Crossings in the Pacific, from 50° S. to the Equator—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
		Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
	JUNE.									
Gazelle	7, 1849	80 00	80 00	80 00	82 00	84 00	106 00	July 9, 1849	32	30
Clarissa Perkins .	24, "	78 00	82 00	81 00	81 00	83 00	114 00	" 30, "	36	43
Venice	6, 1850	80 00	80 00	79 00	80 00	80 00	115 00	" 14, 1850	38	30
Sarah and Eliza .	26, 1849	82 00	81 00	76 00	76 00	85 00	114 00	Aug. 12, 1849	47	36
Raduga	26, 1851	81 00	80 00	78 00	78 00	76 00	118 00	July 28, 1851	32	25
Sheridan . . .	1, 1850	80 00	84 00	90 00	92 00	90 00	118 00	" 2, 1850	31	28
Tartar	29, 1851	82 00	85 00	86 00	91 00	95 00	122 00	" 24, 1851	25	30
T. B. Wales . .	3, 1852	81 00	83 00	83 00	85 00	90 00	103 00	" 3, 1852	30	33
Louisa Bliss . .	1, 1850	79 00	75 00	72 00	74 00	77 00	99 00	" 8, 1850	37	52
Empire	5, 1852	78 00	88 00	93 00	95 00	99 00	102 00	" 8, 1852	33	36
Cohota	23, 1850	84 00	89 00	91 00	96 00	95 00	110 00	" 19, 1850	26	23
Horsburgh . . .	4, 1852	79 00	77 00	77 00	80 00	84 00	98 00	June 29, 1852	25	35
North American .	26, "	80 00	76 00	74 00	76 00	79 00	101 00	July 28, "	32	33
R. C. Winthrop .	9, "	78 00	82 00	86 00	91 00	93 00	104 00	" 12, "	33	33
Abbott	15, "	81 00	78 00	78 00	80 00	84 00	112 00	" 22, 1853	37	40
Competitor . . .	2, 1853	79 00	89 00	94 00	96 00	99 00	112 00	June 23, "	21	26
Hornet	28, "	79 00	87 00	92 00	95 00	102 00	113 00	July 23, "	25	20
St. Lawrence . .	1, "	79 00	86 00	91 00	92 00	98 00	116 00	June 25, "	24	41
White Squall . .	8, 1852	78 00	79 00	79 00	80 00	82 00	100 00	July 2, 1852	24	26
Harriet Hoxie .	4, "	77 00	78 00	72 00	76 00	84 00	103 00	" 6, "	32	28
Sarah Boyd . .	6, 1850	78 00	80 00	80 00	83 00	85 00	115 00	" 15, 1850	39	32
John Land . . .	29, 1853	86 00	93 00	95 00	102 00	103 00	113 00	" 25, 1853	26	31
Flying Eagle . .	6, "	82 00	94 00	99 00	101 00	106 00	114 00	" 7, "	31	34
Average . . .		80 15	83 20	85 50	89 15	91 55	109 40		31.1	32.4
	JULY.									
St. Patrick . . .	19, 1850	81 00	90 00	92 00	93 00	95 00	115 00	Aug. 14, 1850	26	30
Isaac Allerton .	17, "	81 00	93 00	96 00	97 00	99 00	111 00	" 13, "	27	34
Caroline	15, "	81 00	82 00	86 00	88 00	93 00	113 00	" 11, "	27	34
N. B. Palmer . .	10, 1851	86 00	88 00	89 00	91 00	93 00	114 00	" 2, 1851	22	19
Witch of the Wave	27, "	83 00	85 00	86 00	87 00	88 00	115 00	" 18, "	22	32
Finland	2, 1850	89 00	104 00	106 00	108 00	114 00	117 00	" 6, 1850	35	42
Flying Cloud . .	26, 1851	81 00	90 00	94 00	96 00	101 00	124 00	" 12, 1851	17	19
Staffordshire . .	8, 1852	79 00	85 00	86 00	87 00	94 00	110 00	" 25, 1852	48	18
Victory	2, 1853	84 00	90 00	88 00	83 00	90 00	113 00	" 2, 1853	31	32
N. B. Palmer* .	30, 1852	79 00	78 00	73 00	73 00	81 00	111 00	Sept. 7, 1652	39	22
Average . . .		82 24	88 30	89 36	90 18	94 48	114 18		29.4	28.2

* Touched at Valparaiso.

Crossings in the Pacific, from 50° S. to the Equator—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
		Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
	AUGUST.									
Chatham . . .	22, 1849	78 00	78 00	78 00	80 00	81 00	99 00	Sept. 22, 1849	31	39
Templeton . . .	11, 1850	84 00	87 00	86 00	90 00	91 00	113 00	" 10, 1850	30	27
Lady Arabella .	5, "	83 00	83 00	81 00	86 00	93 00	113 00	" 4, "	30	33
Virginia . . .	5, "	84 00	90 00	93 00	96 00	100 00	113 00	" 2, "	28	33
Copeland . . .	16, 1852	87 00	87 00	88 00	89 00	91 00	104 00	" 7, 1852	22	39
Carioca	10, "	84 00	85 00	87 00	86 00	88 00	101 00	" 6, "	27	41
Union	10, "	84 00	85 00	85 00	87 00	88 00	101 00	Aug. 31, "	21	28
Southerner . . .	5, "	79 00	78 00	75 00	75 00	79 00	111 00	Sept. 15, "	41	34
Witch of the Wave	28, "	83 00	82 00	80 00	79 00	86 00	114 00	" 21, "	24	27
Eliza Mallory . .	11, "	82 00	85 00	84 00	86 00	88 00	108 00	" 10, "	30	37
Samoset	11, "	83 00	82 00	83 00	87 00	91 00	107 00	" 5, "	25	42
Union	11, "	86 00	85 00	85 00	87 00	89 00	101 00	Aug. 31, "	20	28
Messenger . . .	3, "	83 00	87 00	82 00	79 00	80 00	103 00	" 29, "	26	34
Average . . .		83 04	84 09	83 37	85 09	88 05	106 46		27.3	34
	SEPTEMBER.									
Angelique . . .	25, 1849	79 00	79 00	74 00	75 00	78 00	99 00	Oct. 29, 1849	34	44
Mermaid . . .	2, 1851	80 00	85 00	87 00	88 00	91 00	106 00	Sept. 21, 1851	19	27
Telegraph . . .	27, "	81 00	82 00	82 00	81 00	84 00	110 00	Oct. 22, "	25	23
Celestial . . .	24, 1850	84 00	90 00	90 00	91 00	96 00	115 00	" 11, 1850	18	20
Thomas Perkins .	29, 1849	79 00	78 00	77 00	80 00	86 00	111 00	" 25, 1849	26	26
Eagle	28, 1851	85 00	88 00	89 00	90 00	90 00	115 00	" 20, 1851	22	28
Carrington . . .	13, 1850	83 00	88 00	88 00	88 00	90 00	115 00	" 5, 1850	22	26
Gertrude . . .	16, "	83 00	90 00	93 00	95 00	100 00	116 00	" 8, "	22	30
Cohota	8, 1852	80 00	86 00	88 00	88 00	89 00	105 00	" 6, 1852	28	26
Albany	8, "	79 00	87 00	89 00	89 00	90 00	101 00	" 6, "	28	38
Average . . .		81 18	85 18	85 42	86 30	89 24	109 18		24.4	28.8
	OCTOBER.									
Sea Witch . . .	5, 1851	79 00	84 00	86 00	85 00	86 00	101 00	Oct. 27, 1851	22	23
Boston	23, 1849	80 00	78 00	75 00	74 00	78 00	106 00	Nov. 27, 1849	31	40
Raven	5, 1851	79 00	81 00	84 00	85 00	85 00	112 00	Oct. 29, 1851	24	20
Talbot	13, 1850	82 00	82 00	83 00	85 00	88 00	115 00	Nov. 12, 1850	29	31
Valparaiso . . .	1, 1851	84 00	83 00	86 00	86 00	91 00	115 00	" 2, 1851	32	30
Samuel Russell .	27, 1852	82 00	83 00	83 00	83 00	85 00	101 00	" 17, 1852	21	21
Winged Arrow .	15, "	83 00	81 00	85 00	90 00	93 00	115 00	" 4, "	20	23
Sea Witch . . .	29, "	79 00	86 00	84 00	87 00	93 00	114 00	" 21, "	23	18
Typhoon . . .	6, 1851	78 00	83 00	86 00	84 00	86 00	115 00	Oct. 31, 1851	25	18
Raven	13, 1852	80 00	82 00	81 00	85 00	88 00	105 00	Nov. 3, 1852	21	26
Seaman	19, "	77 00	78 00	78 00	79 00	84 00	109 00	" 13, "	25	26
Sover'gn of the Seas	1, "	78 00	86 00	98 00	100 00	109 00	120 00	Oct. 28, "	27	17
Matilda	22, "	79 00	82 00	82 00	84 00	89 00	108 00	Nov. 27, "	36	25
Seaman	18, "	77 00	78 00	78 00	80 00	84 00	109 00	" 13, "	26	26
Defiance . . .	15, "	83 00	79 00	83 00	86 00	89 00	105 00	" 7, "	23	25
Average . . .		80 00	81 44	83 28	84 52	88 32	110 00		25.7	24.6

Crossings in the Pacific, from 50° *S. to the Equator*—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
		Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
	NOVEMBER.									
Horton	11, 1850	80 00	78 00	75 00	80 00	86 00	109 00	Dec. 23, 1850	42	33
Comet	28, 1851	84 00	90 00	89 00	92 00	94 00	117 00	" 28, 1851	30	16
Wessacumcon . .	16, 1852	83 00	81 00	84 00	86 00	88 00	100 00	" 16, 1852	30	27
Delegate . . .	22, "	82 00	83 00	84 00	86 00	88 00	106 00	" 15, "	23	24
Raduga	12, "	80 00	82 00	80 00	76 00	79 00	108 00	" 9, "	27	26
Chas. Mallory . .	24, "	89 00	85 00	85 00	85 00	87 00	108 00	" 17, "	23	24
Malay	26, "	87 00	88 00	87 00	86 00	87 00	106 00	" 16, "	20	25
Golden City . .	22, "	81 00	88 00	88 00	92 00	97 00	115 00	" 16, "	24	18
Arcole	13, "	79 00	78 00	76 00	74 00	78 00	96 00	" 8, "	25	25
John Wade . .	29, 1851	86 00	81 00	82 00	86 00	92 00	108 00	" 22, 1851	23	22
Senator Borland .	26, 1852	81 00	85 00	85 00	90 00	96 00	111 00	" 25, 1852	29	34
John Wade . .	22, "	83 00	89 00	90 00	91 00	94 00	110 00	" 15, "	23	23
Monsoon . . .	13, "	80 00	82 00	80 00	76 00	81 00	104 00	" 6, "	23	25
Thos. W. Sears .	24, "	86 00	84 00	83 00	84 00	87 00	113 00	" 21, "	27	23
Average . . .		82 56	83 51	83 26	83 51	88 08	107 56		24.7	24.7
	DECEMBER.									
Golden Gate . .	20, 1851	83 00	82 00	82 00	82 00	85 00	106 00	Jan. 12, 1852	23	23
John Jay . . .	30, 1849	79 00	78 00	74 00	74 00	78 00	105 00	Feb. 6, 1850	37	37
Ambassador . .	19, "	78 00	78 00	81 00	85 00	87 00	113 00	" 26, "	38	32
Tigress	2, 1850	82 00	80 00	80 00	81 00	85 00	114 00	June 1, "	*	33
Flying Fish . .	31, 1851	79 00	79 00	83 00	89 00	93 00	120 00	Jan. 22, 1852	22	23
White Squall . .	1, 1850	81 00	80 00	79 00	82 00	83 00	118 00	Dec. 24, 1850	23	14
Westward Ho . .	20, 1852	79 00	82 00	82 00	86 00	92 00	122 06	Jan. 13, 1853	24	18
Comet	4, "	84 00	89 00	89 00	90 00	95 00	114 00	Dec. 27, 1852	23	20
Flying Dutchman	22, "	89 00	93 00	93 00	95 00	100 00	110 00	Jan. 10, 1853	19	16
Revere	4, "	84 00	87 00	86 00	87 00	92 00	109 00	" 2, "	29	27
Flying Fish . .	25, "	80 00	79 00	82 00	87 00	92 00	112 00	" 13, "	19	18
John Gilpin . .	26, "	84 00	80 00	82 00	87 00	91 00	116 00	" 15, "	20	15
Wild Pigeon . .	25, "	85 00	81 00	82 00	86 00	91 00	111 00	" 13, "	19	26
Adelaide Metcalf	28, "	78 00	77 00	79 00	79 00	79 00	104 00	Feb. 5, "	39	35
Anstiss	28, "	79 00	79 00	80 00	82 00	86 00	110 00	Jan. 22, "	25	25
Average . . .		81 36	81 36	82 16	84 48	88 36	112 18		25.7	24.1

Now, let us examine these crossings by the month. From the United States to the line, and thence clear of St. Roque, the table of crossings (p. 535) has been given. It shows the average time to the parallel of St. Roque for each month, and the actual time by each ship.

The table of Cape Horn crossings (p. 680) shows the time from the parallel of St. Roque; also for each ship arranged according to the month to the parallel of 50° south in the Atlantic; also the time occupied in the passage thence around Cape Horn to the same parallel in the Pacific.

The tables under discussion show the time from 50° south in the Pacific to the line, and thence to California; likewise for each vessel in detail, and every month by the average.

Now, from the United States to the parallel of St. Roque, the average distance is about 4,500 miles, and the average time for January 26 days, with a mean daily distance of 173 miles per vessel.

From St. Roque to the parallel of 50° south in the Atlantic, the average distance is 2,900 miles, and the average time in January is 26½ days, with a mean daily run of 110 miles.

From the parallel of 50° south, in the Atlantic, around the Horn to the same parallel in the Pacific, the average distance is 1,400 miles; the average time for January is 16½ days, with a mean daily rate of sailing of 85 miles for that month.

From 50° south, in the Pacific, to the line, the average distance is 3,500 miles; the average time in January 27.7 days, and the mean daily run 126 miles.

From the line to San Francisco, the average distance is about 3,000 miles; the average time in January 25 days, and the mean daily rate 120 miles.

Now, with this statement as to the distance from crossing to crossing, and the tables as to the time by vessels singly and in groups, by the month, the navigator has always the means before him of knowing when he falls behind, and when he head-reaches, where and how much. He will also have no difficulty in finding out which are the most tedious parts of the passage. I attach great practical importance to this bearing of the tables and *Sailing Directions*, because it is calculated to keep the ship always up to her metal.

The January crossings of 50° S. give February crossings for the line. The times, both north and south of the line, show a uniformity and an average that encourage hopes on the part of the navigator, for a good run, at this season, up to the Heads of San Francisco. If he have already had a fair passage from the United States to 50° S. in the Pacific, he may now calculate on a good passage. The difference between the shortest passage from that parallel to the line and the mean, is eight days; between the longest and the mean, eleven days.

For quick runs, the Contest carries off the palm among the January crossings. She performed the run from 50° S. to San Francisco, in the very excellent time of thirty-seven days. This run, however, *can* be made in thirty-five days, for the Swordfish went from 50° S. to the line in 19 days, and both the Trade-Wind and the Contest went thence to California in the same month, each in sixteen days. But it is only now and then that a vessel will be able to strike a vein of wind, which will carry her through with the speed that the passage of thirty-five days from 50° S. requires.

In February, the A. F. Jenness comes along to spoil averages again. She requires more than double the usual time from the line, and nearly twice as much time as vessels usually do. She has been far behind time all the way, and is therefore, I presume, an extraordinary slow vessel. She had to be rejected from the averages of the passages from the U. States to the line; again, from the Cape Horn averages. She is an exception, and, on this account, I again reject her from the averages. So, also, the Thomas Church.

The February averages for the line are about a day longer, each side of the equator, than those of January.

The John Bertram bears off the palm for this month, by her run of thirty-eight days from 50° S. to the Heads. The Surprise and the Winged Racer contended with her for the prize. But the Bertram seems to have won it by keeping well to the westward south of the line, and so putting herself in the full strength of the S. E trades, and other winds, and where they are uninfluenced by the land.

She crossed 50° S. to the westward of either of the others, and took the S. E. trades still farther to the west. At the line, their crossing was the same. From the line, the Surprise only led her, and she by one day.

The shortest passage, probable, from 50° S. in February, to San Francisco, under canvas, is thirty-seven days. This is the shortest time in which, judging by our experience so far, it is possible for a ship ever to accomplish that part of the voyage; to make it in a shorter time is possible, but the chances for any given ship to do it are but small and few. But in this month, also, winds are fine, and chances fair.

In March, the Isette requires time enough for two trips to the line from 50° S. She is an uncommon case, and we reject her from the means, as one of those vessels which these *Sailing Directions* can do very little towards helping along, for when they get into good winds they have not the capacity to profit much by them.

Now, the navigator will observe a little more uncertainty as to the time it will take him to go from 50° S. to California. Here, the difference between the shortest run to the line and the mean, is 11 days; in January, it was 8. Also, the difference between the longest time and the average to the line, is 16 days; in January, it was but 11.

Unequal, uncertain times, are the exponents of uncertain and unsettled winds.

In April, the Newcastle is the black sheep. Her performance, because it is out of rule, and an exception to that of ships generally, is rejected from the means.

In April, there is seldom a succession of very good winds. In this month the average winds of the winter months prevail for a little more than half the time south of the line, and for about one-third north.

Some fine ships are on the April list; there are about a dozen of them; yet one-third of the whole number in January bear off, each one of them, the palm from the best one of these; not so much, as the Charts show, by reason of better heels as by reason of better winds.

The probabilities are, that many ships will pass this way in April before one is found to beat the Swordfish; for, though she had 46 days from 50° S. to "The Heads," there is but one, the Star of the Union, that led her to the line—and she only a day—and none that came within hail of her thence to San Francisco.

She made the whole run in 46 days; 45 is the possible minimum limit for this month.

In May, we will take the Arcole into the account, though her passage does exceed the mean, 22 days. In this month, though the passage is much more tedious than in the winter months, yet it is nearly as certain. The difference between the extremes, and the mean, being 12 and 9 for May, 8 and 11 for January, 9 and 13 for February, and 7 and 13 for December.

In this month, though the average from 50° S. to the line, is the same as the average from the equator

to San Francisco, yet we are struck with the contrast which the individual cases afford as to the prevailing character of the winds, north and south of the equator.

On the north side, the greatest difference between the mean and the extreme is with the maximum; on the south side, it is with the minimum; showing that, from 50° S. to the line, a vessel is much more liable to meet with winds that will drive her a week or ten days ahead of her time, than she is with airs and calms, that will keep her back even for 7 days. While north of the line, she is much more liable to be beset by calms and airs, that will keep her from 10 days to two weeks behind the average, than she is to meet with winds that will set her 5 days even ahead of the average.

The clever and observant mariner may gather from these tables of crossings much valuable information as to the character and strength of the winds he is to expect.

As an example, take the May crossings. Suppose the average from 50° S. to the line was 30 days, as it is, and that, in casting his eye up the column, "Days from 50° S. to the Line," he should see all the passages ranging from 24 to 26 days, except some three or four, and that these should be 60, 40, and so on. He would conclude that, generally speaking, he was pretty sure in this month of regular or certain winds, and that it is only occasionally that navigators would be delayed here for the want of winds.

Suppose, on the other hand, when he casts his eye up the other column, to examine the time of each ship from the line to San Francisco, greater irregularities are observed, as one passage of fourteen days, another of sixty, and so on; what would be his conclusion? Why, certainly, that in that part of the ocean, in May, the winds would be most uncertain; sometimes a roaring storm, sometimes a raging calm; but always extremes, and that no reasonable reliance could be placed on them.

It is hard to go quickly to San Francisco from the line at this season. The Sea Serpent and the Houqua have each done it in twenty-four days; but they were respectively twenty-eight and twenty-nine days from 50° S. On this part of the route, though they did their best, they fell behind the Stag Hound, the George Morton, the Empress of the Seas, the Archer, and, more than all, the Surprise, from a week to ten days.

A vessel, that shall make the run from 50° S., in May and June, to the Heads of San Francisco in forty-two days, will win laurels for her master.

In June, thirty-one days is the average to the line; and a vessel here is more apt to be a week ahead of the average than she is to be a week behind her time. This results from the fact that a great many vessels are a day or two behind time, with occasionally one a great away ahead. Of course, this brings down the average.

A bad month is June from the equator north, as it is from 50° S. to the equator.

In July begins the dawn of better times. There is the Flying Cloud's famous performance of seventeen days from 50° S. to the line, and nineteen thence to The Heads, to grace this month. The Staffordshire, in this month too, had eighteen and the N. B. Palmer nineteen days each, also, from the line.

August and September are both good months south of the line. But from the line up, the navigator

finds his patience, quite as much as his skill, brought into requisition. I shall have more to say in another place, as to the causes which make the passage along here, in these months, so vexatious.

In October, the winds are decidedly better and more steady, both north and south of the equator.

There are the Winged Arrow, with 20, and both the Raven and the Samuel Russell, each with her 21 days in this month, from 50° S.; and from the line north, we have the Sovereign of the Seas, with 17, and both the Typhoon and the Sea Witch, each with 18 days.

If we throw out from the average the 40 days of the Boston, which appear to be owing to some defect of the ship, quite as much as to any want of winds, we shall have the very slight difference between the mean and extremes of this month, both to and from the line, viz. 6 and 10 days to, with 8 and 6 from the line.

In November, the chances for a good run from 50° S. to California, are still better. In this month, though we have more vessels, yet the difference between the mean of the whole and the extremes, *i. e.* the best and the worst of all the passages made to the line, is 5 and 6 days. Few passages, through trades, calms, and variables, for 3,500 miles, are more regular on the average than this.

It was in this month that the Comet crossed 50° S., and made her beautiful run of 16 days from the line to The Heads.

In December, we have the best running and the best averages of all. The Wild Pigeon, the Flying Dutchman, the Flying Fish (on two trips), the Jno. Gilpin, the Westward Ho, the White Squall, and the Comet, all famous ships, have made this month itself famous for quick runs.

With the view of pointing out the shortest route from 50° S. to the line, in the fair way to California, I have selected from the tables already presented, the monthly mean of the best passages for each month. I have tabulated also the monthly mean longitude in which the vessels making these mean passages crossed the parallels named, including the equator.

Monthly Mean of Best Passages.

MONTH.	Mean of the best	BEST LONGITUDE FOR CROSSING THE PARALLELS OF—						From 50° S. to 0°.	From 0° to San Francisco.
		50° S.	40° S.	35° S.	30° S.	25° S.	0°.		
								Days.	Days.
January . . .	9	80° 00′	83° 00′	87° 00′	90° 00′	92° 00′	111° 00′	22½	21
February . .	8	81 00	85 00	88 00	90 00	93 00	111 00	25	20
March . . .	13	82 00	85 00	88 00	89 00	93 00	110 00	25	24
April	9	83 00	87 00	86 00	89 00	92 00	109 00	24½	30
May	12	82 00	85 00	87 00	87 00	90 00	109 00	24¾	30¼
June	11	82 00	84 00	86 00	89 00	91 00	110 00	27	28
July	6	82 00	88 00	90 00	92 00	95 00	115 00	23	28
August . . .	8	84 00	86 00	85 00	87 00	90 00	108 00	25	31
September . .	4	82 00	86 00	87 00	87 00	90 00	111 00	21	24
October . . .	12	80 00	82 00	84 00	86 00	89 00	110 00	24	23
November . .	11	83 00	85 00	84 00	84 00	88 00	108 00	24	23
December . .	10	83 00	83 00	84 00	87 00	91 00	113 00	22	21

It appears that in January, February, March, and April, decidedly the best place for crossing the line is between 115° and 120° W. That the quickest runs for each of the first three months were made by crossing between 110° and 115°. Also, in May and September, the quickest runs were made by these same crossings, and that the quickest passages in April, August, and October, were made by crossing between 115° and 120°.

But a careful examination of the tables will show that the best average crossing-place of the line in winter and spring, is west of 115°; that in May, the best crossing-place begins to fall east of this meridian, and to approach that of 110° more and more until August, when it is, say, 108°. It now commences to go west again, being good anywhere between 110° and 120°, or even 125°, until winter, when it settles down east of 115° again.

This table shows that the mean crossings on the best trips are for the most part west of the usual route pursued by vessels generally. The mean crossings on the shortest trips are west of the average crossings for each month, except for May, October, and November. In the last two, the average crossings of the whole and of the best, are nearly coincident; and so they are from 50° south to the trade-winds in May, when the best route seems to trend a little more to the eastward. From April to August inclusive, appear to be the most difficult months for quick passages.

This table is well calculated to impress upon the attention of navigators the propriety of the injunction, which, in the present and former editions of this work, I have endeavored, with oft-repeated emphasis, to impress upon them: *As you double Cape Horn, and get on the Pacific side, make as much westing with your northing as you can, aiming to cross the parallel of* 50° *south, as far at least as* 85° or 90° *west.* Do not beat nor dally with *baffling winds* to do this, for you want to lose no time in getting to the north.

With the view, however, of showing the best crossings of the line, I have divided it into lengths or crossings of 5° of longitude, beginning with the meridian of 95° W.; and, with the assistance of Lieut. Minor, Passed Midshipman A. A. Semmes, and O. C. Badger, am enabled to present the following tables, which show the monthly crossing of each division; the time from the United States to this equatorial place of crossing; the time thence to San Francisco, and the total length of passage from the United States:—

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific; the Time and Place of crossing the Equator, with the Passage thence to California, for each Month.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	From the line to California.	From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
Virginia	Cardiff		Dec. 21, 1852	99° 59′W.	43		43	
Whiton	New York	107	March 13, 1847	93 15	42	107	42	149
Ocean Bird	"	140	May 24, 1849	99 25	38	140	38	178
Stag Hound	"	91	June 1, 1852	99 20	34	91	34	125
Louisa Bliss	Beaufort, N. C.	153	8, 1850	100 00	52	153	52	205
Horsburgh	New York	96	29, 1852	98 30	33	113	40.0	153
Chatham	Boston	130	Sept. 22, 1849	99 15	39	130	39	169
CROSSING BETWEEN 100° AND 105° W. LONG.								
Adelaide	New York	144	Feb. 5, 1853	104 06	34	112	29	141
Golden Gate	"	80	24, 1853	104 37	24			
Europe	"	114	March 17, 1852	100 00	35	112.5	28	140.5
George Brown	Philadelphia	111	14, 1851	104 45	22			
John Holland	New York	134	April 16, 1853	102 28	24	122	27	149
Great Britain	"	110	28, 1852	104 30	30			
Sea Serpent	"	82	May 5, 1853	102 03	26	82	30	112
Anonyma	Boston		23, 1849	102 40	34			
Sea Serpent	New York	88	June 5, 1852	101 72	25			
Governor Morton	"	91	12, 1852	101 43	32			
Sweden	Boston	117	26, 1849	102 20	38	120	34	134
Michael Angelo	New York	113	27, 1852	102 09	36			
Hampton	"	130	29, 1853	102 25	39			
Thomas B. Wales	Boston	100	July 3, 1852	102 51	33			
White Squall	New York	84	3, 1852	100 26	26			
Empire	"	97	8, 1852	102 01	35	100	32	132
R. C. Winthrop	Boston	108	12, 1852	104 07	33			
North America	New York	112	27, 1852	100 27	34			
Messenger	"	88	Aug. 29, 1852	102 32	34	89.5	31	120
Union	"	91	31, 1852	101 10	28			
Carioca	Philadelphia	116	Sept. 6, 1852	100 56	41	117.5	40.5	157.5
Copeland	Boston	119	7, 1852	103 43	40			
Cohota	"	110	Oct. 5, 1852	104 09	26			
Albany	New York	127	6, 1852	101 34	38	108	29	137
Sea Witch	"	87	27, 1851	101 30	23			
Raven	"	93	Nov. 2, 1852	104 32	29	95	25.5	120.5
Samuel Russell	"	97	17, 1852	101 30	22			
Monsoon	Boston	100	Dec. 6, 1852	103 53	26	100	26	126
CROSSING BETWEEN 105° AND 110° W. LONG.								
Revere	New York	111	Jan. 3, 1852	109 30	26			
Wild Pigeon	"	88	10, 1852	108 59	17	96	22	118
Golden Gate	"	90	12, 1852	106 00	23			
John Jay	New Bedford	133	Feb. 6, 1850	105 10	37			
Gray Feather	New York	100	17, 1852	109 27	26			
Tingqua	"	87	19, 1852	106 25	28			

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific—Continued.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	From the line to California.	From the U. S. to California.
		Days.			Days.	Days.	Days.	days.
Hazard	New York	107	Feb. 21, 1851	109° 30′W.	24			
Helena	"	113	19, 1851	110 00	21	111	29	140
Russell	"	128	7, 1850	110 00	37			
F. W. Brune	"	122	March 2, 1853	106 56	29			
Winged Racer	"	85	7, 1853	106 24	23			
John Bertram	Boston	86	8, 1853	109 47	19			
Cygnet	"	125	8, 1853	109 00	30			
Sartelle	New York	135	29, 1850	107 15	34			
Whiton	"	112	15, 1848	109 05	28	105	26	141
Samuel Appleton	"	103	23,	109 30	18			
Golden West	Boston	101	24, 1853	107 04	23			
Uriel	"	86	30, 1851	109 45	34			
Benjamin Howard*	"	95	29, 1852	110 00	25			
Sch'r Walter (*via* Rio)	New York	121	April 10, 1853	108 33	25			
Wisconsin	"	94	22, 1852	106 00	30	123	31	154
Herman	Philadelphia	155	11, 1850	108 00	37			
Gray Feather	New York	108	May 1, 1851	109 45	28			
Star of the Union	"	97	5, 1853	106 38	27			
Golden Racer	Boston	96	6, 1853	108 45	34			
Simoom	New York	107	6, 1853	106 41	26	104	31	135
Governor Morton	"	97	15, 1853	109 01	26			
Tornado	"	84	17, 1852	107 07	44			
Aurora	Nantucket	140	30, 1849	110 00	31			
Kate Hays	New York	122	June 3, 1852	109 16	31			
New York	"	103	3, 1853	107 30	35			
Herculean	"	119	8, 1853	109 21	35			
H. Birckhead	Baltimore	111	17, 1853	109 00	31			
Lantao	New York	94	23, 1853	105 55	30			
Vandalia	"	126	2, 1850	107 30	36			
Masconoma	"	123	4, 1850	108 00	45	113	35	148
Sherwood	Boston	106	25, 1851	108 45	40			
Climax	"	88	24, 1853	106 30	27			
Ino	New York	99	19, 1851	109 30	34			
Adirondack	"	151	12, 1850	109 40	49			
Home	Baltimore	109	10, 1850	110 00	39			
Roscoe	New York	121	27, 1853	109 45	27			
Gazelle			July 9, 1849	105 30	30			
Edgar	"	126	2, 1850	108 15	39			
Staffordshire	Boston	83	24, 1852	108 01	18	104	28	132
Cohota	"	103	19, 1850	109 45	23			
Ellen Noyes	"	111	Aug. 6, 1852	107 30	33			
Flying Cloud	New York	95	17, 1852	105 20	19	103	26	129

* CAPT. SHRIEVE TO LIEUT. MAURY: "I approve of the route laid down by you. I have had much experience at sea, as shipmaster, in all quarters of the globe, and heartily concur in your views respecting passages. I also believe the day is not far distant when passages to California will be made frequently in one hundred days. I have often been amazed in viewing tracks of different ships to this port, and those who have the longest passages have been broad off the *right track*. The Benjamin Howard is a medium clipper, seven hundred tons. You will notice I have beat the whole fleet that sailed about the time I did; experienced all sorts of weather on the passage; neither tore a sail nor lost a spar the whole passage."

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific—Continued.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	From the line to California.	From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
Mermaid			Sept. 21, 1851	105° 45′W.	27			
Eliza Mallory	New York	115	10, 1852	108 42	37	128	30	158
Eureka	"	141	15, 1851	108 20	25			
Butler								
Telegraph	"	102	Oct. 22,	109 30	23	102	23	125
Seaman	"	102	Nov. 13, 1852	109 41	26			
Boston	Rio de Janeiro	81	27, 1849	106 00	40	91	33	124
Horton	New York	151	Dec. 23, 1850	109 15	33	151	33	184
CROSSING BETWEEN 110° AND 115° W. LONG.								
Wild Pigeon	New York	104	Jan. 14, 1853	112 20	24			
Flying-Fish	"	74	13, 1853	112 00	18			
Anstiss	Richmond, Va.	116	22, 1853	110 00	25			
Swordfish	New York	71	21, 1852	110 15	20	97	24	121
Ambassador	"	127	16, 1849	112 35	32			
Celestial	"	84	23, 1852	113 30	23			
George Raymond	Boston	102	23, 1852	114 34	25			
Trade-Wind	New York	85	Feb. 7, 1853	112 20	16			
Capitol	Richmond, Va.	112	7, 1853	113 00	20			
Realm	New York	138	8, 1853	113 35	35			
Contest	"	84	9, 1853	111 06	16			
Telegraph	Boston	96	18, 1853	112 00	20	108	24	132
Cygnet	New York	118	26, 1850	111 15	29			
Lawrence	"	134	28, 1850	113 45	26			
Alboni	"	99	28, 1853	113 44	28			
Surprise	"	80	March 3, 1851	110 30	17			
Winthrop	Boston	116	3, 1851	110 30	29			
Potomac	Portland	133	3, 1851	111 20	32			
Living Age	New York	108	12, 1853	112 25	20			
Storm	"	87	17, 1853	110 32	23			
Anna Kimball	"	110	22, 1853	114 10	22	111	25	136
Bald Eagle	"	88	23, 1853	111 15	19			
Danube	"	130	23, 1853	110 32	26			
Bothnia	"	123	24, 1851	112 15	25			
Kentucky	Boston	122	26, 1853	113 08	25			
Hannibal	"	120	22, 1850	114 45	40			
Phantom	"	90	April 6, 1853	113 32	14			
John Steward	New York	111	11, 1853	112 34	32			
Russell Glover	"	115	14, 1850	113 00	21			
Celestial	"	98	16, 1853	110 06	22			
Rattler	"	98	16, 1853	114 08	23			
Daniel			28, 1851	113 15	33	106	27	133
Alhesdrough	"	104	26, 1853	113 36	32			
Aldebaran	Boston	123	27, 1852	110 05	35			
Sea Serpent			22, 1851	114 15	25			
Esther May	Boston	112	28, 1853	113 00	33			
Susquehanna	Philadelphia	108	May 1, 1851	113 25	29	109	28	137

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific—Continued.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	From the line to California.	From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
F. Depau	New York	139	May 20, 1850	112° 45′W.	27			
Stag Hound	"	93	4, 1851	113 30	21			
Masconoma	Boston	122	7, 1853	110 07	37	109	28	137
Swordfish	New York	84	7, 1853	114 02	24			
Surprise	"	87	June 8, 1853	110 43	30			
Paragon	"	120	8, 1853	113 25	41			
Archibald Gracie	Boston	111	11, 1850	111 00	36			
Sirocco	New York	117	12, 1853	111 30	28			
Delia	"	128	10, 1851	114 00	34			
Morgan Dix	"	107	13, 1853	110 30	36			
Tigress	Salem	132	1, 1850	114 30	33	113	33	146
Seaman's Bride	New York	92	19, 1853	114 55	29			
Rose Standish	"	111	20, 1850	113 00	45			
Competitor	Boston	89	24, 1853	114 00	25			
Parthian	Richmond, Va.	94	25, 1853	111 20	28			
Emily Minor (*via* Juan Fernandez)	New York	170	27, 1853	113 55	32			
Flying Eagle (*via* Rio)	Boston	109	July 7, 1853	114 40	34			
Hornet	New York	87	23, 1853	112 54	20			
John Land	Boston	94	25, 1853	114 47	31	109	31	140
Venice	New York	107	14, 1850	114 45	30			
Abbot	Bordeaux	126	23, 1852	113 15	38			
Amity	Boston	132	15, 1850	115 00	31			
St. Patrick	New York	118	Aug. 14, 1850	110 45	34			
Isaac Allerton			13, 1850	111 15	34			
Caroline	"	127	11, 1850	113 30	36			
Sarah and Eliza	"	180	12, 1849	113 40	36	117.5	31.8	149
N. B. Palmer	"	88	2, 1851	114 00	19			
Victory	"	103	2, 1853	112 45	32			
Witch of the Wave	Boston	89	18, 1851	115 00	32			
N. B. Palmer	New York	101	Sept. 6, 1852	113 49	24			
Templeton	Bucksport	126	10, 1850	112 30	27			
Southerner	New York	141	16, 1852	112 10	33	119	29	148
Lady Arabella	"	138	4, 1850	113 00	33			
Virginia			2, 1850	114 00	33			
Witch of the Wave	Boston	90	21, 1852	113 50	25			
Thomas Perkins	New York	100	Oct. 25, 1849	110 45	26			
Columbia	Boston	133	12, 1850	111 45	35			
Jamestown	New York	103	20, 1852		25			
Raven	Boston	85	29, 1851	112 00	20			
Typhoon	New York	87	30, 1851	114 41	19	100	25	125
Eagle	"	101	20, 1851	115 00	28			
Carrington	"	103	5, 1850	115 00	26			
Celestial	"	83	11, 1850	115 00	21			
Talbot	"	139	Nov. 12, 1850	115 00	31			
Valparaiso	"	138	2, 1851	115 00	30	116	25	141
Winged Arrow	Boston	95	4, 1852	114 39	22			
Sea Witch	New York	91	22, 1852	114 10	17			
John Wade	"	94	Dec. 15, 1852	110 30	23			
Thos. W. Sears	"	124	21, 1852	112 59	21	107.7	24.7	132
Senator	"	105	26, 1852	111 00	30			

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific—Continued.

CROSSING BETWEEN 115° AND 120° W. LONG.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	From the line to California.	From the U. S. to California.
		Days.				Days.	Days.	Days.
John Gilpin	New York	78	Jan. 15, 1853	116° 00′W.	16	77.5	19.5	97
Flying Fish	Boston	77	22, 1852	119 50	23			
Seaman	New York	89	Feb. 20, 1850	118 00	18	89	18	107
Flying Childers	Boston	91	March 19, 1853	117 21	22			
Newton	"	124	10, 1851	117 10	26			
Lucia Field	"	120	19, 1851	119 15	31	116	26	142
Lantao	New York	103	21, 1851	118 00	20			
Canton	"	136	28, 1849	118 00	29			
Southerner	"	120	30, 1851	117 00	28			
Eagle	"	92	April 9, 1853	115 30	21			
Tornado	"	79	10, 1853	118 10	22			
Amelia	"	111	29, 1853	116 41	23	97	24	121
Isabelita Hyne	"	101	23, 1851	116 00	24			
Maria	"	111	16, 1851	117 00	32			
Samuel Russell	"	90	15, 1850	118 30	20			
Lucknow	Boston	111	May 6, 1853	117 50	27			
Astrea	New York	138	20, 1853	115 49	35			
Diadem	"		22, 1850	116 00	36	113	30	143
Arcole	Philadelphia	105	31, 1850	117 00	30			
Wisconsin	New York	100	31, 1850	118 45	24			
Valparaiso	"	114	31, 1850	119 00	28			
Stag Hound	"	95	June 5, 1853	116 03	26			
Archer	"	108	8, 1853	115 08	37			
Houqua	"	120	21, 1853	115 11	24			
Empress of the Seas	"	89	10, 1853	115 30	32	112	32	144
St. Lawrence	"	141	29, 1853	116 15	37			
Robert Harding	Boston	126	28, 1853	116 36	39			
Houqua	New York	103	25, 1850	115 15	28			
Sarah Boyd	Philadelphia	129	July 15, 1850	115 15	32			
Raduga	New York	116	28, 1851	118 00	25	114.5	28	142.5
Sheridan	"	103	2, 1850	118 30	28			
Herman	"	110	30, 1849	120 00	27			
Finland	Philadelphia	133	Aug. 6, 1850	117 15	42	133	42	175
Gertrude	New York	116	Oct. 8, 1850	116 00	30	99.5	25	124.5
Sovereign of the Seas	"	83	27, 1852	119 47	20			
Comet	"	88	Dec. 28, 1851	117 00	16	88	16	104

CROSSING BETWEEN 120° AND 125° W. LONG.

Westward Ho	Boston	89	Jan. 13, 1853	122 06	18	89	18	107
Acasta	Sag Harbor	171	March 10, 1851	120 30	28	171	28	199
Kensington	New York	129	June 24, 1851	122 45	39	129	39	168
Tartar	Philadelphia	104	July 24, 1851	121 30	30	103.5	30.5	134
Uncle Toby	Boston	103	31, 1853	121 15	31			
Flying Cloud	New York	71	Aug. 12, 1851	124 00	19	71	19	90

CROSSING WEST OF 125° W. LONG.

Tagus	New York	126	June 15, 1851	128 00	46	126	46	172

Average Length of best Passages of California-bound Vessels from the Atlantic Ports of the U. S. to the Equator in the Pacific, and from the Equator in the Pacific to San Francisco—arranged according to the Month and the Longitude of crossing the Equator.

Month of crossing the equator in the Pacific.	From U. S. to the equator in the Pacific.	No. of passages from which averages are determined.	Averages from the equator to California.	No. of passages from which averages are determined.	Place of crossing the equator in the Pacific.	Average from U. S. to California.	Average passage of the whole month from U. S.	Shortest passage from the U. S. for the month.
	Days.		Days.		Between	Days.	Days.	By the
January . . .	96	3	22	3	105—110	118		
	97	7	24	7	110—115*	121	116	*Swordfish, 91 days.
	77	2	19	2	115—120	96		
February . .	112	2	29	2	100—105	141		
	111	6	29	6	105—110	140		
	108	8	23	8	110—115*	131	134	*Contest, 100 days.
	89	1	18	1	115—120	107		
March . . .	107	1	42	1	90—95	149		
	103	10	26	10	105—110	129		
	111	11	25	11	110—115*	136	135	*Surprise, 97 days.
	115	6	26	6	115—120	141		
April	122	2	27	3	100—105	149		
	123	3	31	3	105—110	154	134	
	106	8	27	10	110—115	133		
	97	6	24	6	115—120*	121		*Tornado, 101 days.
May	140	1	38	1	95—100	178		
	82	1	30	2	100—105*	112		*Sea Serpent, 108 days, and the *Swordfish, 108 days.
	104	7	31	7	105—110	135	138	
	109	5	28	5	110—115*	137		
	114	5	30	6	115—120	144		
June	113	3	40	3	95—100	153		
	108	5	33	5	100—105*	141		*Sea Serpent, 113 days.
	113	13	35	13	105—110	148	146	
	113	12	33	12	110—115	146		
	112	7	32	7	115—120	144		
July	100	5	32	5	100—105	132		
	104	3	28	4	105—110*	132		*Staffordshire, 101 days.
	109	6	31	6	110—115	140		
	114	4	28	4	115—120	142	136	
	103	2	30	2	120—125	133		
August . . .	89	2	31	2	100—105	120		
	103	2	26	2	105—110	129		
	117	6	32	7	110—115	149		
	133	1	42	1	115—120	175	138	
	71	1	19	1	120—125*	90		*Flying Cloud, 90 d'ys.
September . .	130	1	39	1	95—100	169		
	117	2	41	2	100—105*	158		*Witch of the Wave, 115 days.
	128	2	30	3	105—110	158	154	
	119	5	29	6	110—115	148		
October . . .	108	3	29	3	100—105	137		
	102	1	23	1	105—110	125	127	
	99	8	25	8	110—115	124		
	99	2	25	2	115—120*	124		*Sovereign of the Seas, 103 days.
November . .	95	2	25	2	100—105	120		
	91	2	33	2	115—110	124	131	
	116	4	25	4	110—115*	141		*Sea Witch, 108 days.
December . .	100	1	26	1	100—105	126		
	151	1	33	1	105—110	184		
	107	3	24	3	110—115	131	134	
	88	1	16	1	115—120*	104		*Comet, 104 days.
Average for year	107		29			136	136	

Let us see what light the information, contained in these two tables, will throw upon the best California route, as well as upon the best season of the year for that voyage.

The shortest monthly mean is 116 days, and that is for the vessels that crossed the equator in the Pacific, during the month of January. And to this crossing they had an average run of 90 days. Vessels, therefore, for California, that sail from the United States the latter part of September and in all October, are the vessels which, upon an average, should have the fairest winds and make the best passages.

On the contrary, those that are just arriving out when these are sailing, are the vessels which, on the average, have the longest passages. Those that cross the equator in September are those that sail from the United States and Europe in March and April. Their average to the line in the Pacific is four months (121 days).

The shortest passage yet made to California at any season, was made by the Flying Cloud. She sailed from the United States about 1st of June, and crossed the equator in the Pacific, 12th August, between 120° and 125° W.

The Swordfish had also a run of 71 days to the line. She sailed from the United States in the fall, the most favorable time, and crossed the equator in the Pacific in January between 110° and 115°. And the next is by the Flying Fish in the same month, but in 74 days.

The crossings that have given the shortest passage to San Francisco for each month are marked (p. 717) with an asterisk (*), and the name of the vessel quoted in the last column.

It is of some consequence, in deciding as to the best crossing-place on the equator, that the navigator should have an idea as to the parallels near which he may expect to lose the S. E. trades; for the equatorial limits of these winds change with the season.

In March, you will occasionally carry them several degrees over into the northern hemisphere. But in this month they are generally near the verge of their extreme declination towards the south. When you lose them and get the N. E. trades, keep away with a good rap full, never aiming to cross the parallel of 20° north to the east of long. 125° west. Unless the winds force you off, aim to be in shore of the meridian of 130° W. when you lose the N. E. trades.

When you do lose them, if then you have to fight the calms and baffling winds of the horse latitudes, make the best of your way on a due north course, till you cross this belt of calms, or catch a good wind, or get into the variables beyond. I shall have more to say upon this subject.

In April, you will carry these trades for a little farther, and so on farther and farther until October, when the northern edge of them becomes stationary and commences to return south. It reaches its farthest parallel of southern declination in March or April.

It may be well here to make a remark as to the influence of extensive arid plains which the navigator may find to the east of him as he sails across the belt of the N. E. or the S. E. trade-winds.

In the summer and fall, the influence of these winds is felt far out to sea. The monsoons of India are due to such an influence; so are the monsoons in the Atlantic; in the Gulf of Mexico; and in the Pacific off the coasts of Central America; and so, indeed, are all monsoons produced.

Why, then, not have a monsoon in the southeast trades of the Pacific, since South America and the pampas of Buenos Ayres are to windward of them?

In the first place, the Andes stand up as a screen between them and those plains; and in the next place, those plains are neither so very extensive nor so arid when we come to compare them with the vast deserts of Africa and Asia.

But, nevertheless, in order to keep away from the land, and clear of its influence, though feeble upon the winds of the south Pacific, navigators should, when winds are fair and opportunities favorable, endeavor to make, while they are well to the south, westing enough to keep clear even of the slight influence that the land in South America exerts upon the winds along its west coast.

Therefore, after you have doubled Cape Horn, and gained an offing from the land, there is no necessity for running a thousand miles or more off from the South American coast, as from the coasts of Central America you have to do, in order to get better winds. The chief advantage of making, while south of the parallel of 35° or 40° S., the meridian near which you intend to cross the equator, is, that there the degrees of longitude are short, and therefore easy to run down; and that when you have made your westing down there, you can spread the more canvas when you get the S. E. trades, which you will then have on the quarter. If you put off making westing until you get these winds, you will then have to stand away to the northward and westward through them, which course will bring them aft, and therefore make them less favorable.

The Flying Cloud's track beautifully illustrates this view. On her celebrated passage, she passed along the west of South America, in the southern winter time, when the influence of the land there, upon the winds is the least. She crossed the line in August, in 124°, far beyond the influence of the disturbing agents in North America.

This passage, however, of the Flying Cloud should be alluded to, not as a rule, but rather as an exception. Nevertheless, she does not so out-top all hope of reasonable expectations, that other ships may not strive to surpass her. For, though she has set a good example, that example will yet be more than followed.

I pronounced her passage at the time to be one of the most remarkable that had ever been made under canvas in any quarter of the world. Other ships have since astonished the world by their performances. But the Flying Cloud's to California is still the shortest, and is therefore *remarkable.* Much greater distances have since been accomplished in less time. Claims have also been set up to greater speed than hers in twenty-four hours; but those claims have not been accompanied by details sufficient to justify me in any decision under which the palm which she has so gallantly won and so proudly worn, may be borne off by another as yet.

She passed inside of the Falkland Islands on the 20th of July, and on the 24th, was around the cape, having, in the meanwhile, rode out a furious gale that lasted two days.

In lat. 37° S., July 31, she took the wind from the southward and eastward, and so carried it to lat. 12° N. in 127° W.; having crossed the line in the Pacific, August 12, in 124° W.

She was a day in the doldrums, between these two systems of trade-winds. Finally, she took the

N. E. trades about the parallel of 14° N. in 127° W. They held on to the *north* of N. E., having forced her on the 24th as far as 142°, on the parallel of 35° N.; from which point, after fighting for 5 days with the wind from the northward and eastward, right in her teeth, she had two days of N. W. winds, which she got as she neared the shore, and so ran into the harbor of San Francisco at daylight of Sept. 1.

For 26 days consecutively, this ship averaged, according to her abstract log, two hundred and twenty-seven two fifth nautical miles a day; her least performance for any one of these days being 93 miles, and her greatest THREE HUNDRED AND SEVENTY-FOUR; 374 nautical miles are equal to 433¼ English or statute miles; which gives the extraordinary feat of a vessel, under canvas, having averaged for 24 consecutive hours the enormous rate of $15\frac{7}{12}$ knots, or *eighteen statute miles per hour.*

It appears from the summing up, that the average passage to California for all classes of ships that use the Charts, is, the year round, 136 days. When these investigations commenced, the average passage the year round, of all classes of ships from the Atlantic ports of the United States to California, was 180 days.

For that part of the route between New York and the line in the Atlantic, the average time saved is ten days to each ship: for the average passage to the equator in the Atlantic, was by the old route, 41 days; it is now by the new, 31.

The following table may be interesting. It gives the crossing-places of the line in the Pacific, and the time from the United States, with the names of many of the vessels by which the shortest passage in each month was made.

Name of Ship and Place of crossing the Equator in the Pacific, on the Shortest Passages for each Month.

NAME OF VESSEL.	To line in Pacific.	Place of crossing.	Line to California.	Total from U. S. to California.	Crossed the line in the month of
	Days.		Days.	Days.	
Flying Fish	74	112° 00′ W.	18	92	January.
John Gilpin	78	116 00	16	94	"
Flying Fish	77	120 00	23	100	"
Swordfish	71	110 00	20	91	"
Celestial	84	113 00	23	107	"
Wild Pigeon	88	109 00	17	105	"
Golden Gate	90	106 00	23	113	"
Westward Ho	89	122 00	18	107	"
Contest	84	111 00	16	100	February.
Trade Wind	85	112 00	16	101	"
Seaman	89	118 00	18	107	"
Hazard	107	109 00	24	133	"
Helena	113	110 00	18	131	"
Bald Eagle	88	111 00	19	107	March.
Storm	87	110 00	23	110	"
Flying Childers	91	117 00	22	113	"
Surprise	80	110 00	17	97	"
Samuel Appleton	103	110 00	18	121	"
Tornado	79	118 00	22	101	April.
Eagle	92	115 00	21	113	"
Phantom	90	113 00	14	104	"
Celestial	98	110 00	22	120	"
Samuel Russell	90	118 00	20	110	"
Russell Glover	115	113 00	21	136	"
Swordfish	84	114 00	24	108	May.
Stag Hound	93	114 00	21	114	"
Stag Hound	90	96 00	34	124	"
Tornado	84	107 00	44	128	"
Stag Hound	95	116 00	26	121	June.
Surprise	87	111 00	30	117	"
Competitor	89	114 00	25	114	"
Empress of the Seas	89	115 00	32	121	"
Seaman's Bride	92	115 00	29	121	"
Sea Serpent	88	101 00	25	113	"
Governor Morton	91	102 00	32	123	"
Hornet	87	113 00	20	107	July.
John Land	94	115 00	31	125	"
Staffordshire	83	108 00	18	101	"
Cohota	103	110 00	23	126	"
Empire	97	102 00	35	132	"
Thomas B. Wales	100	103 00	33	133	"
Flying Cloud	71	124 00	19	90	August.
N. B. Palmer	88	114 00	19	107	"
Union	91	101 00	28	119	"
N. B. Palmer	101	114 00	24	125	September.
Witch of the Wave	90	114 00	25	115	"
Templeton	123	112 00	27	150	"
Jamestown	103		25	128	October.
Sovereign of the Seas	83	120 00	20	103	"
Raven	85	112 00	20	105	"
Celestial	83	115 00	21	104	"
Typhoon	87	115 00	19	106	"
Sea Witch	91	114 00	17	108	November.
Winged Arrow	95	115 00	22	117	"
Raven	93	105 00	29	122	"
John Wade	94	111 00	23	117	December.
Comet	88	117 00	16	104	"
White Squall	From Rio	124 00	14		"

In urging upon California-bound vessels the importance of making westing about the parallel of 50°, S., I do not mean that they should expose themselves to heavy weather, or contend against adverse circumstances, in order to get west on this part of the route; I simply mean that, if a vessel, after doubling the cape, can steer a W. N. W. course as well as a N. W.; or a N. W. as well as a N. N. W.; or a N. N. W. as well as a N. course, that she should on all such occasions give preference to the course that has most westing in it, provided she do not cross 50° S. to the westward of 100° or thereabouts; nor 30° S. to the westward of 120°; nor enter the S. E. trade-wind region to the west of the last-named meridian. This is the western route. It is so called because it requires you to keep as far west within certain limits as well you may without running broad off to make westing, or without fighting with head winds, or baffling winds, or calms, to get west.

The western route from Cape Horn to California is to be preferred by all vessels that double the Horn from May till October inclusive. This route lies well out from the land; so that the influence of the land upon the winds will not be as marked as it is at the same season along the eastern or usual route.

The farther from the land, the more regular and steady the wind, may be safely taken as a general rule.

There is much more land in the northern than in the southern hemisphere; and the action of the sun's rays in our summer time upon this excess of the land, very materially interferes, as my researches abundantly prove, with the regular course of the N. E. trades.

Where is there such a thing known as a regular monsoon in the southern hemisphere? The monsoons of India and the China seas are due this excess of land in our hemisphere. So are the African monsoons of the Atlantic, the monsoons of the Pacific, and those of the Gulf of Mexico. They are all produced by the action of the rays of the sun upon extensive deserts, or wide and arid plains in the northern hemisphere. There may be a monsoon about New Holland, but we are speaking of what we know certainly to be the case.

In the interior of North America, between the parallels of 30° and 40° N., there is an immense region of country that is parched with drought during the summer and fall; the influence of this region is, as I have before remarked, felt by the winds of the Gulf of Mexico, by the winds of the intertropical regions of the Pacific beyond Central America, and by the winds out upon the high seas, off the coast of California and Oregon;—these winds, for many miles out to sea, feel that influence, obey it, and assume the character more or less of monsoons during our summer and fall.

In the discovery of this fact we have the key to the California route, from the equator up.

A vessel that crosses the equator in August or September, as far as 120° or 125° W., is some 1,500 miles from the Continent, and about 2,500 miles from the centre of this disturbing agent. Being bound from the crossing to California, she has the belt of N. E. trades to cross. These winds blow with much more regularity to the west of 120° than they do at this season in with the coast. Having, therefore, to cross them, the vessel is enabled to do it by a course on the average, between N. N. W. and N. W. This course brings her out of them as far west, it may be, as 145°, about the latitude of San Francisco. But this is the season when N. W. and westerly winds most prevail in this part of the ocean also.

On account of the atmospherical disturbance situated in the interior of North America, as before explained, and in the latitude of San Francisco, or as high up as 40° (for that will be found occasionally not

too far for a vessel on the western route to go), the degrees of longitude are not long, and with fair winds it will not take many days for her, when near the parallel of 40°, to run down 10° or 15° of longitude.

According to all these California passages, and the results which they show, it appears that it is *possible* for a vessel under canvas to make the run from New York to San Francisco in eighty-five days. And it does not appear that there has ever been a combination of circumstances and a succession of winds which would have made it possible for any vessel to have done this more than once or twice in the last three years. If the Flying Cloud or the Swordfish, after crossing the line in the Pacific, had met with the winds which the White Squall had thence to San Francisco, she would have made the run in eighty-five days. Eighty-five days may be regarded, therefore, as the shortest combined passage, and as the minimum limit of *possible* passages from any one of the Atlantic ports of the United States. It is therefore, we may infer, within the range of probability that the passage by ships, at their present rate of speed, may be made in eighty-five days from the Eastern States to California; but it is scarcely probable, for it is barely within the range of possibility, that it will ever be made in less time.

The Farallones, seven small islands about thirty miles from San Francisco, are in the fair way to the harbor. They afford a fine landmark, and should be made by all inward-bound vessels. The course from the South Farallone to the mouth of the harbor is about N. 73° E., *true*, distance 27 miles; or by compass N. E. by E. ¼ E. "The fort on the south point of the Island of Alcatraces," is said to be the best course in.*

Vessels upon approaching The Heads of San Francisco, especially in the winter months, are liable to be beset by fogs. I have reports of some vessels that have had fine runs all the way from the United States; and yet, when they got almost in sight of the port, have been enveloped with and delayed by fogs for many days.

The positions of the following-named points or places along the coast of California have been determined by the Coast Survey. They differ somewhat from the *Wind and Current Charts;* I therefore quote them in this place:—

San Clemente (S. E. end of Island of San Clemente) . .	33° 00′ 00″ N., 118° 34′ 00″ W.
San Nicholas (S. E. end of Island of San Nicholas) . .	33° 14′ 12″ N., 119° 25′ 00″ W.
San Luis Obispo (Bay of San Luis Obispo)	35° 10′ 37″ N., 120° 43′ 31″ W.
San Simeon (Bay of San Simeon)	35° 38′ 24″ N., 121° 10′ 22″ W.
†Point Pinos (Bay of Monterey)	36° 37′ 59″ N., 122° 00′ 10″ W.
Prisoner's Harbor (Island of San Miguel)	34° 01′ 10″ N., 119° 40′ 00″ W.
Cuyler's Harbor (Island of San Miguel)	34° 00′ 00″ N., 120° 20′ 27″ W.

* See *Sailing Directions* by Captain Cadwallader Ringgold, U. S. N., 1851.

† The only place named on the Charts. The others are small towns and harbors, the names of which are not on the *Wind and Current Charts*, though the places for them are.

The object of these Charts should not be forgotten by navigators. They are intended to illustrate the winds and currents; to show the tracks of vessels at sea, and to serve the practical purposes of the navigator until he reaches the land, when it is presumed he will be guided by Pilot's or local Charts, and not by the Track Charts for running into port.

THE ROUTE TO CALIFORNIA REVIEWED.

The passages to California afford many cases of beautiful navigation. The abstract logs which some of the ships in that trade return to this office, are studies. An examination of them often reveals instances of the most consummate seamanship, faultless management, and skilful navigation. These are, however, traits not peculiar to California traders alone; for many who are co-operating with me in this system of research, not only return well-kept abstracts of most beautiful observations from other parts of the ocean, but they bring to bear a degree of intelligence that is most charming.

But the California passage is the longest and most tedious within the domains of commerce; many are the vicissitudes which attend it. It tries the patience of the navigator, and taxes his energies to the very utmost; therefore, I address the above remark in particular to abstract logs from the California route.

It is a great race-course, upon which some of the most beautiful trials of speed the world ever saw have come off. Last summer, there was the race between the Flying Cloud and the Hornet. For three months and more, through fair winds and foul, in the storm and in the calm, these ships were neck and neck, seldom or never breaking tie throughout the entire length of that long race-course.

I regret that the abstract log of the Flying Cloud, which Capt. Creesy was under pledge to keep for this office, has not come to hand, that a description of this race might be given. It would no doubt serve to put some upon their mettle, and help to spur up others who are about to flag. Capt. Creesy returned his abstract as far as the equator in the Atlantic; since that, I have had nothing from him.

But there are other ships also that have run over this course. Among these are the Wild Pigeon, Capt. Putnam; the John Gilpin, Capt. Doane—alas! now no more—the Flying Fish, Capt. Nickels, and the Trade Wind, Capt. Webber. These are all clipper ships; they were ably commanded, and handled by their masters most beautifully. It was a sweepstakes; and to win, both speed and wind were essential.

The tracks of four ships are capital illustrations of what shipmasters may gain by recollecting that the information which the *Wind and Current Charts* spread before them, is not of my teaching, or that of any one person; that it is worth more than the experience of any single navigator, for it is the experience of thousands, expressed in lessons of easy comprehension.

Moreover, these abstract logs furnish accounts of a race, in which each ship being put upon her mettle, was driven at her topmost speed, the one almost in hail of the other, for three months, over a course of fifteen thousand miles in length.

All sailed from New York in the autumn of 1852. The Wild Pigeon, October 12; the John Gilpin, October 29; the Flying Fish, November 1; and the Trade Wind, November 14. It was the season for the best passages. Each one was provided with the *Wind and Current Charts.* Each one had evidently studied them attentively; and each one was resolved to make the most of them, and do his best. All ran against time; but the John Gilpin and the Flying Fish for the whole course, and the Wild Pigeon for part of it, ran neck and neck, the one against the other, and each against all. It was a sweepstake with these ships, around Cape Horn and through both hemispheres.

Wild Pigeon led the other two out of New York, the one by seventeen, the other by twenty days. But luck and chances of the winds seem to have been against her from the start. As soon as she had taken her departure, she fell into a streak of baffling winds, and then into a gale, which she fought against and contended with for a week, making but little progress the while; she then had a time of it in crossing the horse latitudes. After having been nineteen days out, she had logged no less than thirteen of them as days of calms and baffling winds; these had brought her no farther on her way than the parallel of 26° N. in the Atlantic. Thence she had a fine run to the line, crossing it between 33° and 34° W.; the thirty-second day out. She was unavoidably forced to cross it so far west; for only two days before, she crossed 5° N., in 30°—an excellent position.

In proof that the Pigeon had accomplished all that skill could do and the chances against her would permit, we have the testimony of the barque Hazard, Capt. Pollard. This vessel being bound to Rio at the same time, followed close after the Pigeon. The Hazard is an old hand with the Charts; she had already made six voyages to Rio, with them for her guide. This was the longest of the six, the mean of which was twenty-six and a half days. She crossed the line this time in 34° 30′, also by compulsion, having crossed 5° N. in 31°. But, the fourth day after crossing the equator, she was clear of Cape St. Roque, while the Pigeon cleared it in three days.

So far, therefore, chances had turned up against the Pigeon, in spite of the skill displayed by Putnam as a navigator, for the Gilpin and the Fish came booming along, not under better management—but it was as good—with a better run of luck and fairer courses before them. In this stretch they gained upon her; the Gilpin seven and the Fish ten days; so that now the abstract logs show the Pigeon to be but ten days ahead.

Evidently, the Fish was most confident that she had the heels of her competitors; she felt her strength, and rejoiced in it; she was most anxious for a quick run, and eager withal for a trial. She dashed down southwardly from Sandy Hook, looking occasionally at the Charts; but, feeling proud in her sweep of wing, and trusting confidently in the judgment of her master, she kept on the average two hundred miles to leeward of the right track. Rejoicing in her many noble and fine qualities, she crowded on her canvas to its utmost stretch, trusting quite as much to her heels as to the Charts, and performed the extraordinary feat of crossing, the sixteenth day out from New York, the parallel of 5° N.

The next day she was well south of 4° N., and in the doldrums, long. 34° W.

Now her heels became paralyzed, for fortune seems to have deserted her awhile; at least her master, as the winds failed him, feared so; they gave him his motive power; they were fickle, and he was helplessly baffled by them. The bugbear of a northwest current off Cape St. Roque began to loom up in his imagination, and to look alarming; then the dread of falling to leeward came upon him; chances and luck seemed to conspire against him, and the mere possibility of finding his fine ship back-strapped, filled the mind of Nickels with evil forebodings, and shook his faith in his guide. He doubted the Charts, and committed *the* mistake of the passage.

The *Sailing Directions* had cautioned the navigator, again and again, not to attempt to fan along to the eastward in the equatorial doldrums; for, by so doing, he would himself engage in a fruitless strife with baffling airs, sometimes reinforced in their weakness by westerly currents. But the winds had failed, and so too the smart captain of the Flying Fish evidently thought had the *Sailing Directions.*

If there be a breeze, and if it be fair for making easting in the doldrums, and if the navigator be too far west, of course he should then make easting. But if the airs be light and baffling, the vessel will only continue the longer in the doldrums by steering east or west, for then she runs along with the calm belt. But by steering north or south, she goes straight across it, and in the least time possible.

After passing it, and getting with a rising barometer the S. E. trades, and finding them, as is often the case, at S. S. E., then the navigator, having a breeze, can make easting. At any rate, it is better to attempt to make easting by beating against the S. E. trades, than by fanning along with light airs and calms, in the doldrums. Therefore, the *Sailing Directions* advise the navigator, in all such cases, to dash right across this calm streak, stand boldly on, take advantage of slants in the wind, and, by this device, make easting enough to clear the land. So, forgetting that the Charts are founded on the experience of great numbers who had gone before him, Nickels being tempted, turned a deaf ear to the caution, and flung away three whole days and more, of most precious time, dallying in the doldrums.

He spent four days about the parallel of 3° N., and his ship left the doldrums, after this waste of time, nearly upon the same meridian at which she entered them.

She was still in 34°, the current keeping her back, just as fast as she could fan east. After so great a loss, her very clever master, doubting his own judgment, became sensible of his error. Leaving the spellbound calms behind him, where he had undergone such great trials, he wrote in his log as follows: "I now regret, that, after making so fine a run to 5° N., I did not dash on, and work my way to windward to the northward of St. Roque, as I have experienced little or no westerly set since passing the equator, whilst three or four days have been lost in working to the eastward, between the latitude of 5° and 3° N. against a strong westerly set;" and he might have added, "with little or no wind."

In three days after this, he was clear of St. Roque. Just five days before him, the Hazard had passed exactly in the same place, and gained two days on the Fish, by cutting straight across the doldrums, as the *Sailing Directions* advised him to do.

The Wild Pigeon, crossing the equator also in 33°, had passed along there ten days before, as did also the Trade Wind, twelve days after. The latter crossed the line also to the west of 34°, and in four days after, had cleared St. Roque, which certainly is a great deal better than stopping in the doldrums to fight with baffling airs.

But, notwithstanding this loss of three days by the Fish, who so deeply regretted the mistake, and who afterwards so handsomely retrieved herself, she found herself, on the 24th of November, alongside of the Gilpin, her competitor. They were then both upon the parallel of 5° south, the Gilpin being 37 miles to the eastward, and of course in a better position, for the Fish had yet to take advantage of slants, and stand off shore to clear the land.

The Charts showed the Gilpin now to be in the best position, and the subsequent events proved the Charts to be right, for thence to 53° S., the Gilpin gained on the Pigeon two days, and the Pigeon on the Fish one.

Both the Pigeon and the Fish dashed through the Straits of Le Maire; the Gilpin going around. For the benefit of those who follow in this route, I quote the Le Maire passages of both:—

From the Wild Pigeon's Log.—"Straits of Le Maire, Dec. 12, 1852. Lat. 54° 48′ S.; long. 64° 45′ W. Barometer, 28.90; temperature of air, 45°; of water, at surface, 42°. Winds: first part, W. S. W.; middle part, N. W.; last part, calm. It was now near noon, and we were becalmed, and had some difficulty in keeping clear of the Realm; the tide was now setting strong to the S. W. I did not expect this, for I had an impression that it always set through to the northward. I have now no doubt of their being regular tides through these straits, and no one should despair of a passage through. The tide rips, races, and whirlpools, are ugly-looking customers—quite equal to those of the Pentland Frith, in Scotland. These straits should be surveyed by one of our Government vessels; for I have no doubt, if the shores were well known, and by keeping close in, an eddy would be found that would help a vessel through, even with the tide against her, in the middle of the straits. On entering these straits, I should keep well over towards the western shore, the wind being off, that is to say, from the westward. The Realm being six miles astern when the wind hauled to S. W., could not keep so far to windward; the tide was now strong against us, but was with the Realm, for she passed us rapidly about three miles to the leeward, and went ahead of us four miles; between the two ships, there was a race or tide rip that fairly roared and extended north and south as far as the eye could reach; it had the appearance of a strong tide over rocks. Seeing the Realm had a fair tide, and we a head one, I bore up and crossed the race to the leeward; in crossing it we were shaken violently, and whirled around in spite of helm and sails by rapid whirlpools. However, we had no sooner crossed the race than we had a change in the tide, and we were soon up with the Realm.

December 13, at noon. Lat. 56° 27′ S.; long. 65° 45′ W. Current, easterly, one mile per hour. Barometer, 28.60; temperature of air, 42°; of water, at surface, 41°. Winds: during first part, N.; middle part, N. W.; latter part, N. W. Light winds, and very squally, bad-looking weather. At 10 P. M. had a white squall; shortened sail; was obliged to keep before the wind to save our sails, being caught with royal and studding-sails out; lost no spars, but had some sails blown to pieces. This is the first white squall I ever saw and felt, and I have been to sea for thirty years and upwards.

December 14, at noon. Lat. 56° 28′ S.; long. 66° 44′ W. Barometer, 28.40; temperature of air, 39°; of water, at surface, 41°. Winds: during first part, N. W., variable; middle part, S. S. E.; latter part, S. W.; moderate and doubtful-looking weather. At 5 P. M. had a heavy squall from the westward, with snow and hail. Middle part, a gale from the south, and a large sea making; ship under snug sail. At 4 A. M. thick rains and stormy; made Cape Horn under our lee, having been set in by the tide at the rate

of one and a quarter mile per hour. Ends with a bad gale from the S. W., and a heavy rolling sea; ship under close reefs.

December 15, at noon. Lat. 56° 52′ S.; long. 66° 52′ W. Current, per hour, one and a half mile, easterly. Barometer, 28.80; temperature of air, 38°; of water, at surface, 40°. Winds: first part, S. W.; middle part, S. S. W.; latter part, S. E.; first part, hard gale from the S. W.; second part, blowing in furious gusts; third part, moderating fast, all sail set at noon."

From the Log of the Flying Fish.—"December 20, 1852. Lat. 54° 56′ S.; long. 65° 7′ W. Barometer, 29.50; temperature of air, at 9 A. M. 47°; of water, 46°. Winds: first part, S. W.; middle part, S. S. W. to W.; last part, westerly.

First part, fresh winds and clear weather; middle part, wind increasing and thickening up in the westward; last part, wind died away; cloudy weather; wind hauled to westward; gentle breezes; made the land; entrance of Straits of Le Maire.

December 21. Lat. 55° 16′ S.; long. ——. Barometer, ——; temperature of air, at 9 A. M., 52°; of water, 45°. Winds: first part, southward; middle part, easterly; last part, northerly.

At 4 P. M. wind hauled to eastward and freshened; at 5 P. M. tacked ship off Cape Diego to the N. E.; at 6 P.M. tacked ship to southward and stood in through Straits of Le Maire; strong flood against us until midnight. Middle part, wind died away to a flat calm; latter part, light southerly airs and baffling. In the straits, passed a brig showing Danish colors. A fore-and-aft schooner and a brig in sight. West end of Staten Land bearing N. by W. true, distant 28 miles.

December 22. Lat. 56° 6′ S.; long. ——. Barometer, ——; temperature of air, —; of water, —. Winds: first part, N. W. to N. E.; middle part, N. E.; last part, N. E.

First part, light baffling winds, and hazy weather; middle part, freshened from N. E. with fog; last part, ditto. Meridian, passed Cape Horn bearing N. half E.; distance 7 miles."

By dashing through the straits, the Fish gained three days on the Gilpin; but here, fortune again deserted the Pigeon, or rather the winds turned against her; for as she appeared upon the parallel of Cape Horn, and was about to double round, a westerly gale struck her and kept her at bay for ten days, making little or no way, except alternately fighting in a calm or buffeting with a gale, while her pursuers were coming up "hand over fist" with fine winds and flowing sheets.

They finally overtook her, bringing along with them propitious gales, when all three swept past the cape and crossed the parallel of 51° S., on the other side of the Horn; the Fish and the Pigeon one day each ahead of the Gilpin.

The Pigeon was now, according to the Charts, in the best position, for she was in 85° W.; the Gilpin next, in 84°; and the Fish last, in 79°; but all were doing well.

From this parallel to the S. E. trades of the Pacific, the prevailing winds are from the N. W. The

position of the Fish, therefore, did not seem as good as the others, because she did not have the sea room, in case of an obstinate N. W. gale.

But the winds favored her. On the 30th December the three ships crossed the parallel of 35° S., the Fish recognizing the Pigeon; the Pigeon saw only a "clipper ship," for she could not conceive how the ship in sight could possibly be the Flying Fish, as that vessel was not to leave New York for some three weeks after she did; the Gilpin was only 30 or 40 miles off at the same time.

The race was now wing and wing, and had become exciting. With fair winds and an open sea, the competitors had now a clear stretch to the equator of two thousand five hundred miles before them.

The Flying Fish led the way, the Wild Pigeon pressing her hard, and both dropping the Gilpin quite rapidly, who was edging off to the westward.

The two foremost reached the equator on the 13th January, the Fish leading just 25 miles in latitude, and crossing in 112° 17′;* the Pigeon 40 miles farther to the east. At this time the John Gilpin had dropped 260 miles astern; and had sagged off several degrees to the westward.

Here Putnam, of the Pigeon, again displayed his tact as a navigator, and again the fickle winds deceived him: The belt of N. E. trades had yet to be passed; it was winter; and by crossing where she did, she would have an opportunity of making a fair wind of them, without being much to the west of her port when she should lose them. Moreover, it was exactly one year since she had passed this way before; she then crossed in 109°, and had a capital run thence of 17 days to San Francisco.

Why should she not cross here again? She saw that the 4th edition of *Sailing Directions*, which she had on board, did not discountenance it, and her own experience approved it. Could she have imagined that, in consequence of this difference of 40 miles in the crossing of the equator, and of the two hours' time behind her competitor, she would fall into a streak of wind which would enable the Fish to lead her into port one whole week? Certainly it was nothing but what sailors call "a streak of ill luck" that could have made such a difference.

But by this time "John Gilpin" had got his mettle up again. He crossed the line in 116°; exactly two days after the other two—and made the glorious run of 15 days thence to the pilot grounds of San Francisco.

Thus end the abstract logs of this exciting race, and these remarkable passages.

The Flying Fish beat: she made the passage in 92 days and 4 hours from port to anchor; the Gilpin in 93 days and 20 hours from port to pilot;† the Wild Pigeon had 118. The Trade Wind followed, with 102 days, having taken fire and burned for 8 hours on the way.

The result of this race may be taken as an illustration as to how well navigators are now brought to understand the winds and the currents of the sea.

Here are three ships sailing on different days, bound over a trackless waste of ocean for some 15,000

* Twenty-five days after that, the Trade Wind clipper came along, crossed in 112°, and had a passage of 16 days thence into San Francisco.

† The abstract log of the Gilpin is silent after the pilot came on board.

miles or more, and depending alone on the fickle winds of heaven, as they are called, to waft them along; yet like travellers on the land bound upon the same journey, they pass and repass, fall in with and recognize each other by the way; and what perhaps is still more remarkable, is the fact that these ships should each, throughout that great distance, and under the wonderful vicissitudes of climates, winds, and currents which they encountered, have been so skilfully navigated, that, in looking back at their management, now that what is passed is before me, I do not find a single occasion on which they could have been better handled except in the single instance of the Flying Fish, while crossing the doldrums in the Atlantic. And this mistake her own master was prompt to discover, and quick to correct.

This mistake is common among navigators. But one in crossing the equator as far as 35° W. is not hopelessly too far west; and even then he had better go straight across the doldrums, trusting to luck for slants, than to attempt to make easting in those calm places. Twelve days after the Flying Fish had crossed the equator, in the Atlantic, which she did in 34° 30′, the Trade Wind came along and crossed it in 34° 10′, with the wind S. S. E. Of course, she could have made an east course on the starboard tack, but she took fire, burned for eight hours, and was in imminent danger of being destroyed. During this time she lost a degree of longitude by falling that much to the westward. Notwithstanding all this, she was only six days from the line to 9° S., which cleared her of everything. But for the fire, her passage to California would probably have been less than one hundred days.

It is rare, and deserving of note and commendation, too, to find any ship so well navigated on such a long voyage, and through such a variety of scenes, that, if it were to do over again, no departure from the course actually pursued could be made for the better.

There is another circumstance which I have observed, and which is worthy of notice in this connection, as illustrative of the accuracy of the knowledge which the investigations upon which these Charts are based, afford concerning the force, set, and direction both of winds and currents, and it is this:—

In calculating the best routes for the different months, pp. 419, *et seq.*, I have calculated also the distance which a vessel undertaking to follow these routes would have to accomplish, on account of detour caused by head winds, &c. On this occasion, only the John Gilpin and the Hazard entered the distance by log from New York to the line. The distance which, according to the *Sailing Directions*, each vessel would, at that season of the year, after allowing for the deviations which head winds would require her to make from the straight course, have to sail to reach the equator, is 4,115 miles. The Gilpin actually logged 4,099, the Hazard 4,077. Thus accomplishing, in the year 1852, the voyage by sailing, the one within 38, the other within 16 miles, of the distance which, by calculation in 1849, it was predicted they would have to accomplish. Instances of the like are now of common occurrence.

FROM PANAMA TO CALIFORNIA AND THE NORTHWEST.

The passage under canvas from Panama to California, as at present made, is one of the most tedious, uncertain, and vexatious that is known to navigators.

The voyage from Valparaiso to California is a shorter one, in point of time, than is that from Panama, though the latter, as it regards distance, is not half so long as the former.

A brother officer of the navy, writing from San Francisco, says:—

"I learned, on my arrival at Panama, that great numbers of sailing vessels were in the habit of resorting thither for the purpose of taking passengers and freight to San Francisco; but to my surprise I heard that they seldom made the passage under 90 days, and often were 120 days on the way. There were then many vessels there, all ready to sail, and among them the clipper ship Hornet, none of which has yet arrived though 53 days have intervened.

"One of the clipper ships some time since made the passage in 45 days, by standing to the southward as if bound to Callao, and making all her westing in the S. E. trades, south of the line. This is such a round about way of getting to San Francisco from Panama, that there must be something wrong in the courses steered by the vessels which take the northern passage. It is well known that there is a strong westerly current running past the Galapagos Islands, which, by my own experience on one occasion, I found to be sixty miles in twenty-four hours. This current extends to the eastward almost to Point Malo, and westerly entirely across the Pacific, though not so strong as in the vicinity of the Galapagos. It strikes me that navigators, with proper instructions as to this current and the prevailing winds, ought always to make this passage in certainly not more than forty days.

"Knowing that you had few, if any abstracts of this passage, I took the liberty of telling Captain Goodrich that these logs would be valuable to you, and suggested that he get as many of them together as possible and send them to you."

That this voyage can, with a better knowledge of the winds and currents than navigators now possess, be shortened very considerably, I have no doubt.

But, unfortunately, only a few of the vessels in the Panama trade, send me abstracts of their logs.

As soon as I can collect materials enough to justify a discussion of this passage, I will undertake it. In the mean time, drawing upon such slender sources of information as I chance to have, I venture the following suggestions, as to the route from Panama to the northward and westward. I say *suggestions*, for my information is not sufficient to justify the application of the more positive term of *Sailing Directions* to the remarks I have to make.

I have more than once, while preparing this work, called the attention of navigators to the system of monsoons off the Pacific coast of Central America. It is this system of monsoons and the calms, or equatorial doldrums as they are called, which are always to be found between the N. E. and the S. E. trade-winds, or between the monsoons and each of these two systems of winds, that contribute so much to the prolongation of the passage from Panama.

Of course, where two winds meet from different quarters, every navigator knows he must have a belt of calms or light baffling airs; for a wind from the N. E. and a wind from the S. E. cannot blow each at the same time and place. Therefore, when two such winds meet, their line of meeting is marked by calms and baffling airs.

Now, my investigations have been carried far enough to show that at certain seasons of the year, a vessel bound from Panama to California, must cross at least three, at some seasons four, such meetings of winds, or bands of calms, before she can enter the region of N. E. trades. Hence the tedious passage.

But, although the researches connected with these Charts have revealed this fact, the materials upon which they are founded are not sufficient to show with certainty the best way of avoiding these calm and baffling regions.

In the absence of more especial information, and in view of the important interests to be subserved by a shortening of the passage from Panama to California and Oregon, I venture the following suggestions as to that passage. These suggestions are derived from the light which the experience of those Panama traders whose logs I have, cast upon the subject. But this light is feeble, because the materials whence it is derived are meagre. Still, they amount to several thousand observations carefully made; and in the aggregate they are worth more than the experience of any single navigator in that trade can possibly be. Nevertheless, I do not ask for them that degree of confidence to which the *Sailing Directions* given in this work are generally entitled. These suggestions, added to individual experience, will probably be found by navigators to be of some service.

In the discussion of the winds as it is conducted for the *Pilot Charts*, Panama and its approaches are included between the parallels of 5° and 10° N. Between these parallels, and east of 85° west, it appears, from the observations which have been discussed, that the prevailing winds in November, December, January, May, June, and July, are between N. W. and S. W. inclusive; that in December, January, February, and March, they prevail about one-fifth of the time from the northward and eastward; that calms are least prevalent in the month of March, the prevailing wind for March being N. W.; and for June S. W.; though N. W. winds are also frequent in June; and that, for the other months, the observations are too few to give any indication as to the prevailing winds.

Between the same two parallels, but to the west of 85°, and as far as 95°, the prevailing winds are in December, January, and February, N. E.; in March and April they are variable, prevailing alternately from N. E. and N. W. In May, June, July, August, and September, they prevail from south to S. W. inclusive; in October, from S. E. to S. W. inclusive. In November, they are inclined to variable, though from S. E. by the way of south to W. S. W. is the favorite quarter.

It is, moreover, indicated that to the east of 80° the winds in December, January, and February, prevailing as they do from the northward and westward, are generally favorable for getting to the southward and westward, by steering S. S. W. or S. W.; that in May, calms are frequent, and the prevailing points of the wind are decidedly W. S. W., S. W., and S. E.; and in June, W., W. S. W., S. W., and N. W. But as the favorite point is west, and calms are not so frequent as in May, June appears to be a more propitious

month than May for crossing the parallel of 5° N. by a southwardly course from Panama. Between 5° and 10° N., for the other months, I have not observations enough, to the east of 80°, to justify me in any remarks as to the winds.

Neither have I observations enough for January, February, or March, to the east of 80°, and between 0° and 5° N., to authorize deductions; but for all the other months of the year, they are abundant. They show that, to the east of 80°, between the equator and 5° N., the winds are steady between S. E. by the south to west, and that calms are most frequent in this part of the ocean during the months of December and April. The points from which the winds most prevail are, in December, S. W.; in April, S. S. W., and S. W.; in May, June, and July, S. W.; in August, S. S. W., and S. W.; in September, S. W.; in October, and November, from S. E. to W. S. W.

Between 80° and 85° west from the equator to 5° N., the prevailing direction of the wind, all the year, is between S. E., and west by the way of south; though from March to August, inclusive, it is most inclined to be variable. In December, March, and April, calms are most frequent.

Between 85° and 90°, the prevailing quarter for the wind, all the year, from the equator to 5° N., is between S. E., and S. W. It is most variable from January to June, inclusive. In March and April, the N. E. trades are frequently found here; calms are most prevalent in March.

Continuing west between the same parallels, the region from 90° to 95° west seems to be, of all, the most liable to calms the year round. From October to January inclusive, they are not so frequent as in the other months, being less frequent in October.

From S. E. to S. S. W., is the ruling quadrant for the winds here all the year; though from January to June inclusive, they go from N. E., around by the way of east, to west.

To the west of 95° they are steady between S. E. and south, except from January to May inclusive. In January, February, and March, they often get as far north as N. E., and in April and May, as far as E. N. E.

Now then, after carefully studying this description of the wind, derived, it is true, from no great abundance of materials, I have to suggest the following routes for the consideration of navigators bound northwest from Panama.

From the Bay of Panama make the best of your way south until you get between 5° N. and the equator.

Being between these two parallels, it will be for the navigator to decide whether he will shape his course west, and keeping between them until he crosses the meridian of 95° west, or whether he will cross the equator, and make his westing in south latitude, with the southeast trades on his quarter. The winds that he finds between 5° and the line should decide this question for him. If he can get west here, with a good breeze, he should crack on, and when his good wind leaves him, steer S. again.

If the passage from Panama be attempted in January, February, March, April, May, or June, time will probably be saved by going south of the equator; for at this half of the year the northeast trades and the equatorial doldrums are often found between the equator and 5° N. Between the meridians of 80° and

85° west, in this part of the ocean, these winds and calms are found even in the months of July and August. Therefore, in coming out of Panama, and after crossing 5° N. in any season, make a S. W. course, if the winds will allow. If the wind be S. W., brace up on the starboard tack; but if it be S. S. W., stand west, if it be a good working breeze. But if it be light and baffling, with rain, know that you are in the doldrums, and the quickest way to clear them is by making all you can on a due south course.

Suppose that, after crossing 5° N., you have got to the west of 85° without having crossed the equator. Now, if the time of the year be in that half which embraces July and December, the prevailing winds will be between S. E. and south inclusive, and the course is west as long as there is a breeze; as soon as the breeze dies away, and you begin to fight the baffling airs, conclude that you are in the vicinity of the doldrums that are often found here either between the N. E. and S. E. trades, or between one of these trades and the system of southwardly monsoons that blow north of the line, and between the coast and the meridian of 95° west.

These belts of doldrums lie east and west, and the shortest way to cross them is by a due north and south line; therefore let it be a rule, whenever the navigator finds himself in one of these calm belts, to make all the latitude possible, for by that means he will soonest clear it.

Having crossed the meridian of 95°, stand away to the northward and westward with a free wind.

West of longitude 100°, and between the parallels of 5° and 10° N., the winds, in the months of November and December, are variable between N. E. and south, by way of east. In January, February, and March, they are quite steady as N. E. trades. In April, they are variable. The doldrums are generally found between those parallels in this month. During the rest of the year, the winds are all the time between S. E. and S. W.

It will be well to cross the parallel of 10° N. at least as far west as the meridians of 105° or 110° W. Here, between the parallels of 5° and 10° N., the winds in November are steady from S. S. E. and S.; December, April, and May are the months for the doldrums in this part of the ocean.

Having crossed the parallel of 10° N., between 105° and 110, the navigator is then in the fair way to California. See *Sailing Directions for California.*

In making the west coasts of Mexico and the United States, the kelp is said to form an excellent landmark. This weed is very long, and grows on the rocks at the bottom. When, therefore, in approaching the coast, you come across lines or swarths of tangled kelp, its being tangled or matted is a sign that it is adrift. It is afloat in deep water, and you may sail boldly through it without fear. But when you come across it tailing out straight, it is then fast to the rocks at the bottom, and it is dangerous to get among it.

Vessels out of San Francisco intending to touch at Panama or any of the ports south, should stand out well from the Mexican coast. Information as to the best route for these passages is wanting. But I should, with such information only as I at present have, with regard to this navigation, feel disposed, were I bound from San Francisco to Panama, to steer straight for the line somewhere about 105° west, stand on south until I could, with the S. E. trades, run in on the starboard tack for the land.

From Valparaiso and Callao to San Francisco, steer straight for the line, according to the table of crossing for best California passages. No other directions from these ports are necessary, for it is plain sailing.

ROUTES BETWEEN CALIFORNIA AND ASIA.

I am not prepared to give any sailing directions for this route, that are derived from an extensive system of research concerning the winds in this part of the ocean; but enough is known to give general directions, which are very simple. For the way to go under canvas from California to China, is through the N. E. trade-winds; and the way to return, is with the westerly winds, which are the prevailing winds north of 40° or 45°.

This voyage is the counterpart of the route going and coming between the Capes of Virginia, and the Straits of Gibraltar; with this difference, that the Pacific Ocean is much broader than the Atlantic, and that the winds are much better developed out upon the Pacific, than they are in the Atlantic; and, therefore, the passage each way between California and China, will be a more certain passage, than that between the Capes of Virginia and the straits.

ROUTES BETWEEN CALIFORNIA AND AUSTRALIA.

The great circle distance from South Australia to California, is about 7,000 miles, and vessels in the direct trade between Australia and the Pacific coasts of the United States, may have the choice of routes going as well coming; going the distance to be sailed on account of detour for the sake of winds, is about 7,500 miles; returning, that is, coming this way by the eastern route, the distance is eight or nine hundred miles greater. With the exception of the N. E. trades on the passage from New South Wales, or Victoria to California, the winds are fair, or may conveniently be made fair both ways. A good N. E. course can be made through the S. E. trades; and a N. N. W. course on the average, through the N. E. trades. But these courses will not give easting enough for the California-bound trader, and it therefore becomes a question for him to decide, whether he will make up his easting in the variables south of S. E. trades, or in the variables north of the N. E. trades, for in both of those systems of variables westerly winds prevail.

In coming out of the Victoria ports, go south of Van Dieman's Land, or through Bass's Straits, as you have the winds and find it expedient.

Being south of Van Dieman's Land makes it convenient to pass south of New Zealand, if the wind be fair, as in the majority of cases it will be. Having passed south of New Zealand, steer for the parallel of 40° or 45° S., between the meridians of 150° and 140° W., thence for the equator between 120° and 130° W., crossing by a north course, both the horse latitudes of the southern hemisphere and the equatorial doldrums; then run through the N. E. trades as best you may, keeping a "rap full" and running up into the variables beyond the horse latitude calms of the northern hemisphere, if need be, to complete your easting and make your port.

If the winds be not fair for passing south of New Zealand, try Cook's Straits in preference to passing to the north of New Ulster.

If you pass through Cook's Straits, then stick her well to the eastward and take the eastern passage. On this passage, you should run down your easting pretty well before you get far enough north to be bothered by the baffling winds of the horse latitudes south. If these come as low down as 38° or 40° S., stand north the moment you feel them till you get the S. E. trades; then cross these and the N. E. trades, both as obliquely to the eastward as they will permit, with fore-topmast studding-sail set.

On this passage you will have finally to run down your easting, when you get into the variables, beyond the N. E. trades, and of course you will aim to reach the parallel of 38° or 40° N., or even a higher one north, to do this. How far you will go north depends somewhat upon the distance you may be west of California when you lose the N. E. trades. If you be only a degree or two from the land, you will steer straight for your port without caring to get to the northward of it; but if you be ten or twenty degrees to the west of it, or even farther, then of course the distance to be run makes it an object to turn out of your way and go north in search of good winds.

Therefore, the choice of routes on this voyage resolves itself into the answer to this question: Is it best to make easting between the parallels of 40° and 50° S., or about the parallel of 40° N.? If the former, then the eastern route is the route; if the latter, then the preference should be given to the western route

I give preference to the eastern route especially and decidedly when the winds at starting are favorable for the east course. I have no doubt but that, as a general rule, the winds by the eastern route, both variables and S. E. trades, are much more steady and reliable than they are by the western route. Moreover, the distance from the Victoria ports, *via* south side of Van Dieman's Land and New Zealand, is not more than three or four hundred miles greater than it is by the most direct route that is practicable, and the chances of good winds, by the eastern route, will, in my opinion, amply make up for this increased distance.

It is proper for me to state here that I do not give these Australian sailing directions as directions that are founded on or derived from investigations into the routes actually pursued by vessels from Australia to California; but I give them as deductions drawn from the knowledge which I have acquired touching the general system of the winds and currents out upon the high seas.

The most difficult and uncertain parts of this passage will be in the time required to cross the three belts of calms, and to clear the winter fogs of California. But for these, the eastern passage, from Victoria to California, would be one of the most certain passages in the world.

The distance from Victoria to California cannot be accomplished under canvas, by the eastern route, much short of 8,700 miles. But driving captains, with clipper ships under them, may expect to average, one trip with another along this route, not far from 200 miles per day. The clipper rate from Victoria to Cape Horn, will probably be upwards of 200 miles a day: for I feel assured there is no part of the ocean in which the winds generally will admit of more heavy dragging and constant driving than they will in the extra-tropical regions generally of the South Pacific, say on the polar side of 40° S.

Returning from California to the gold fields of Australia, the route out of San Francisco, should be down as soon as possible into the N. E. trades, as though you were bound to China, India, or the Sandwich Islands, crossing the equator anywhere between the meridians of 140° and 150° west, according as you prefer to run down your westing, principally in the N. E. or S. E. trades. I give the preference to the latter generally, because they are more steady, reliable, and certain than are their congeners of the northern hemisphere—at least such is the rule. The distance by this route to Bass's Straits will be about 7,500 miles, and an increase upon this of the average distance to be sailed on the passage going, together with the distance returning, will not amount, as before stated, to more than six or eight hundred miles.

Aim to cross 30° S., on the passage from California to Australia, in the neighborhood of 170° E.

Thence, the course is between Australia and New Zealand direct for your port.

In these passages, as on the California routes generally, navigators have to cross the calms of Cancer and of Capricorn, as well as those of the equator; which last are found between the N. E. and S. E. trade-winds, but upon different parallels, according to the season of the year.

It may, therefore, be remarked here, once for all, and which remark navigators bound either from the United States or from Panama to California, are requested to bear in mind, that the barometer will often enable the navigator to tell when he has crossed these belts of calms, and entered the trades.

In the belt of equatorial calms there is an ascending column of air. All the atmosphere which the N. E. and S. E. trades pour into this belt, rises up and flows off by counter currents in the upper regions. Of course, then, the mean height of the barometer in the equatorial calms, is less than its mean height in the trades on either side. This difference does not, probably, exceed one tenth of an inch (0.1 inch). But close attention to the barometer in and about these calms, will often enable the navigator to decide whether the winds he may have be really trade-winds or not; for after having been fighting these calms, if you get the wind from N. E. or S. E., as the case may be, and the barometer *rises*, then you may be sure that you have the trades.

I have frequently, in the course of this work, had occasion to allude to the equatorial calms, and the rains which accompany them. At this day, it is not sufficient to tell the navigator that things are so. He depends more upon the lights of reason and the convictions of his understanding, less upon faith and the *ipse dixit* of philosophers than he used to do. And therefore, when facts and phenomena are now stated to him, his first question generally is, for the explanation of them. I admire this spirit, and have frequently, in the pages of this work, turned aside to pay homage to it. (See the illustration afforded by Dewey's Meteorological Journal at Para, p. 467, 5th edition.)

Where the two trade-winds meet, they and the vapors which they bring ascend, and it is then "the rainy season."

The observations of Dewey on the land, show clearly enough that as the belt of equatorial calms passes over Para, the mean height of the barometer is less than it is in the extra-tropical latitudes generally, or than it is when the trade-winds prevail at Para.

There is no route on which close attention to the barometer while crossing these calm belts, will be of more service to the navigator than on the California route from Panama.—See that Chapter, p. 731.

In the calms of Cancer and of Capricorn, there is a descending instead of an ascending current of air; therefore the barometer ranges higher, on the average, within those two calm belts than it does anywhere else. The difference, however, does not exceed the tenth of an inch (0.1). Close attention to this instrument will often enable the navigator to decide, when he has crossed this belt and got into the region of trades, even before he gets the wind from the trade quarter. He determines this by its fall.

The passage between Australia and California should be made ordinarily in from 40 to 45 days;—the passage to the east being rather the shorter; of course, clipper ships will generally bring the passage within 40 days or less. See the remarks about the Farallones, in the *Sailing Directions for California* from the United States, page 723.

ROUTES FROM EUROPE AND THE UNITED STATES TO AUSTRALIA.

The gold ports of Australia, whether the distance be measured *via* Cape Horn, or by the way of the Cape of Good Hope, are between 12,000 and 13,000 miles from the Atlantic ports of the United States or Europe. The best way for vessels in the Australian trade, from Europe or America, *via* the Atlantic, to *go*, is by doubling the Cape of Good Hope; and the best way to *come* is, *via* Cape Horn; and for this reason, viz: The prevailing winds in the extra-tropical regions of the southern hemisphere are from the N. W., which of course makes fair winds for the outward bound around the Cape of Good Hope, and fair winds for the homeward bound around Cape Horn. Here, all is plain sailing; vessels homeward bound should steer by the shortest cut for Cape Horn, and the outward bound, after doubling the Cape of Good Hope, should shape their course as direct for the port of destination as the land and the winds will permit them.

Returning by the way of Cape Horn homeward, the best route is to get south of the parallel of 45° or 50° S. as soon as you can. Do not hesitate, if the winds favor, to pass south of New Zealand. But whether you pass south of these islands or not, as soon as you get clear of them, let the course be shaped direct for Cape Horn; recollecting that the farther you keep south of the middle of the straight line on your chart from Van Dieman's land to Cape Horn, the nearer you are to the great circle route, and the shorter the distance. The difference by the great circle, and by the straight course on the Charts, being upwards of 1,000 miles.

In the passage from Australia to Cape Horn, by keeping between the parallels of 45° and 60° all the way, you will, I am of the opinion, feel more or less the warmth and set of a current that passes south of Australia from the Indian Ocean. Whether the boisterous weather, to which a warm current in such latitudes would give rise, will compensate for the advantages to be gained in other respects, must be left for experience to determine. For my own part, I do not suppose this current to be as strongly marked as is our Gulf Stream in the Atlantic; though the passage from the Capes of the Delaware to Liverpool may be considered as affording us the means of judging pretty accurately as to this passage from Australia; the chief difference being, I suppose, in the climate and the gales, and a greater prevalence of westwardly winds.

The climate in the Pacific along this route will be found not quite so mild as is that along the European route in the Atlantic. But the gales in the Atlantic are probably more frequent and violent than they are in the South Pacific; at any rate, I suppose that such will be found to be the case, until you reach the regions of Cape Horn.

The Australian routes present frequent opportunities for fine runs. In the South Pacific Ocean, below the parallel of 40° S., and away from the influence of the land—as along this route, especially from New Zealand to Cape Horn—the westerly winds blow almost with the regularity of the trades; and a fast vessel, taking a westerly gale as she clears the New Zealand Islands, may now and then run along with it pretty nearly to Cape Horn; or taking it on the outward passage after clearing the Cape of Good Hope, by keeping well south, may run along with it to Van Dieman's Land.

The United States and Australia are nearly antipodal. A diameter of the earth having one end in the Atlantic upon the parallel of 38° N. at its intersection with the meridian of 35° W. would have the other near Port Philip, New South Wales. It will therefore be perceived how that the meridians of many places in America being followed to the south pole, and thence onward, would guide one to various places in New Holland.

Thus, the same meridian line which passes through Eastport, in Maine, being continued on the other side of the world, will be found to pass near the Swan River settlement of the great Gold Continent.

This meridian is a great circle; and an arc of it, therefore, represents the shortest distance between any two places that are situated upon it.

Hence, it will be perceived that the great circle from New York to Australia passes very nearly through the axis of South America, thence south through the antarctic regions, and so on northwardly again, till it reaches this modern Ophir.

But this route is impracticable to the navigator, and it is therefore useless to give him sailing directions for it.

Let us, however, look for one, which, being practicable, will be found to deviate as little as possible from the great circle, and which, moreover, all things being considered, offers to vessels in the Australian trade from Europe, as well as from the United States, the fairest prospect of the most speedy passages. Having found such a route, I propose to give those navigators, whether American or European, who are co-operating with me in collecting data for my researches, the benefit of additional sailing directions for Australia, or at least such farther suggestions with regard to the passage, as I at present feel prepared to make.

As the great circle from New York to Port Philip passes through South America, and as the land blocks the way so that ships cannot go west of that meridian, we must look to the eastward of it for the most practicable route.

Cape St. Roque and Port Philip may be considered for all our present purposes to be actually, as in reality they nearly are, on the same meridian. To find the great circle distance between two such places, we have but to add the co-latitude of one to the co-latitude of the other, and their sum gives what is

sought. Thus, the co-latitude of the St. Roque is 84° 32′, and of Port Philip, 51° 41′, the sum of which is 136° 13′ of co-latitude.

It will suit the purposes of illustration better, to count from the equator in the Atlantic at its intersection with the meridian of St. Roque (35° 24′), from which point the great circle distance to Australia is 8,500 miles.

Now all ships, whether from North America or Europe, that are bound into the southern hemisphere, are advised to cross the line to the eastward of 35° 24′ (west). Therefore, this great circle is not yet far enough to the eastward for the navigator. Suppose, then, the average crossing-place in the Atlantic to be, as it nearly is, in 30° west; let us start the great circle from this point. From this crossing to Port Philip, the most remote parallel touched by the great circle, is about 84° S. near its intersection with the meridian of 60° E., and the distance to Australia is 8,480 miles.

It will be as well for the navigator who is aiming for a quick passage—and who in these times is not?—to notice how this great circle from the line in 30° W. runs. It crosses the parallel of 10° S. near 28° 50′ W.; of 20°, near 27° 30′ W.; of 30°, near 26° 00′ W.; of 40°, near 24° 20′ W.; and of 50°, near 21° 50′ W., &c.

This route is also impracticable, for it takes one too far south. But it will serve as a guide to another, which will enable the navigator to take the nearest route that is practicable.

Vessels that are bound southeastwardly, after crossing the line in 30° W., can generally reach, without being pinched by the way, 30° S. between 30° and 35° W. The great circle distance thence to Port Philip is about 6,700 miles. But if a vessel do not go south of 55° S., she cannot accomplish the passage from the parallel of 30° in the South Atlantic in less than 7,400 miles. It will be observed that, since a vessel cannot make southeasting in the S. E. trades, vessels crossing the line in 30°, or indeed on any other meridian, will find themselves generally forced a little to the westward of the great circle to Port Philip from the point of equatorial crossing, be that upon what meridian it may.

The majority of vessels bound around the Cape of Good Hope, cross the meridian of 20° W. between the parallels of 30° and 35° S. Here, they generally aim to make a course a little to the south of east. But the great circle route to Australia would require them to pass the parallel of 70° S. before crossing this meridian of 20° W. Therefore, the course of the Australian-bound vessel between the parallels of 30° and 35° S., so far from being a little to the *south* of east, is only a little to the *east* of south. The two routes go off nearly at right angles, and therefore Australian-bound vessels do not care to make so much easting in the trades as do those vessels that desire either to touch at or double close around the cape; consequently, it is no object with them to hug the trades as close as the cape or India-bound vessels do.

Here then, as you clear the belt of S. E. trade-winds, there is a fork in the routes. The vessel bound to or around the cape going to the east; but she whose destination is for the gold fields south, should stand on to the southward, not thinking of hauling up to the eastward until she clears the calms of Capricorn, and finds herself well within the region of the trade-like westerly winds of the southern hemisphere.

She may then begin to edge away and to haul up gradually to the eastward, crossing 50° S. in about

10° W., and reaching the parallel of 55° near the meridian of 20° E. Upon this parallel (unless experience shall prove that she may, without inconvenience as to ice and weather, go still farther south, and the farther south the shorter the distance), she should run along till she crosses the meridian of 100° east, when she may begin gradually to edge up for her port, but still keeping to the right of the rhomb-line on her chart, that leads to it.

Hence, it will be perceived that Australian-bound vessels have nothing to do with the Cape of Good Hope; they do not wish to go within scarcely a thousand miles of it.

The best crossing-place of 25° or 30° south, that the S. E. trades will generally allow for the Australian route, is about 35° W., a few degrees more or less.

The great circle from this crossing to Port Philip will give the navigator a very correct idea as to the best course for him to pursue after reaching 25° or 30° S., at the crossing above mentioned.

The distance from it to Port Philip is about 6,700 miles, the arc of the great circle crossing the prime meridian between the parallels of 70° and 75° S., the meridian of 55° east between the parallels of 80° and 82° S. Here it reaches its greatest southern declination, and begins then to incline northwardly.

Australian-bound vessels, therefore, are advised, after crossing the equator near the meridian of 30° W., say between 25° and 32°, as the case may be, to run down through the S. E. trades, with topmast-studding-sails set, if they have sea room, aiming to cross 25° or 30° south, generally somewhere about 28° or 30° W., and so on, shaping their course, after they get the winds steadily from the westward, more and more to the eastward, until they cross the prime meridian to the south of 50°, reaching 55° south, *if at all*, in about 20° east. Thence the best course—if ice, &c. will allow—is onward still to the southward of east, not caring to get to the northward again of your greatest southern latitude, before reaching 120° east. The highest latitude should be reached between the meridians of 60° and 80° east. The course then is north of east, gradually hauling up more and more to the north as you approach Van Dieman's Land.

Such is the best route to Australia.—The highest degree of south latitude (and, as a rule, the farther you go south, the shorter the distance) which it may be prudent to touch, depending somewhat on the season of the year and the winds. If the winds are not good and strong, bear south to look for them. In our summer, one will not have to go so far south to look for these winds as he will in our winter. The shortest passages, therefore, will probably be made in the southern spring and early summer, when daylight, the winds, the state of the weather, and all except ice, are most favorable for reaching high southern latitudes.

Now, the first thing that will probably strike the navigator who has not been accustomed to measure on a terrestrial globe the distance between places, will be the fact that the Cape of Good Hope, instead of being a sort of half-way station on the road-side between Europe or the United States and New Holland, is some thousand miles or more to the northward of the shortest and best route.

And the next thing will be, that the best crossing on the equator for Australian-bound vessels from the United States is not to the eastward, but it is on the same meridian which affords the best crossing for the Rio or Cape Horn bound vessels.

Vessels, therefore, bound to Australia from the United States, or Europe, should take the Rio route as

far as the equator. Indeed, the route around Cape Horn to Australia, to the Cape of Good Hope and to India, may be considered as one and the same until the belt of S. E. trades in the Atlantic be passed. Vessels bound from Europe, should aim to cross the equator in about 25°. Farther east would take them where the equatorial doldrums will prove troublesome; farther west, too far out of the way.

Having crossed the equator with sea room and a good offing from the shores of Brazil, the best course for all, whether European or American, is, as before stated, to crack on through the S. E. trades with topmast studding-sails set, or at any rate with a clean rap-full.

When these winds fail, as they will do, from 25° S. in *our* summer and fall, to 35° or even 40° in *our* winter and spring, and the Australian trader finds himself in the horse latitudes of the southern hemisphere, his course is then due *south* until he gets beyond them, and well into the strong westerly winds of that region.

These winds will be found, between the parallels of 45° and 55° generally, according to the season of the year, but always between 50° and 55°, or even farther south, to prevail with great regularity and force; moreover, they are accompanied by that long rolling swell which will of itself help a vessel along many miles a day.

All the abstracts which I have as yet received from Australian-bound traders, go to confirm and illustrate, in the most beautiful manner, everything that I have previously said with regard to the westerly trades of the extra tropical south, and the advantages of the southern route to Australia.

I have endeavored to impress navigators with a sense of the mistake they commit in considering the Cape of Good Hope on the wayside of their best route to Australia.

It is not only a long way out of the best and most direct track for them, but the winds also, to the north of the fortieth parallel of south latitude, are much less favorable for Australia than they are to the south of this parallel.

The *Sailing Directions** issued by the British Admiralty, I am aware, recommend the Cape of Good Hope route, and the parallel of 39° south, as the best upon which to run down easting for Australia.

I quote from these *Sailing Directions*:—

"Ships from the Cape of Good Hope, bound to the south coast of Australia, should run down their longitude on the parallel of 39° south, where the wind blows almost constantly from some western point, and generally not with so much strength as to prevent sail being carried to it. In a higher latitude, the weather is frequently more boisterous and stormy, and sudden changes of wind, with squally, wet weather, are almost constantly to be expected; especially in the winter season, and after passing the island of St. Paul and Amsterdam. Islands of ice have also been encountered in those regions, as was almost fatally proved by H. M. ship Guardian striking against one in 46° or 47° south, in the beginning of summer, and nearly foundering."†

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* 1853.

† The Australia Directory, Vol. I. Edited by John Burwood, Master, R. N. Second edition, printed for the Hydrographic Office, Admiralty, 1853: Chapter I., pages 1 and 2.

In a note to this paragraph of the *Australia Directory*, it is added: "In summer, however, a route on the principle of great circle sailing, termed 'composite route,' may be advantageously adopted. See *Tables to Facilitate the Practice of Great Circle Sailing*. By J. T. Towson. Third edition, page 49; published at the Hydrographic Office, Admiralty."

Page 49 of the very excellent work of Mr. Towson's, "TO FACILITATE THE PRACTICE OF GREAT CIRCLE SAILING," contains simply an example for finding the distance run, by what he terms the "composite track," between latitude 43° 11′ S., and latitude 33° S., the difference of longitude being 140° 30′.

Now, in going to Mr. Towson's very convenient tables to get out the "composite track" for the route which the investigations connected with the *Wind and Current Charts* induce me to recommend, and which shall be the best that the winds and the ice will allow, the navigator, instead of taking the Cape of Good Hope, or its latitude, as one of his points, should take the parallel upon which he loses the S. E. trades in the Atlantic; and instead of taking the difference of longitude between the prime meridian and Australia, or 140° 30′, as one of the arguments of the calculation, he should take for that the difference of longitude between Australia and the meridian upon which he happens to be when he loses the said S. E. trade-winds in the South Atlantic, which would be from 170° to 175°.

The maximum latitude, or the "vertex," which he should use, will depend upon the season of the year; and what that "vertex" is to be for any season, is one of the objects of present inquiry, and of these investigations touching the Australian route; it will depend upon winds, weather, ice, &c.

I hope the abstract logs from vessels in that trade will, ere long, enable me to make a satisfactory and proper decision upon this point. For, by ascertaining that point, I expect to be able to fix definitely upon a route which shall bring Australia some two or three weeks, perhaps thirty days, nearer to the United States and Europe, than by the admiralty route, along the parallel of 39°, it is or can be.

In recommending this new route, and a route which differs so widely from the favorite route of the admiralty, I should remark that I do it, not because it is merely the great circle route, nor because it has anything to do with the composite track, but because the winds, and the sea, and the distance, are all such as to make this route the quickest. I say the sea, because I suppose there is no danger from icebergs if a proper look-out be kept; though I should state that this is a mere supposition of my own, for I have no special information bearing directly upon the subject, further than the silence of the few navigators who have pursued this route; for in their logs I find no mention of icebergs.

The *Sailing Directions of the Admiralty*, though they mention islands of ice, which have been seen in the *beginning* of summer as high as 46° or 47° S., nevertheless, recommend vessels to go south *only in the summer*. Summer would be the time for icebergs; and I infer, therefore, that the case mentioned is the only one concerning the danger of icebergs by the way that has of late been properly authenticated before the admiralty.

I do not venture lightly or without reflection to differ with the Hydrographic Office of England, in matters of this sort. That is high authority, I am aware. I allude to its work, and the opinions uttered by it, with the utmost respect. The object that I, and those who co-operate with me, have in view, is the

object for which the great Hydrographic Office of the world—that of the British Admiralty—was established and is maintained, viz: for the improvement of navigation, the benefit of commerce, and the good of the seafaring community.

Our objects being the same, therefore, when my investigations, which have so far been carried on through a separate and independent system of observations, lead me to results which differ from conclusions by others, I may surely be permitted to announce these results; and if they differ from admiralty authorities, I may also be permitted, without offence, to allude to that difference, and to show, by facts and observations, not which side is entirely right—for that is not always the case with either—but which is the less wrong.

In further proof that the route recommended in the *Sailing Directions of the Admiralty* is too far to the north for the best winds, I shall quote from several abstract logs; indeed, I might say, from all which have been received from Australian traders, for they all go to show the same thing.

The following is directly to the point. It is from the abstract log of the barque Gem of the Sea, Captain Albert Bowen, from New York to Australia, in 1853:—

"Before sailing, I obtained an English directory for the Indian Ocean and Australia, published in 1843, which recommended crossing in the latitude of 39° south, which I followed, and which I think greatly prolonged my passage. I would advise going as far south as 48°, where they will get a strong steady wind from the westward. By crossing in 39°, I very unexpectedly got a great deal of northerly and easterly wind, with more calms and light winds than I ever experienced before. I have crossed the Indian Ocean both in summer and winter, but never experienced half so much easterly winds in all before."

Captain George H. Heaton, of the English emigrant ship, Thomas Arbuthnot, sends me a beautiful abstract log of a voyage in that ship from Plymouth to Sydney. She sailed October 5; followed the admiralty route by passing near the Cape of Good Hope, and running along thence due east near the parallel of 39° or 40° S. From the time she lost the S. E. trades in the Atlantic (22° S.) to Sydney, she had 63 days. This was in 1848.

In June of the same year, Captain Ariaans, of the Bremen ship Leontine—and from whom I have received a most valuable contribution in the shape of a number of admirably kept abstracts—also with the same *Sailing Directions* for his guide, took likewise the admiralty route.

From the time of his losing the S. E. trades in the Atlantic—June 9, latitude 26° S.—to Adelaide, she had 53 days.

On this passage, she barely touched the parallel of 40° S. once. Now, this was in the southern winter, when those "brave west winds" of the extra-tropical south make their nearest approach to the equator. The Leontine found at this season of the year these west winds as constant and as steady, between 38° and 40°, as the Arbuthnot, at her season of the year, would have found them along the parallel of 45° or 46°.

I quote so much of this abstract as relates to this part of the passage:—

Abstract Log of the Bremen Ship Leontine (W. T. ARIAANS). *Bremen to Port Adelaide, South Australia*, 1848.

Date.	Latitude at noon.	Longitude at noon.	Bar.	THER. 9 A. M. Air.	THER. 9 A. M. Water.	WINDS. First part.	WINDS. Middle part.	WINDS. Latter part.	REMARKS.
1848									
June 9	25°42′S.	41°06′W.	30.0	69°	69°	N. E.	N.	N.	Brisk and cloudy.
10	27 54	37 41	29.9	68	69	N. E.	N. E.	N. E.	Brisk and cloudy.
11	29 49	34 50	29.9	68	69	N. N. E.	N. N. E.	N. E.	Brisk and cloudy.
12	31 44	31 16	29.9	68	69	N.	N.	N.	Brisk and cloudy.
13	33 05	27 09	30.0	68	68	N.	N.	N.	Brisk and cloudy.
14	34 18	22 57	30.0	68	68	N.	N.	N.	Very brisk and pleasant.
15	No obs.	No obs.	29.8	68	68	N.	N. N. W.	N. N. W.	Very brisk with rain.
16	No obs.	No obs.	30.0	68	68	N. N. W.	N. W.	N. W.	Very brisk with rain.
17	34 22	9 19	30.0	68	68	N. N. W.	N. N. W.	N. N. W.	Very brisk and clear.
18	34 16	4 39	30.0	68	68	N. N. W.	N. N. W.	N. N. W.	Very brisk and clear.
19	34 22	0 35	30.0	69	68	N. N. W.	N. N. W.	N. N. W.	Moderate; fine weather.
20	34 36	1 19 E.	30.0	69	68	N. W.	N. W.	N. W.	Moderate; fine weather.
21	35 18	4 30	30.0	69	68	N. W.	N. W.	N. W.	Moderate; fine weather.
22	36 06	8 11	30.0	67	67	N. W.	N. W.	N. W.	Moderate; fine weather.
23	36 43	12 30	30.0	67	67	N. W.	N. W.	N. W.	Brisk and cloudy.
24	No obs.	No obs.	29.8	67	67	N. N. W.	N. N. W.	N. N. W.	Commences moderate; increasing wind.
25	35 44	17 55	29.9	67	67	W.	S.	S.	Unsteady and baffling.
26	36 40	19 46	30.0	65	68	S. E.	S. S. E.	S. E.	Moderate.
27	37 48	19 48		64	68	Variable	Variable	Variable	Variable; light and calm; heavy swell from eastward.
28	38 14	23 55	29.7	64	68	S. W.	S. W.	S. W.	Brisk.
29	37 18	27 49	29.9	66	66	W. S. W.	S.	S. S. E.	Brisk with heavy squalls.
30	37 02	28 01	30.0	66	66	S. S. E.	S. S. E.	S. S. E.	Brisk with heavy squalls.
July 1	38 20	32 00	30.0	65	66	S.	S.	S.	Moderate; fine weather.
2	38 31	34 50	30.0	66	66	S. W.	S. W.	S.	Moderate; fine weather.
3	38 38	36 27	29.9	67	66	S. W.	N. W.	W. N. W.	Light and baffling.
4	38 26	41 28	30.0	65	65	N. W.	N. W.	N. E.	Brisk and cloudy.
5	38 50	45 54	30.0	61	60	N. N. W.	N.	N. W.	Brisk and cloudy.
6	38 49	49 02	30.0	60	60	N. N. W.	N. N. W.	N. N. W.	Brisk and cloudy.
7	38 18	51 58	30.0	60	60	N. N. W.	N. W.	N.	Brisk and clear.
8	No obs.	No obs.	30.0	65	64	N. N. W.	N. W.	N. W.	Moderate with rain.
9	37 56	60 38	30.0	65	65	N. W.	N. N. W.	N. N. W.	Brisk and clear.
10	No obs.	No obs.	29.8	65	65	N. W.	W.	W.	Squally with rain.
11	38 38	68 38	29.8	65	64	W.	W. by N.	W. by N.	Squally with rain.
12	39 09	71 56	30.0	66	66	W. N. W.	N. W.	N. W.	Fine breeze and cloudy.
13	39 41	No obs.	30.0	66	66	N. W.	W.	S. W.	Squally with thunder and lightning.
14	39 41	80 00	30.0	67	66	W. S. W.	W.	S. W.	Very brisk; clear.
15	39 57	85 21	29.8	66	66	W.	W.	W.	Very brisk; occasional rain.
16	40 08	89 59	29.5	66	66	N. W.	W.	N. W.	Unsteady, blowing hard at times.
17	39 08	94 37	29.6	66	66	W.	W.	W.	Brisk and cloudy.
18	38 57	98 14	30.0	66	66	W.	N. W.	N. W.	Fine breeze and clear.
19	No obs.	No obs.	30.0	65	66	N. N. W.	N.	N. W.	Fine breeze and cloudy.
20	39 12	107 07	30.2	64	66	N. N. E.	N. N. E.	N. N. E.	Fine breeze and clear.
21	39 03	111 02	30.2	67	66	N. N. E.	N.	N.	Fine breeze and clear.
22	38 18	115 20	30.0	66	66	N.	N. W.	N.	Fine breeze; drizzling rain.
23	37 22	119 17	29.9	66	66	N. W.	W. N. W.	W. N. W.	Fine breeze; drizzling rain.
24	36 16	123 30	29.9	68	67	W. S. W.	W. S. W.	W. S. W.	Pleasant breeze.
25	36 04	126 42	30.0	67	67	S. S. W.	S. W.	W. S. W.	Pleasant fine weather.
26	36 00	131 02	30.0	67	67	S. W.	W. S. W.	S. W.	Pleasant fine weather.
27	35 31	133 25	30.1	68	67	W. S. W.	S. W.	W. S. W.	Pleasant fine weather.
28	25 35	134 25	30.0	68	67	W. S. W.	S.	W. S. W.	Moderate, with rain.
29	No obs.	135 14	30.0	68	65	S. E.	E. S. E.	S. E.	Light airs, with rain.
30	No obs.	No obs.	30.0	68	64	N. E.	N.	E. N. E.	
31	No obs.	No obs.	30.0	68	64	N. E.	N. E.	N. E.	
Aug. 1	No obs.	No obs.				N. E.	N. E.	N. E.	Arrived at Port Adelaide.

I have arranged the winds in columns, in order that their great predominance from the westward might the better be seen at a glance.

Captain Ariaans tried this route again at the same season of the year in 1850. With experience now to guide him, he ventured farther to the south, and though he only went about two degrees and a half farther south, he gained by it nearly a week.

From the time when he lost the S. E. trades, June 24, lat. 24° S., to Adelaide, she had 47 days; thus gaining, by edging away only two or three degrees south of the admiralty route, five days.

I quote this abstract log also:—

Abstract Log of the Bremen Ship Leontine (W. T. ARIAANS). *Bremen to Port Adelaide, South Australia*, 1850.

Date.	Latitude at noon.	Longitude at noon.	Bar.	THER. 9 A. M.		WINDS.			REMARKS.
				Air.	Water.	First part.	Middle part.	Latter part.	
1850									
June 24	24°11′S.	32°44′W.				S. E.	E. S. E.	E. N. E.	Moderate breeze.
25	No obs.	No obs.	30.0			N. E.	N.	N. N. W.	Moderate breeze.
26	27 19	26 43	30.0	70°	70°	N. N. W.	N. N. W.	N. W.	Moderate breeze; cloudy.
27	28 24	23 48				N. W.	W.	N. W.	Moderate breeze; cloudy.
28	29 58	23 57	29.8	67	67	S. S. E.	S. E.	E. S. E.	Light airs; cloudy.
29	31 44	23 14				E.	N. E.	N. E.	Light airs; cloudy.
30	33 05	20 38	29.8	67	67	N. E.	N. N. E.	N. W.	Light airs; cloudy.
July 1	No obs.	No obs.	29.8			N. W. by N.	N. W. by N.	N. W. by N.	Light airs; cloudy.
2	35 49	14 30		64	66	N. W.	W.	W. S. W.	Moderate; clear.
3	36 26	10 16	29.9			W. S. W.	S. W.	S. S. W.	Moderate; clear.
4	35 52	6 27	29.8			S. S. W.	S.	S. by E.	Increasing wind; thunder and lightning; rain.
5	35 29	2 48	29.9	62	66	S. S. W.	S. S. W.	S. S. W.	Strong breeze; hail and rain squalls.
6	35 54	0 16 E.	29.9	64	65	S. S. W.	S. W.	W.	Strong breeze; hail and rain squalls.
7	36 47	3 35	29.9	63	64	W.	N. W.	W.	Strong breeze; hail and rain squalls.
8	37 33	7 40	29.7	61	60	N. W.	N. W.	N. W.	Very unsettled; high sea.
9	38 09	11 58	29.8	57	52	N. W.	W.	N. W.	Strong wind; high sea.
10	38 37	16 42	29.8	60	54	N. W.	N. W.	N. W.	Strong wind; cloudy.
11	38 56	21 02	29.8	58	52	W. N. W.	W. N. W.	W. N. W.	Strong wind; cloudy.
12	40 08	25 03	29.7	57	52	W. N. W.	W. N. W.	W. N. W.	Brisk and pleasant.
13	40 47	28 06	29.7	56	53	N. E.	N.	N. E.	Fine breeze; clear.
14	41 40	31 13	29.8	56	53	N.	N.	N.	Light airs; clear.
15	42 26	34 16	30.0	52	50	N. E.	N. E.	N. E.	Light airs; clear.
16	42 42	39 24	30.0	49	45	N. N. E.	N. N. E.	N. N. E.	Brisk airs; clear.
17	No obs.	No obs.	29.9	45	43	N. N. E.	N.	N. W.	Light airs and foggy.
18	42 16	48 00	29.7	39	43	N. W.	W.	S. S. E.	Light breeze.
19	41 46	51 09	30.0	39/49	36/46	S. S. E.	E.	N. E.	Moderate.
20	No obs.	No obs.	29.9	49	43	N. E.	N.	N. W.	Fresh breeze; cloudy.
21	No obs.	No obs.	29.9	48	47	N. W.	N.	N. W.	Fresh breeze; cloudy.
22	42 44	65 24	30.0	54	52	N. N. W.	W.	N.	Fresh breeze; pleasant.
23	No obs.	No obs.	29.8	54	52	N. N. W.	W.	S. W.	Moderate, then heavy squalls and rain.
24	42 28	75 28	29.8	50	54	S. W.	S. W.	W.	Heavy squalls with hail and snow.
25	42 10	80 10	29.7	51	54	W. N. W.	S. W.	W. S. W.	Heavy thunder and lightning, hail-storm, &c.
26	41 17	84 59	29.8	54	53	W. S. W.	S. W.	S. W.	Violent squalls; thunder and lightning.
27	39 59	89 44	29.9			S. S. W.	S.	S.	Squally; ends moderate.
28	38 49	93 19	29.9			S.	S. S. W.	S. S. W.	Brisk and moderate; clear.
29	38 44	96 03				S. S. W.	Variable	W. N. W.	Variable wind; good weather.
30	38 40	98 48				W. N. W.	W. N. W.	W. N. W.	Moderate breeze; clear.
31	38 42	101 50	30.0	59	59	N. W.	N. W.	N. W.	Moderate breeze; clear.
Aug. 1	38 56	105 03	30.0			N. W.	W.	N. N. W.	Light airs; clear.
2	39 02	109 42	30.0	63	64	N. N. W.	N.	N.	Brisk, with rain.
3	38 56	114 14				N.	N. W.	W.	Changeable; at times heavy wind.
4	38 33	118 00		64	64	W.	W.	S. W.	Moderate; clear.
5	38 29	120 00				S. W.	Variable	N. E.	Changeable; light airs.
6	38 22	125 05				N. N. E.	N.	N.	Brisk and very pleasant.
7	37 56	127 56				N.	N. N. E.	N. N. E.	Increasing wind and sea.
8	No obs.	No obs.	29.8			N.	N. N. E.	N. N. E.	Heavy wind and high sea.
9	36 06	134 34				N. W.	W.	S.	Squally with rain; pleasant.
10	35 44	136 21				S. S. W.	S. W.	Variable	Commences moderate; ends calm.

In 1852, and at the same season of the year, Capt. Cave, of the American ship Helena, went on the same voyage from New York. He was very near or actually on the parallel of 40° S. for twenty-three days consecutively, making in that time 103° of longitude, or on the average, 4° 28′ per day. The Leontine, on her second trip, was in the same latitude, fifteen days consecutively, during which she made 65° of longitude, or on the average 4° 20′ per day.

She was on or near the parallel of 38° S. for eleven days consecutively, during which time she made but 34° of longitude, thus averaging 3° per day against 4° 20′ and 4° 28′ on the other trips; and which each of the two vessels accomplished by going a little farther south, but into a region of much better winds.

The Helena took the "brave west winds" of this route in lat. 32° S., long. 27° W., and with the exception of two days near the Cape of Good Hope, did not record a wind with easting in it—but for one day—thence to Port Philip. From the meridian of the cape, in lat. 39°, he had a run of twenty-seven days to the golden land. He kept along near the parallel of 41°, and averaged nearly five degrees of longitude a day.

The Gem of the Sea, the Bremen ship, the English ship, and the American ship, all afford practical illustrations of the error into which the *Admiralty Sailing Directions* have led navigators, by teaching them, when bound to Australia, to consider themselves as on the India route as far as the Cape of Good Hope. The two routes really run together no farther than the calms of Capricorn in the Atlantic. Here they turn off from each other at sharp angles; that for the land of gold being nearly due south, that for India a little to the south of east.

With the view of farther illustrating these facts, as well as the route, I quote the Helena's abstract log from July 15, taking her up in her greatest longitude west after crossing the equator, which she did July 4, long. 31° 30′ west. She moreover appears to have found the belt of horse latitudes south, quite broad, for she was in baffling winds from 20° to 27° S. (five days.)

Abstract Log of the Ship Helena (F. H. Cave), New York to Port Philip, Australia, 1852.

Date.	Latitude at noon.	Longitude at noon.	Bar.	THER. 9 A. M.		WINDS.			REMARKS.
				Air.	Water.	First part.	Middle part.	Latter part.	
July 20	32°15′S.	27°39′W.		60°	62°	N.	N. N. W.	N. N. W.	Strong breezes and cloudy.
21	33 49	24 14		57	54	N. N. W.	N. W.	W. N. W.	Strong breezes and rough sea.
22	35 06	19 38		57	56	W. N. W.	W. N. W.	W. N. W.	Strong breezes and squally.
23	35 12	14 47		56	56	W.	W.	W.	Strong gales and squally.
24*	35 14	10 28		56	58	W. by S.	W. by S.	W. by S.	Strong gales and squally.
25*	36 11	6 42		61	56	S. W.	S. W. to N.	N. N. W.	Moderate and passing clouds.
26*	36 53	2 35		58	55	N. N. W.	N. W.	N. W.	Moderate and squally.
27	37 46	1 56 E.		56	55	W. N. W.	N.	W.	Moderate and squally.
28	37 33	6 00		56	55	W. N. W.	W. N. W.	N. W.	Baffling with hail squalls.
29	38 12	10 50		56	56	N. W. by W.	N. W. by W.	N. W. by W.	Strong gales and squally.
30	38 24	15 12		60	51	W. N. W.	W. N. W.	W. N. W.	First strong, middle gale, ends moderate.
31	38 23	17 28		60	51	W. N. W.	S. S. E.	S.	First and middle strong and squally, ends light and cloudy.
Aug. 1	38 36	20 31		60	60	S. to S. E.	Calm.	E.	Light, baffling, and rainy.
2	39 12	23 34		66	65	E.	N. E.	N. E. to N.	Moderate and passing clouds.
3	39 18	27 49		62	58	N.	N.	N.	Moderate and passing clouds.
4	40 07	32 48	29.50	60	56	N.	N. by E.	N. N. E.	First moderate, middle squally, ends fine.
5	39 50	35 50	29.95	58	56	N.	S. W.	W. to S.	Light, calm, moderate, and squally.
6			29.69	56	54	N. E. by E.	N. E.	N. to N. W.	Baffling and squally.
7	40 41	44 01	29.70	54	51	N. W.	W.	W.	Commenced moderate and squally with rain; ends gales and squally.
8†	40 31	47 13	29.96	56	48	W.	S. W. to W.	N.	Strong, baffling, moderate, and squally.
9	41 06	52 28	29.80	58	54	W. N. W.	N. W.	N. W.	Commenced moderate; ends strong.
10	41 59	58 06	29.40	56	52	N. W. to N.	N.	N.	Strong breezes and passing clouds; ends strong gales.
11	41 53	62 22	29.09	58	50	N.	W. N. W.	W. N. W.	Strong gales and heavy sea.
12	41 05	67 00	29.20	58	50	W.	W. S. W.	W. S. W.	Strong gales and heavy sea.
13	39 52	71 56	29.70	56	54	W. S. W.	W. S. W.	S. W.	Strong gales and heavy sea; ends more moderate.
14	39 57	76 46	29.80	54	52	W. S. W.	W. S. W.	W.	Fine breezes and pleasant.
15	40 01	81 33	29.50	56	52	W. N. W.	W.	W.	Moderate and strong breezes and squally.
16	40 08	86 15	29.40	56	52	W.S.W. to S.	S. W.	W. N. W.	Strong breezes, and gales, and squally.

* The course of this clever navigator, from July 18 to 24, proves what I say. The Helena was aiming for the usual track around the Cape of Good Hope. She did not take the fork in the route, to which I have alluded; and, by so missing her way, she certainly prolonged her passage considerably. She should have run down with the winds on her quarter upon a S. S. E. course, or there away, until she got the "westerly trades," the northern verge of which she found July 29; that is, 11 days after losing the S. E. trades, and near the parallel of 38° south.

† Here she appears to have got regularly into the westerly trades. And now it is not difficult to cast back and see how much the clever master of this ship would have gained, if he had had these *Sailing Directions* before him; or if, on the 18th of July, he had stood away a little to the eastward of south, reaching the parallel of 45° somewhere about 25° or 30° west, and then edging up east, but still keeping to the southward.

The nearer the poles the shorter the degrees of longitude.

Ships intending to take this route should be well manned and found, that they may stand the boisterous, rolling, and rough-weather run that may be expected along this route of fair winds.

Abstract Log of the Ship Helena—Continued.

Date.	Latitude at noon.	Longitude at noon.	Bar.	THER. 9 A. M.		WINDS.			REMARKS.
				Air.	Water.	First part.	Middle part.	Latter part.	
Aug. 17	39°50′ S.	90°30′ E.	29.20	50°	51°	W.	W. S. W.	W. S. W.	Heavy gales, and squally; with hail, thunder, and lightning.
18	39 30	94 58	29.30	54	50	W. S. W.	W. S. W.	W. S. W.	Heavy gales and squally, with hail.
19	39 23	100 07	29.40	50	50	W. S. W.	W. S. W.	S. W.	Heavy gales and squally, with hail.
20	39 42	105 19	29.40	49	50	S. W.	S. W.	W.S.W.to W.	Heavy gales and squally, with hail.
21	40 25	109 29	29.45	51	50	W. N. W.	W. N. W.	W. N. W.	First and middle moderate; ends strong, and passing clouds.
22	40 29	114 35	29.64	56	50	W. N. W.	W.	W.	First, strong and squally; ends clear and strong gales.
23	40 22	119 32	29.76	50	50½	W. to W.S.W.	W. S. W.	S. W.	First, strong gales and hail squalls; middle moderating; ends moderate and clear.
24	40 21	122 41	29.70	56	50	S. W.	N. W. to N.	N. W.	Moderate, calm, and baffling.
25	40 23	128 09		54	50	N. W.	N.	N.	Strong breezes and passing clouds.
26	No obser	vation.	29.58	54	50	N.	N. N. E.	N. N. E.	Commences moderate; middle and heavy gales, and thick rainy weather.
27	41 01	136 14		52	50	N. W. to W.	W.	N. W. to N.	Strong gales and squally.
28	39 32	140 07		60	56	N. W.	W.	W.	Commences strong gales and rainy; ends fine breezes.
29	No obser	vation.				W.	W.	N. W. and baffling.	Commences strong breezes and clear; 2 A. M. made the land; ends baffling.

The Helena's log affords a very good illustration as to the mistake which the Australian-bound trader is very apt to make, by supposing that his route through the South Atlantic lies along the usual track of vessels bound around the Cape of Good Hope. The Australian route is not the Old India route any farther than the polar edge of the S. E. trades.

Both from America and Europe the route to Australia, as far as the calms of Capricorn, is perfectly understood; so far, it is the route around Cape Horn, and it is the route also around the Cape of Good Hope.

The saving already effected for this part of the route from the United States is on the average ten days. With the assistance of navigators in the Australian trade, I hope to reduce the average of the passage for the vessels of all nations to that land of gold, at least, another ten or fifteen days, probably more. A vast gain of time in that voyage is to be made upon the admiralty route.

At the last meeting of the British Association, it was stated by a distinguished gentleman from Bombay, that, where he came from, it was estimated that a set of Charts and Sailing Directions for the Eastern Seas, based upon the principles of these, would produce an annual saving to British commerce that would be equivalent to a gain of $1,000,000 to $2,000,000 (£250,000 to £500,000).

At first, I thought this an over-estimate as to the saving they would effect, even for the whole world, in all parts of the ocean. I thought this, because I had never computed the rate per ton per day, that shippers usually pay for freight across the high seas.

Between Europe and the United States, the average time both ways, from all ports, is about 40 days; and the average freight about $5 the ton, or twelve and a half cents per ton per day.

From the United States to Rio, the average time is about 45 days, at an average freight of $8 the ton, which is at the rate of 17.7 cents the ton per day.

From the United States and Europe to Australia, the average passage is about 100 days, and the average freight about $20, or 20 cents the ton per day. To California, the freight ranges from $25 to $30 the ton, with an average passage of 135 days. This also gives an average rate of freight of from 18 to 22 cents per ton per day.

To be within the mark, let us assume the average rate of freight per ton per day, under canvas, on these distant voyages, to be 15 cents, and the average size of the vessels in that trade to be only 500 tons (it is really about 700).

The saving to be effected thereby, to vessels co-operating in this system of research, at 15 cents per ton per day for ten days, will be on the average at the rate of $750 per day for each vessel of 500 tons, whose passage these Charts may shorten.

Supposing, therefore, that 150 vessels only per month, or 1,800 per year of all flags, go from the ports of the North Atlantic Ocean to Australia, it appears that the amount to be saved here is even greater than the estimated amount for the Indian Ocean.

The United States alone, therefore, are not the only nation that is interested in the results of these investigations. All who use the sea are interested in them alike.

But the Secretary of the Navy, the Hon. J. C. Dobbin, has, on the part of the United States, with the view of enlisting the most extensive co-operation in this common plan for the common good, authorized all shipmasters that navigate the sea under friendly flags, to be placed upon the same footing with regard to the *Wind and Current Charts* which American shipmasters occupy. That is, any merchant captain, whatever be the flag he sails under, who will agree to keep and furnish an abstract log, of *every voyage*, according to the form prescribed at pp. 94 and 95, and on the terms set forth at p. 763 of this work, will be furnished therefor with a copy of these *Sailing Directions*, and of such sheets of the Charts as relate to his cruising ground.

Therefore, before applying for the Charts, each master should furnish himself with *at least* one good chronometer, one good sextant, two good steering compasses, a marine barometer, and three air and water thermometers, which barometers and which thermometers have been compared with recognized standards. I say *at least*, because this is the smallest outfit of instruments that can enable the navigator properly to perform his part of the agreement.

The several foreign governments invited to co-operate in this system of research, have been requested to appoint each some person to receive these Charts, and distribute them to the shipmasters under the flag of his country, who are properly qualified and prepared to furnish, in the required form, the observations required.

It thus appears that navigators, who are invited to co-operate in this system, are not invited to labor for naught. There is a prospect of direct pecuniary benefit to inure to every ship, the result of whose observations shall contribute to the shortening of the passage a single day; and that benefit is in saving, at the rate of $75 per day, for every day, on every voyage, that the passage of a vessel carrying 500 tons merchandise may be shortened.

A clipper ship, well handled, and with a good streak of luck in making the run from the United States into the variables of the southern hemisphere, will be able, now and then, to make the passage to Australia by this route in 60 days, if not in less time; but in 60 days it can be accomplished under canvas alone. It used to be a ten-months' voyage.

In that trade, clipper ships will be able to set up a strong opposition to steamers; for if we take into account the increased distance that steamers, touching at the Cape of Good Hope, and one or two other places, for coal, will have to go, together with the delays incident thereto, we shall see that our clipper ships have not much cause to fear that steamers will ever run them off the water in the Australian trade. Ships with steam, as an auxiliary only, may drive clipper ships from that track.

As it has been already remarked, Australia and the United States are antipodal; they are about 12,000 geographical miles apart, and it is about as near to come *via* Cape Horn, as it is to go *via* the Cape of Good Hope. The steamers, therefore, on their return *via* the Cape of Good Hope, have head winds to contend with for that much of the way; whereas the canvas trader, returning by Cape Horn, has fair winds to go, and fair winds to come, from the Cape of Good Hope all the way east, even to Cape Horn.

The passage from Cape Horn to the United States is sometimes made from forty to forty-five days; and Cape Horn may be reached under canvas from Port Philip, with these westerly winds and long swells, and by keeping well to the south, in twenty or twenty-five days.

I have great confidence in the existence, regularity, and force of these N. W. trades in the great southern ocean, especially on the polar side of 49° or 50° S.

The opinion may be rash, or the expression of it may seem like a boast; but, be what it may, I here venture the prediction, that the round voyage from the United States to Port Philip or Hobartown, and home again, can be made, and will be made, under canvas, by the route here laid down, in 130 or 135 days, or *less*.

Nay, I go further—for so great is the confidence I have in the propelling power of these westwardly trades of the extra-tropical south—and venture the opinion that a voyage of circumnavigation can be accomplished by this route in less time than the passage has ever yet been made by clipper ships from New York or Boston to San Francisco.

ROUTE FROM AUSTRALIA.

Here, again, the statistics with regard to the winds and currents of the South Pacific Ocean, which the abstract logs of the fleets of vessels that are collecting data for me furnish, compel me to differ from the recommendations of the Admiralty in the *Sailing Directions* for Australia.

The homeward route recommended in the *Australia Directory* of the Admiralty, already referred to, and published in 1853, from Australia, is thus described at page 4:—

"Ships bound from Sydney to Europe or Hindostan, from the 1st of September to the 1st of April, may proceed by the southern route through Bass Strait, or round Tasmania, easterly winds being found to prevail along the south coast of Australia at that season, particularly in January, February, and March, when ships have made good passages to the westward, by keeping to the northward of 40° S., and have passed round Cape Leeuwin into the S. E. trade-wind, which is then found to extend farther south than during the winter months. In adopting the southern route, advantage must be taken of every favorable change of the wind, in order to make westing; and it is advisable not to approach too near the land, on account of S. W. gales, which are often experienced even in summer, and the contrary currents, which run strongest in with the land. The prevalence of strong westerly gales renders the southern route very difficult, and, indeed, generally impracticable in the winter, although the passage has been performed at that season, by ships in good condition, which sailed well; but the northern route, through Torres Strait, is preferred in the winter months."

Here is a difference as wide as the poles, and as far as the east is from the west. These Sailing Directions which I am now writing are founded on, in fact they are the results of, the actual experience of navigators, and yet so great is the difference between them and the British admiralty, the highest authority known in navigation.

They recommend vessels bound to Europe or America, from Sydney, to steer to the southward. The Admiralty Directory says, go north.

They advise vessels to go through Cook's Strait, or pass south altogether of New Zealand. The Directory of the Admiralty says, go north of New Holland, and pass through Torres Strait.

They say, come east. The Admiralty says, go west.

The same brave west winds which take vessels so rapidly from the meridian of the Cape of Good Hope eastwardly, along the parallels of 50° to 60° towards Australia, will also bring them over eastwardly along the same parallels towards Cape Horn.

The investigations which have been carried on at this office, concerning the winds of that part of the ocean, forbid me to recommend this Admiralty route to any homeward bound European or American vessel, under any circumstances whatever; always assuming that these directions are intended for ships that are seaworthy, properly fitted and found. The average passage to Europe, by this Admiralty route, is 120 days. Ships may occasionally find the easterly winds as low down south as the directions of the Admiralty suggest; but it is the exception, not the rule, so to find them. In proof of this, I refer to the Pilot Charts of that part of the ocean, and shall quote other authorities.

To establish this point, I take the first abstract that I lay my hands upon. That happens to be the Thomas Arbuthnot's—an English trader—from Sydney to London, *via* Cape Horn.

Abstract Log of the Thomas Arbuthnot (G. H. Heaton), Sydney to London, 1849.

Date.	Latitude at noon.	Longitude at noon.	Bar.	THER. 9 A. M.		Winds.	REMARKS.
				Air.	Water.		
April 23	41°07′ S.	179°54′ E.	29.95	64°	62°	East.	Variable and clear.
24	44 10	177 31 W.	29.60	62	59	E. by N.	Moderate and clear.
25	46 27	173 55	30.00	61	58	E. to N.	Strong breezes and heavy rain.
26	47 42	171 24	30.10	58	54	N. to N. N. W.	Strong breezes and heavy rain.
27	49 04	171 04	30.20	58	56	East.	Moderate and clear, a heavy swell.
28	50 01	166 14	30.08	58	54	N. E. to N. W.	Steady, strong breezes, and clear.
29	50 14	160 40	29.70	55	53	W. N. W.	Steady, strong breezes, and clear.
30	50 32	154 59	29.70	54	52	West.	Steady, strong breezes, and clear.
May 1	50 49	150 22	29.80	53	51	West.	Steady, strong breezes, and very cold.
2	50 47	145 02	29.70	54	49	West.	Steady, strong breezes, and very cold.
3	51 24	139 48	29.60	53	48	West.	Steady, hard gales, and very cold.
4	52 04	134 30	29.70	52	47	West.	Steady, hard gales, and very cold.
5	52 19	128 35	29.75	50	46	West.	Hard gales, very cold.
6	52 48	123 32	29.70	50	44	West.	Hard gales, very cold.
7	53 11	117 50	30.05	50	44	N. W. to W.	Hard gales, very cold, hazy, and damp.
8	53 40	112 48	30.08	50	44	W. S. W. to S. W.	Hard gales, very cold, hazy, and damp.
9	54 09	106 37	29.50	50	44	S. W.	Hard gales; much sea; much snow.
10	54 33	101 34	29.35	50	44	S. W. to W.	Moderate breezes and clear.
11	56 06	96 23	29.50	45	44	S. W. to S.	Freshening gales, with a high sea.
12	55 21	92 06	29.20	43	40	S. S. E. to W.	First part hard gales; ends moderating.
13	56 24	86 38	29.22	44	43	W.	Steady, strong winds, heavy squalls, and rainy.
14	56 40	80 24	29.50	44	42	W.	Steady, strong winds, heavy snow, and rain.
15	56 40	75 27	29.48	46	48	S. W. to S. S. E.	Variable, with light rain; ends increasing, snow.
16	56 52	69 10	29.35	40	40	South.	Very heavy squalls, high sea.
17	56 52	65 20	29.17	42	38	S. W. to S. S. E.	Very heavy squalls; 2 P. M. saw Diego Ramirez Island.
18	55 05	60 19	29.5	43	40	S. E. to N. W.	Heavy gales, with lots of snow.
19	53 21	55 24	29.35	42	42	S. W. to S.	Heavy breezes, continual snow squalls.
20	51 15	51 17	29.50	42	42	S. E. to S.	Heavy breezes, continual snow squalls.
21	49 57	48 23	29.48	44	42	S. W. to S.	Moderate and clear.

Now this is not a fast ship, yet in forty days from Sydney she had doubled Cape Horn.

She did not get into those "brave winds" until April 27, lat. 49° S. From that time till May 17, when she was off the Horn, she ran with flowing sheets through these free winds of the west, 106° of longitude in 20 days, which gives her the average rate of 5° 18′, say 200 miles per day.

The barque Gem of the Sea (A. Bower), which took the Admiralty route to Australia, and missed the strength of these westerly winds, resolved to avail herself of them from Port Philip to Callao. She accordingly followed very nearly the great circle route, reaching the parallel of 50° south, in about longitude 169° east, and not recrossing it until 140° west (9 days). She arrived at Callao, November 1, 1853, after the extraordinary run of 37 days from Port Philip. Steam could not have done much better. She had westerly

winds all the way, until she reached the parallel of 19° S., longitude 83° W. It is unusual, however, to carry these westerly winds so far up into the region of S. E. trades.

Again, the distance home from Australia, is very much the same by Cape Horn, as it is by the Cape of Good Hope.

It is obvious, therefore, that a vessel, running before these west winds, to Cape Horn, takes a route home, which, as to time—the true measure of distance—is much nearer than it would be to steer west in the face of these winds. But the Admiralty Directory recommends the navigator, it may be said, to go north, to get out of the region of these west winds; to go where the winds are easterly, and then steer west.

In reply, it may be remarked that, by going towards the equator, you go away from the great circle, where the degrees are short, and the distance shortest, into parallels where the degrees are long and the distance greatest; and then the easterly winds are not, for speed, equal to those of the "bonny west," farther south.

These winds are already beginning to be known so well to the Australian traders, that it is usual for them, I am told, when bound home by this route, to strike topgallant-masts, before leaving port. It is a voyage that tries ship and crew; but of all the voyages in the world, that part of it between the offings of Australia and Cape Horn is perhaps the most speedy for canvas.

There it may outrun steam.

I have deemed it proper thus to allude to what I consider faulty Sailing Directions, because that Directory is uttered by the highest authority known to navigators; and because it was necessary to point out wherefore, and wherein, I differ, that navigators may then be enabled the better to choose, each for himself, which of the two to follow.

FROM THE SANDWICH ISLANDS, HOME.

South of the calms of Capricorn, the winds are the same all round the world. Taking them on meridian of the Cape of Good Hope, a fast ship may run with them to the eastward, averaging upwards of 200 miles a day all the way round to Cape Horn.

Capt. McKay, in his passage of 83 days, in the Sovereign of the Seas, from the Sandwich Islands to New York, carried the S. E. trades down to the parallel of 45° south. There, he found the baffling winds peculiar to the horse latitudes; after crossing the parallel of 48°, he cleared this belt, and took the famous westerly winds which wafted him along so finely.

There is warm water, an Australian gulf stream, to be crossed or drifted along with, between Port Philip and Cape Horn. In the paper on the Gulf Stream, which is referred to at p. 332 of this work, the existence of such a body of warm water was theoretically pointed out. The abstract log of the Sovereign of the Seas gives me practical proof of its existence, as the following extract will show:—

Date.	Lat. S.	Long. W.	Temp. Air.	Temp. Water.
March 8	47° 49′	158° 30′	70°	70°
9	48 26	156 23	67	65
10	48 25	151 24	65	65
11	48 15	143 44	60	60
12	48 19	136 32	60	62
13	48 40	129 19	40	43
14	48 58	125 00	43	42

Here is a change of 19° in the temperature of the water in one day's run; and from the parallel of 47° 49′ to that of 48° 40′, though the difference of latitude is less than one degree, the difference in the temperature of the water is 27°!

I shall not now stop to investigate the genesis of this warm water and warm current; suffice it for our present purpose to say, it receives its warmth in the equatorial regions; but whether in the Indian Ocean or in the torrid zone of the Pacific, it is immaterial for our present purpose. We know it comes from warmer latitudes than those in which the Sovereign of the Seas found it; and, therefore, it has southing, and, if southing, probably easting also, in its course.

In like manner, the cold water into which this ship ran from the warm, we may, for like reasons, suppose to come from towards the polar regions, and to be bound probably to the coast of Peru, there to feed that remarkable current which was discovered by Humboldt, and which runs up as far as to the Galapagos Islands, where it probably joins the equatorial current that flows west from the meridian of 100° W. in the torrid zone of the Pacific; and which, taking a sweep down towards the Society Islands, may complete the circuit, and so feed the warm current of which I have been speaking. Is this cold current in 45°, or 50°, or 55° south, an ice-bearing current?

Vessels bound around Cape Horn from any of the inter-tropical islands of the Pacific, should run south through the trades with topmast studding-sails, make for the trade-like westerly winds of the South Pacific, and with them run down their easting for Cape Horn.

I may quote the abstract log of the Sovereign of the Seas, McKay, on her celebrated run from Oahu to New York, in 1853.

This log will also serve still farther to illustrate these Sailing Directions for the homeward passage from Australia.

The Sovereign of the Seas is one of the glorious fleet of a thousand sail that is voluntarily engaged in making observations for the *Wind and Current Charts.* She it is, it will be recollected, who, taking them for her guide, made the extraordinary run of one hundred and three days from New York to San Francisco, both crossing the equator in the Pacific and arriving in port on the day predicted.

Returning from the Sandwich Islands to New York, in the remarkably short run of eighty-three days, she passed through a part of the Great South Sea, which has been seldom traversed by traders—at least, I have the records of very few that have.

Little or nothing, except what conjectures suggested, was known as to the winds in this part of the ocean. The results of my investigations elsewhere, with regard to winds and the circulation of the atmosphere, had enabled me to announce as a theoretical deduction, that the winds in the "variables" of the South Pacific would probably be found to prevail from the westward with a trade-wind like regularity.

Between the parallels of 45 and 55 degrees south, and from the meridian of the Cape of Good Hope eastward, around to that of Cape Horn, there is no land or other disturbing agent to intercept the wind in its regular circuits; here the winds, it was conjectured, would be found blowing from the west with greater force than from the east in the trade-wind regions; and, giving rise to that long rolling swell peculiar to those hyper-austral regions of the Pacific, they would enable ships steering east to make the most remarkable runs that have ever been accomplished under canvas.

The Sovereign of the Seas has afforded the most beautiful illustration as to the correctness of these theoretical deductions.

Leaving Oahu for New York, *via* Cape Horn, February 13, 1853, she stood to the southward through the belts, both of the northeast and the southeast trades, making a course good on the average through them, a little to the west of south. She finally got clear of them, March 6, after crossing the parallel of 45° S., upon the meridian of 164° W.

The 8th and 9th, she was in the horse latitude weather of the southern hemisphere. So far, her run had been good, but there was nothing remarkable in it.

Having crossed the parallel of 48° S., she found herself, on the 10th, fairly within the trade-like west winds of the Southern Ocean; and here commenced a succession of the most extraordinary days' runs that have ever been linked together across the ocean.

From March 9 to March 31, from the parallel of 48° S. in the Pacific, to 35° S. in the Atlantic, during an interval of twenty-two days, that ship made 29 degrees of latitude, and 126 of longitude. Her shortest day's run during the interval, determined by calculation, from the position given in the log, being 150 knots. The wind, all this time, is not recorded but once with easting in it; it was steady and fresh from the westward.

In these twenty-two days, that ship made five thousand three hundred and ninety-one nautical miles. The predicted triumph of canvas under these west winds over steam elsewhere is already realized; for here is a ship under canvas, and with the winds alone as a propelling power, and with a crew, too, so short, the captain informs me, that she was but half manned, accomplishing, in twenty-two days, the enormous run of six thousand two hundred and forty-five statute miles (one-fourth the distance round the earth), and making the daily average of two hundred and eighty-three statute miles and nine-tenths (283.9). During eleven of these days consecutively, her daily average was three hundred and fifty-four statute miles; and during four days, also, consecutively, she averaged as high as three hundred and ninety-eight and three-quarter statute miles.

This abstract log will also illustrate very well the homeward passage from the islands in the Pacific

generally; that is, the way home thence is in all cases to run down south until you get into the westerly winds, and then bear away east.

Captain McKay made only one mistake by the way, and that was in getting from the S. E. trades through the belt of the horse latitude weather into the N. W. trades, I may call them, of the southern hemisphere.

In passing from one system of trades to the other, or from the trades to the variables, there is always a debatable ground which belongs neither to trades nor variables. This debatable ground between the trades about the equator is called the doldrums. Between the trades and the variables of the extra-tropical regions, it is called the horse latitudes.

In these debatable grounds, calms and baffling winds are to be expected, sometimes of several weeks, and often of many days, and occasionally of only a few hours' duration. And the rule for crossing these belts is, whenever there is sea-room, to steer due north or south according to your destination.

Therefore, in coming from the Sandwich or the Society Islands, or California to Cape Horn, the rule should be to go south as fast as possible, in order to get in the N. W. trade-wind region of that ocean with its heaving swells. Until you get into the region of these winds, no course can be given. The best passages are to be made by crossing the trades with topmast studding-sails set.

And in illustration of this, I might refer to the abstract log of the Sovereign of the Seas, as well as of the Comet and the Flying Dutchman from California. The last two ships, though they lost the S. E. trades in about 30°, did not get the regular westerly winds for some ten days afterwards, near the parallel of 48° or 50°.

All three of these ships were in this debatable ground of Capricorn in the Atlantic, from two to three days; the Sovereign of the Seas making only 68, 84, and 72 miles a day; the Comet, 27 and 43 miles on two successive days; the Flying Dutchman, 46 and 104. Indeed, it may be said that these ships fell in with the baffling winds of the horse latitudes 3d of April, when they lost the N. W. trades.

Returning, therefore, to the route to Australia, and thence home *via* Cape Horn, I beg to impress navigators with the fact that I am not prepared to speak as to the ice that may be expected so low down as the parallel of 55° or 60° south, between the meridians of the Cape of Good Hope and Van Dieman's Land; and, therefore, navigators who take these Sailing Directions for their guide, must judge for themselves as to dangers from the ice by the route of which I am now treating. I have no reliable information upon that subject.

Abstract Log of the Ship Sovereign of the Seas, L. McKay, *bound from Honolulu to New York*, 1853.

Date.	Latitude at noon.	Longitude at noon.	Dist. per log.	Bar.	THER. 9 A. M.		WINDS.			REMARKS.
					Air.	Water.	First part.	Middle part.	Latter part.	
Feb. 12										Sailed from Honolulu.
13	19°21′ N.	158°16′ W.	168*	30.10	75°	77°	N. E.	Variable	E.	First part, fine; middle part, squally; ends, light.
14	18 10	159 10	89	30.10	75	77	E. to E.S.E.	S. E.	E. to N. E.	Nearly calm.
15	16 20	159 43	120	30.05	78	78	S. E.	S. S. E.	S. S. E.	Nearly calm; fine and clear.
16	12 27	160 28	265	30.00	75	78	S. S. E.	S. S. E.	E. by S.	First part, light breezes; ends, fresh and squally.
17	8 13	159 00	301	30.00	77	76	E. by S.	E. by S.	E. N. E.	Heavy breezes and cloudy weather.
18	4 20	157 42	302	30.00	81	79	N. E. by E.	N. E. by E.	E. to E.S.E.	Strong breezes and cloudy; rough sea.
19	2 40	158 49	166	30.00	80	80	S. E. by E.	S. E.	S. E.	Moderate weather.
20	0 47	160 50	156				S. E.	S. E.	S. E. by E.	Pleasant weather and light breeze.
21	2 27 S.	157 35	211	30.00	85	85	E. N. E.	E. N. E.	E. N. E.	Pleasant weather and light breeze.
22	5 47	159 38	199	30.10	85	83				Pleasant weather and light breeze.
23	8 32	160 03	164	30.00	87	85	E.	E.	E.	Pleasant weather and light breeze.
24	9 22	160 11	82	29.95	87	81	E. S. E.	Variable	S. S. E.	Light and variable.
25	11 44	160 10	140	29.90	85	83	E. N. E.	Variable	Variable	Squally with rain.
26	16 25	159 54	307				Variable	E.	E.	Strong breezes and squally, with heavy rain.
27	20 42	160 59	308	29.90	78	82	E.	E.	E.	Strong breezes and squally, with heavy rain.
28	24 34	160 41	231				E.	E.	E. N. E.	Steady breeze and clear.
March 1	27 32 D. R.	159 36 D. R.	179	29.90	77	80	N.E. to S.E.	E. S. E.	N. E.	First part, variable winds and squally; ends, fresh.
2	30 17	159 20	173	29.92	78	78	N. E.	N. E.	N. E.	Light variable winds, with heavy rain.
3	32 41	159 40	150	29.00	87	76	S. E. by E.	E.	E.	First part, light winds, with rain; ends, pleasant.
4	37 14	161 15	311	29.82	71	72	S. S. E.	S. S. E.	S. S. E.	Strong breezes and squally; sprung fore-topmast.
5	42 00	163 21	308	29.80	70	70	S. S. E.	S. S. E.	S. S. E.	Strong breezes and squally; heavy sea.
6	45 04	164 00	198	29.93	70	70	S. S. E.	E.	E. by N.	Strong breezes and squally; heavy sea.
7	47 07 D. R.		129				S. E. by E.	S. E. by E.	S. E. by E.	Moderate weather; fished fore-topmast.
8			96				N. E. by E.	N. E. by E.	N. E. by E.	Moderate weather.
9	48 26	156 23	169	29.90	67	65	N.	N. W.	N. W.	Moderate weather and pleasant.
10	48 25	151 24	271	30.05	65	65	N. W.	N. W.	N. W.	Fresh breezes and pleasant.
11	48 15	143 44	332	30.05	60	60	N. W.	N. W.	N. W.	Strong gales and heavy squalls during the night.
12	48 19	136 30	312	29.89	60	62	W. S. W.	W. S. W.	W. S. W.	Strong breezes throughout.
13	48 40	129 19	284	28.95	40	43	W. S. W.	N. N. W.	N. N. W.	First part, fresh breezes; latter part, heavy gales.
14	48 58	125 02	207				W. N. W.	N. W.	S. W.	Fresh gales and heavy sea; latter part, moderate.
15	49 00	118 46	275				W. S. W.	W. S. W.	W. S. W.	Fresh breezes and cloudy.
16	49 40	109 28	396				N. W.	N. W.	N. W.	Strong breezes and cloudy, with rain.
17	50 25	101 58	311	30.05	43	43	N. W.	N. W.	N. W.	Strong breezes and heavy sea.
18	52 12	91 28	411				N. W.	N. W.	N. W.	Strong breezes and rough sea.
19	55 18	84 03	360				N. W.	W.	W.	Strong westerly winds and heavy sea.
20	56 18	76 58	267	29.72	43	41	W. N. W.	W. N. W.	W. N. W.	Strong breezes and pleasant.
21	56 23	69 00	307	29.60	49	49	N. N. W.	N. N. W.	N. W.	Moderate breezes and pleasant; made Diego Ramirez, bearing E. by S., distant 15 miles.
22	55 17	64 50	172	29.60			N. N. W.	N. N. W.	N. N. W.	Light breezes and warm weather.

* The distances in this column are the distances as given by the log.

Abstract Log of the Ship Sovereign of the Seas—Continued.

Date.	Latitude at noon.	Longitude at noon.	Dist. per log.	Bar.	THER. 9 A. M		WINDS.			REMARKS.
					Air.	Water.	First part.	Middle part.	Latter part.	
March 23	54°37′ S.	60°30′ W.	146	29.70	40°	40°	N. W.	N. N. W.	N. N. W.	First part, light breezes and pleasant; latter part, fresh and foggy.
24	52 42	53 15	251	29.75	45	45	N. N. W.	N. W.	N. W.	Moderate breeze and foggy.
25	50 15	47 47	203	29.78	50	48	N. N. W.	W. N. W.	N. W.	Steady breezes and pleasant weather.
26	47 53	43 05	168	30.47			W. N. W.	W.	W. N. W.	Light breezes and pleasant.
27	44 39	43 24	190	29.95	47	47	W. N. W.	N. N. E.	N. W.	Light breezes and cloudy.
28	41 50	38 30		29.95	52	52				Light breezes and heavy sea.
29	39 19	34 20	237	30.10	54	54	N. E. by N.	N. E.	E. N. E.	Moderate breezes and cloudy.
30	37 30	31 18	183	30.52			N.	N.	N. by E.	Light breezes and pleasant.
31	35 28	29 57	188	29.95	63	63	N.	N. N. E.	N. N. W.	Strong breezes and squally; latter part, rainy.
April 1	34 10	28 11	161	29.90	67	66	N. N. E.	N. N. E.	N.W. by N.	Light breezes and pleasant.
2	32 13	30 47	171	30.12	67	67	N. by E.	N. N. E.	N. E.	Light breezes and pleasant.
3	31 09	29 16	105	30.15	73	73	N. by E.	N. by W.	N.	Light breezes and pleasant.
4	29 47	27 55	135				N. by W.	N. by E.	N. by E.	Light breezes and pleasant.
5	28 39	27 47	124	30.18	77	77	N.	N. by E.	N.	Light breezes and pleasant; latter part, squally with rain.
6	27 33	26 49	143				N. by E.	N. by E.	N. by W.	Light breezes and pleasant.
7	26 24	27 12	84	30.12	80	80	N. N. W.	S. E.	N. N. E.	Squally with rain; ends light breezes and clear.
8	24 19	28 47	128	30.11	78	78	E.	E. N. E.	N. N. E.	Light breezes and pleasant.
9	22 18	30 20	156	30.10	76	76	N. by E.	E. N. E.	N. N. E.	Light breezes and pleasant; latter part, showers of rain.
10	21 11	32 21	149	30.10	79	79	N. N. E.	E. N. E.	N. E.	Light variable winds and pleasant.
11	19 53	33 24	207	30.10	79	79	N. E. by E.	N. E. by E.	N. E. by E.	Moderate breezes and pleasant.
12	12 31	34 37	280	30.00	76	76	E.	E.	E.	Fresh and cloudy.
13	9 37	34 17	196	30.00	76	76	E.	N. N. E.	E.	Moderate and cloudy; ends, squally with rain.
14	7 03	34 22	141	29.90	82	82	E.	E.	S. E.	Light and pleasant.
15	4 50	35 20	152	29.90	83	82	S. E.	S. E.	S. E.	Fine weather.
16	3 14	37 25	166	29.95	85	84	S. E.	E. S. E.	E.	Light winds and clear.
17	2 20	39 05	99	30.00	89	87	E. N. E.	E. N. E.	E. N. E.	Calm and squally, with light rain.
18	1 46	40 00	61	30.00	89	89	E. N. E.	N. N. E.	Calm	Light breezes and squalls.
19	0 48	40 37	98	30.00	89	89	Variable	E. N. E.	Variable	Calm, with passing squalls of rain.
20	0 49 N.	42 22	77	30.10	90	88	N. N. E.	N. N. E.	N. N. E.	Light airs and sultry.
21	1 21	41 18	53	30.10	90	90	N. N. E.	S. E.	Calm	Light airs and passing clouds with rain.
22	2 42	42 42	106				Calm	N. N. E.	N. N. E.	Calms and squalls.
23	5 34	45 15	237	30.14	85	85	N. E. by N.	N. E.	W.	Fine breezes with occasional squalls.
24			293				N. N. E.	N. N. E.	N. N. E.	Fine breezes.
25	13 20	52 23	285							Fine breezes and fine weather.
26	16 10	54 55	282	30.15	85	85	E. N. E.	E.	E.	Fresh breezes and pleasant.
27	19 42	59 02	286	30.12	86	85	E.	E.	E.	Strong breezes and passing clouds.
28	23 21	61 35	273	30.00	83	83	E.	E.	E.	Pleasant breezes, with a rough sea.
29	26 00	62 40	188	30.15	86	86	E. S. E.	W. ½ S.	S. E.	Light breezes and pleasant.
30	28 10	64 00	153				S. E.	S. E.	S. E.	Commences pleasant; ends rainy, thick weather.
May 1	29 53	68 03	196	30.00	77	77	S. E.	N. E.	N. N. E.	Moderate breezes and thick, rainy weather.
2	31 43	71 26	199	30.12	68	71	N. by E.	N. N. E.	N. N. E.	Pleasant with passing clouds.
3	33 13	73 26								Weather cool and pleasant.
4	34 32	71 47								Commences calm; ends with moderate breezes.
5	37 22	74 35								Moderate breezes; sounded in 40 fathoms: bottom.
6										Made Barnegat light at 1 A. M.; took a pilot on board, and stood in; at 3 P. M., anchored in East River.

A LAST WORD ABOUT THE ROUTE TO RIO, AND PORTS BEYOND THE EQUATOR.

At page 418, I have recommended that vessels bound from Boston, New York, &c., for the southern hemisphere, should, when they come out with good and fair winds, stand east, or as nearly east as the land and a regard for their own safety will permit, until they reach the meridian of 60° W., or even of 55° W., and then stand away to the southward, aiming to strike the calms of Cancer in 40° or 45° W., and thus have room enough to push straight across those calms on a south course, if the winds should baffle them there.

Vessels from the Capes of the Delaware or Virginia should do the same; that is, stand due east when the winds are fresh and fair for that course; otherwise, all of them should follow the usual route.

Navigators will understand that this route is only recommended when, on taking their departure, the winds are favorable for making easting rapidly; for, when they do come out with the winds so favorable, the shortest passages, especially from New York, and ports east, may be expected by this route; but when the winds are not favorable at coming out, for going east, then the chances by this route for a quick passage to the line, are not so good.

CONDITIONS UPON WHICH THE WIND AND CURRENT CHARTS ARE FURNISHED TO NAVIGATORS.

It is supposed that the proceedings of the Maritime Conference at Brussels will give a new impulse to the *Wind and Current Charts*, and greatly increase the number of laborers in this field of research. To enlarge the corps of observers, and to extend the benefits of this system of observations, the Hon. J. C. Dobbin, Secretary of the Navy, has authorized the merchant vessels of all friendly nations trading upon the high seas, to be put upon a footing with American vessels as it regards these Charts.

He has, moreover, commanded the Abstract Log, recommended by the Conference at Brussels, to be used on board of every man-of-war; and he recommends the same to be done by merchantmen, as per the following

GENERAL ORDER.

NAVY DEPARTMENT.

November 3, 1853.

The form of the "Abstract Log" recommended by the late Maritime Conference at Brussels is hereby approved and adopted for use in the Navy of the United States.

It is recommended to navigators generally, and will be faithfully kept on board of all vessels in the naval service.

Commanding officers of vessels are especially charged with the execution of this order; and they will transmit copies of the abstract kept on board, to the Chief of the Bureau of Ordnance and Hydrography, at the end of the cruise, and at such other times as he may direct.

Signed, J. C. DOBBIN,

Secretary of the Navy.

To entitle the navigator to a copy of these *Charts*, or rather, of such sheets as relate to his cruising grounds, and a copy of the *Sailing Directions*, he should be able to show that he is prepared to make the observations required of him; or, in other words, that he is provided with the requisite instruments, which should be, at least, one good steering compass, one good sextant, one mercurial barometer, and three air and water thermometers. I say at least, because the above enumeration includes only the instruments that are essentially necessary to enable the navigator to comply with his part of the agreement.

The Charts are to be had by American shipmasters on application either at the National Observatory, Washington, or at the office of its agent, George Manning, No. 142 Pearl Street, New York.

Holland has established a Wind and Current Bureau, under the superintendence of Lieutenant Marin Jansen, of the Dutch Navy.

England is doing the same, which is to be under the Board of Trade. English co-operators are therefore referred to Captain F. W. Beechey, R. N., member of the Naval Department of the Board of Trade, for further information as to their obtaining the Charts.

Spain and Portugal, Belgium, Sweden and Norway, Russia, Prussia, and Denmark, the Republic of Bremen, and the free city of Hamburg, have taken, or are preparing to take similar measures. The Charts, &c., for their navigators, will be delivered to such persons as those governments may appoint to receive them; and each one, no doubt, will in due time let those whom it concerns know how, where, and upon what terms, the Charts, &c., are to be obtained.

These Charts, it cannot be too often repeated, are based upon information collected for the most part by private ship-owners and masters. The information being furnished to the Government gratuitously, the Government incurs the expense of publishing it, and of making it available to navigators. The Government, then, offers a copy of the Chart so published to every navigator, upon condition that he will continue to keep and forward to this office abstract logs of his voyages, which abstracts are required to be kept according to the form herein prescribed.

Every navigator, who, after receiving a copy of the Charts, fails to comply with these conditions—viz: to keep abstracts of his voyages, as per form, and to transmit them to me, at the National Observatory, on his return to the United States, or, on his return to his own country, to transmit them to the person appointed to receive them—forfeits his claim to all future publications.

The following is the form of the receipt which every navigator is required to sign for such Charts as he may receive:—

FORM OF RECEIPT.

Received this *day of* 185

from *one Abstract Log, one Copy of*

Maury's Sailing Directions, *edition, and*

sheets Nos. (*Series A.*)

do. do. (" *B.*)

do. do. (" *C.*)

do. do. (" *D.*)

do. do. (" *E.*)

do. do. (" *F.*)

MAURY'S WIND AND CURRENT CHARTS; *for, and in consideration of which, I promise to keep, in the manner and form prescribed, a journal of my Voyages, and, on my return, to transmit the same to the National Observatory, Washington.*

_____

Commanding _____

of _____

Bound _____

Navigators will please bear in mind that the abstract logs which they return to this office, are to be bound, and to be preserved for use and reference for an indefinite period. Therefore, it is desirable that care should be used with the abstract on board ship, so that it may be returned in good condition for preservation.

For these reasons, it is desired that the abstract log should be returned only at the end of the voyage, and not, as heretofore, when the voyage has been half completed. Vessels, therefore, in the California trade, are requested not to return their logs from San Francisco, but to continue them, and transmit them on their return to the Atlantic States.

It may be proper to add here, that the navigator who receives a copy of the *Charts and Sailing Directions* is expected to give his co-operation by keeping an abstract log, not only for the voyage upon which he may then be bound, but for all subsequent voyages, or until he shall be informed that no farther co-operation is desired.

And whalemen will please recollect that their abstracts must embrace, for *every day that they are not at anchor*, a regular record of their latitude and longitude, force and direction of the wind three times a day, temperature of the air and water, and mention of whales whenever seen.

NAMES OF THE OFFICERS EMPLOYED IN THE CONSTRUCTION OF THE WIND AND CURRENT CHARTS.

NORTH ATLANTIC TRACK CHARTS.—Lieuts. D. D. Porter, Whiting, Herndon, Wyman, Beaumont, and Gibbon, Prof. Wm. Flye, Passed Midshipman Temple.

NORTH ATLANTIC THERMAL CHARTS.—Lieut. Gantt and Prof. Flye.

NORTH ATLANTIC PILOT CHARTS. (All denominations of PILOT CHARTS.)—Lieuts. Herndon, Dulaney, H. N. Harrison, Ball, Forrest, and Balch, Prof. W. B. Benedict, Passed Midshipmen Davenport, Powell, De Koven, Wainwright, Roberts, De Krafft, Woolley, Jackson, Murdaugh, Semmes, Johnson, Lewis, Terrett, Wells, and Brooke.

NORTH ATLANTIC TRADE-WIND CHART.—Lieut. De Haven.

NORTH ATLANTIC STORM AND RAIN CHARTS.—Lieuts. Minor, Ball, and W. Rogers Taylor.

SOUTH ATLANTIC TRACK CHARTS.—Lieuts. Whiting and Gibbon, Profs. Flye and Benedict, Passed Midshipmen Temple, Woolley, and Badger.

SOUTH ATLANTIC THERMAL CHARTS.—Lieut. W. R. Gardner and Prof. Flye.

SOUTH ATLANTIC STORM AND RAIN CHARTS.—Lieuts. Minor, Beaumont, Guthrie, and Passed Midshipman Young.

NORTH PACIFIC TRACK CHARTS.—Lieuts. Whiting, Gibbon, and W. C. B. S. Porter, Prof. Flye, Passed Midshipmen Fillebrown and Badger.

NORTH PACIFIC THERMAL CHARTS.—Lieut. W. Ross Gardner.

SOUTH PACIFIC TRACK CHARTS.—Lieuts. Whiting, Gibbon, Balch, and W. C. B. S. Porter, Prof. Flye.

INDIAN OCEAN TRACK CHARTS.—Lieuts. Whiting, Gibbon, Balch, Wyman, and W. C. B. S. Porter, Prof. Flye, Passed Midshipmen Temple and Brodhead.

INDIAN OCEAN THERMAL CHARTS.—Lieut. W. R. Gardner.

WHALE CHART.—Lieuts. Herndon and Fleming, Passed Midshipmen Welsh and Jackson.

PROGRAMME CHART.—Lieut. Wyman and Passed Midshipman Jackson.

STATEMENT, SHOWING THE CHARTS THAT HAVE BEEN PUBLISHED, AND STATE OF FORWARDNESS OF THOSE REMAINING TO BE PUBLISHED.

NORTH ATLANTIC TRACK CHARTS, in eight sheets, extending from 20° E. to 100° W., and from the equator to 65° 30′ N. All published.

NORTH ATLANTIC THERMAL CHARTS, in eight sheets, and of the same dimensions as the TRACK CHARTS. All published.

NORTH ATLANTIC PILOT CHARTS, in two sheets, extending from 0° to 100° W., and from the equator to 70° N. Second edition. All published.

TRADE-WIND CHART OF THE NORTH ATLANTIC, in one sheet, extending from 10° W. to 100° W. Published.

STORM AND RAIN CHART OF THE NORTH ATLANTIC, in one sheet, extending from 10° E. to 100° W., and from the equator to 60° N. Published.

SOUTH ATLANTIC TRACK CHARTS, in six sheets, extending from 20° E. to 100° W., and from the equator to 65° 30′ S. Sheets one and two are a second edition. All published.

SOUTH ATLANTIC THERMAL CHARTS, in six sheets, and of the same dimensions as the TRACK CHARTS. All published.

SOUTH ATLANTIC PILOT CHARTS, in two sheets, extending from 20° E. to 70° W., and from the equator to 70° S. All published.

STORM AND RAIN CHART OF THE SOUTH ATLANTIC, in one sheet, extending from 20° E. to 7° W., and from the equator to 60° S.; is nearly ready to send to the engraver.

NORTH PACIFIC TRACK CHARTS.—This series, when completed, will consist of eleven sheets, extending from 110° E. to 70° W., and from the equator to 65° 30′ N. Of these, sheets Nos. 8, 9, 10, and 11, have been published. The Coast Line has been engraved for all the other sheets, and tracks have been laid down for sheets 6 and 7.

NORTH PACIFIC THERMAL CHARTS, in eleven sheets, and of the same dimensions as the TRACK CHARTS. Considerable progress has been made in the construction of this series; but the work upon them has been suspended, for the present, for want of force.

NORTH PACIFIC PILOT CHARTS, in six sheets, extending from 15° E. to 75° W., and from the equator to 70° N. Of these, sheets Nos. 5 and 6 have been published, and the rest are now in process of construction.

STORM AND RAIN CHARTS FOR THE NORTH AND SOUTH PACIFIC OCEANS are being constructed.

SOUTH PACIFIC TRACK CHARTS.—This series will consist of ten sheets, extending from 140° E. to 70° W. Sheets 5 and 10 have been published, and the Coast Line has been engraved for Nos. 3 and 4.

SOUTH PACIFIC PILOT CHARTS.—This series will consist of six sheets, of which No. 6 alone has been published—the remaining sheets being now under construction.

INDIAN OCEAN TRACK CHARTS—the series to consist of eleven sheets—extending from 20° E. to 140° E., and from the equator to 65° 30′ S. Of these, the Coast Line has been engraved for sheets 1, 2, 4, 5, 8, 9, 10, and 11, and some progress has been made in drawing tracks for sheets 4 and 5. Mr. Flye is now drawing the Coast Line of sheet 7.

INDIAN OCEAN THERMAL CHARTS.—The series will consist of eleven sheets, and will be of the same dimensions as the TRACK CHARTS. Considerable progress has been made in the preparation of all the sheets of this series; but the work upon them has been suspended, for the present, for want of material.

The PILOT CHARTS FOR THE INDIAN OCEAN are included under the head of SOUTH PACIFIC PILOT CHARTS.

WHALE CHART OF THE WORLD, in 4 sheets. All published.

PROGRAMME WHALE CHART, in 1 sheet. Published.

PHYSICAL MAP OF THE OCEAN, in 4 sheets—in process of construction.

RECAPITULATION.

Number of sheets already published	48
Number of sheets in the hands of the engraver	20
Number of sheets in process of construction	44

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ERRATA.

Page 219. 13th line from top, *for* "Plate XV." *read* "Plate XIV."

" 751. 16th " " " *for* "$750 per day for each vessel," *read* "$750 for each vessel."

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THE END.

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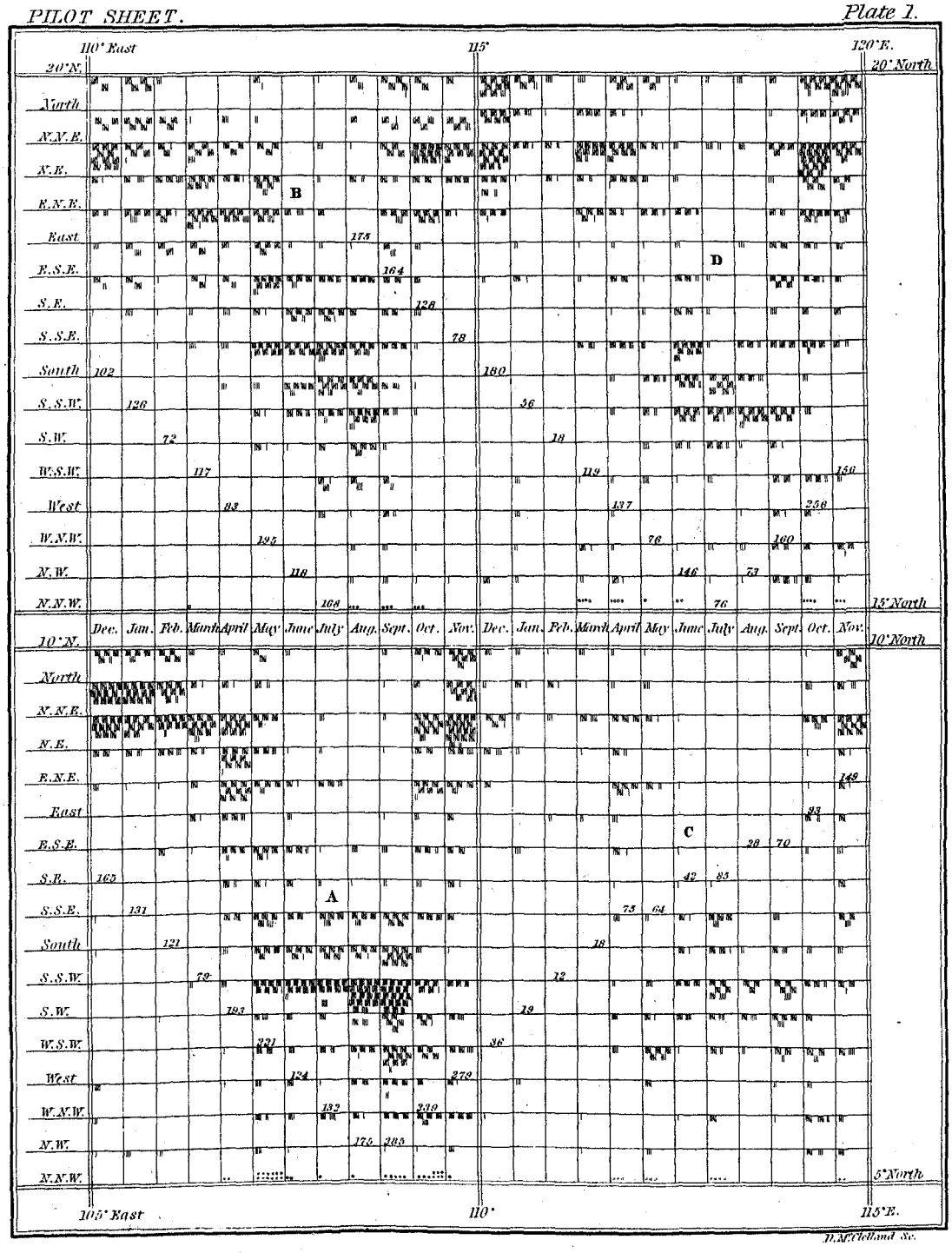
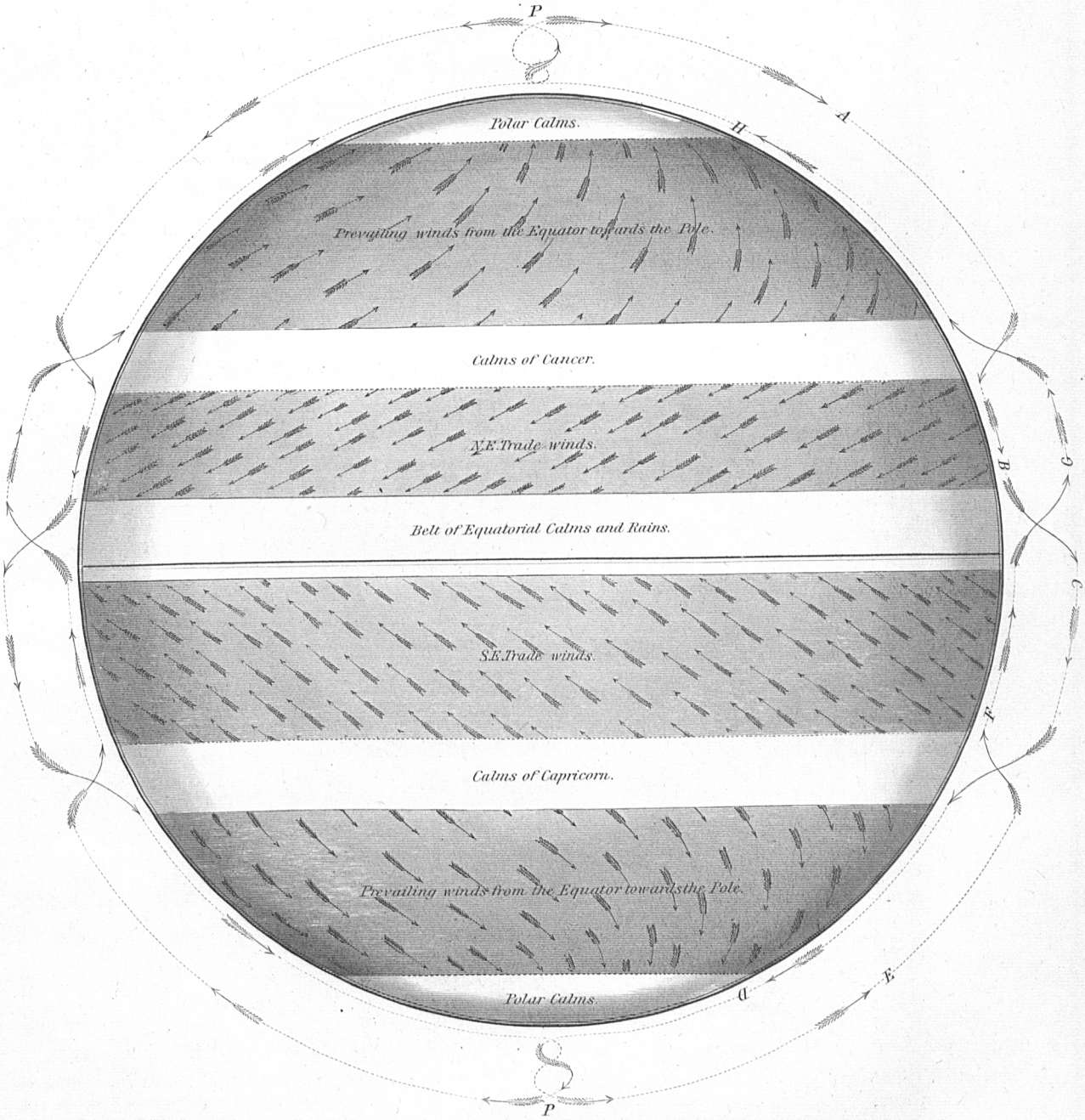


D. M'Clelland Sc.

DIAGRAM OF THE WINDS.

Plate II.



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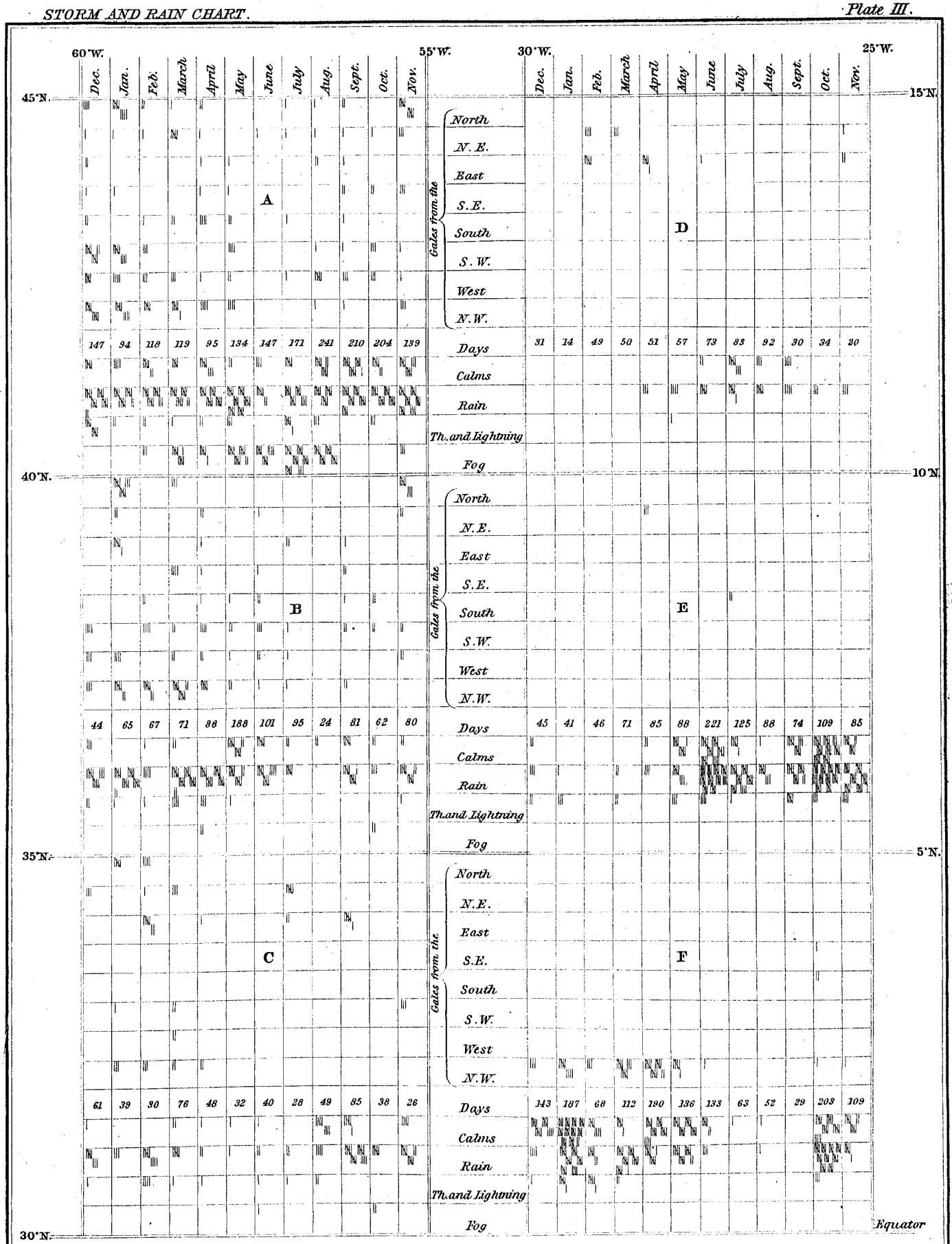
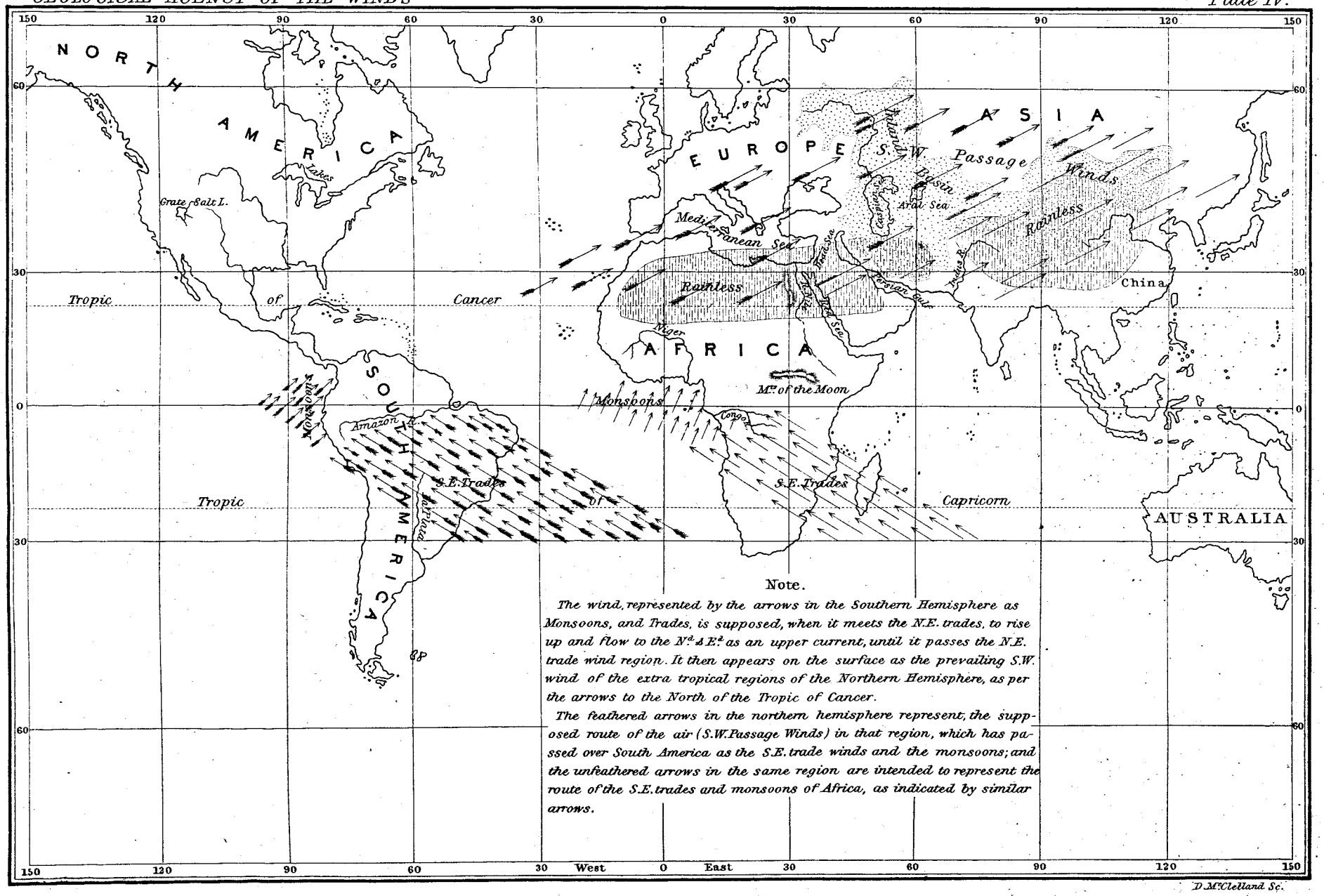


D. McClelland Sc.

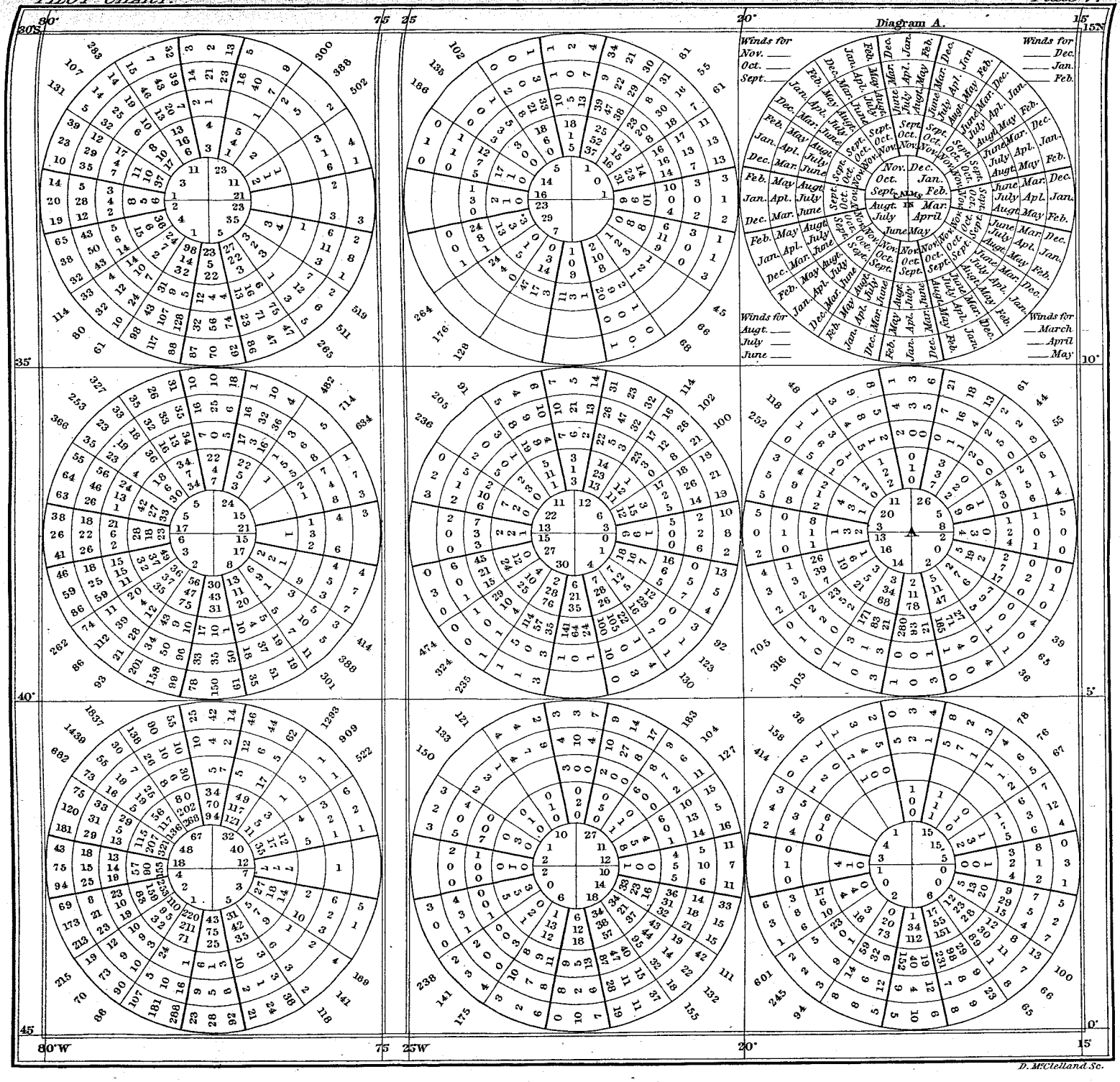


Note.

The wind, represented by the arrows in the Southern Hemisphere as Monsoons, and Trades, is supposed, when it meets the N.E. trades, to rise up and flow to the N.d & E.d as an upper current, until it passes the N.E. trade wind region. It then appears on the surface as the prevailing S.W. wind of the extra tropical regions of the Northern Hemisphere, as per the arrows to the North of the Tropic of Cancer.

The feathered arrows in the northern hemisphere represent, the supposed route of the air (S.W. Passage Winds) in that region, which has passed over South America as the S.E. trade winds and the monsoons; and the unfeathered arrows in the same region are intended to represent the route of the S.E. trades and monsoons of Africa, as indicated by similar arrows.

D. M'Clelland Sc.



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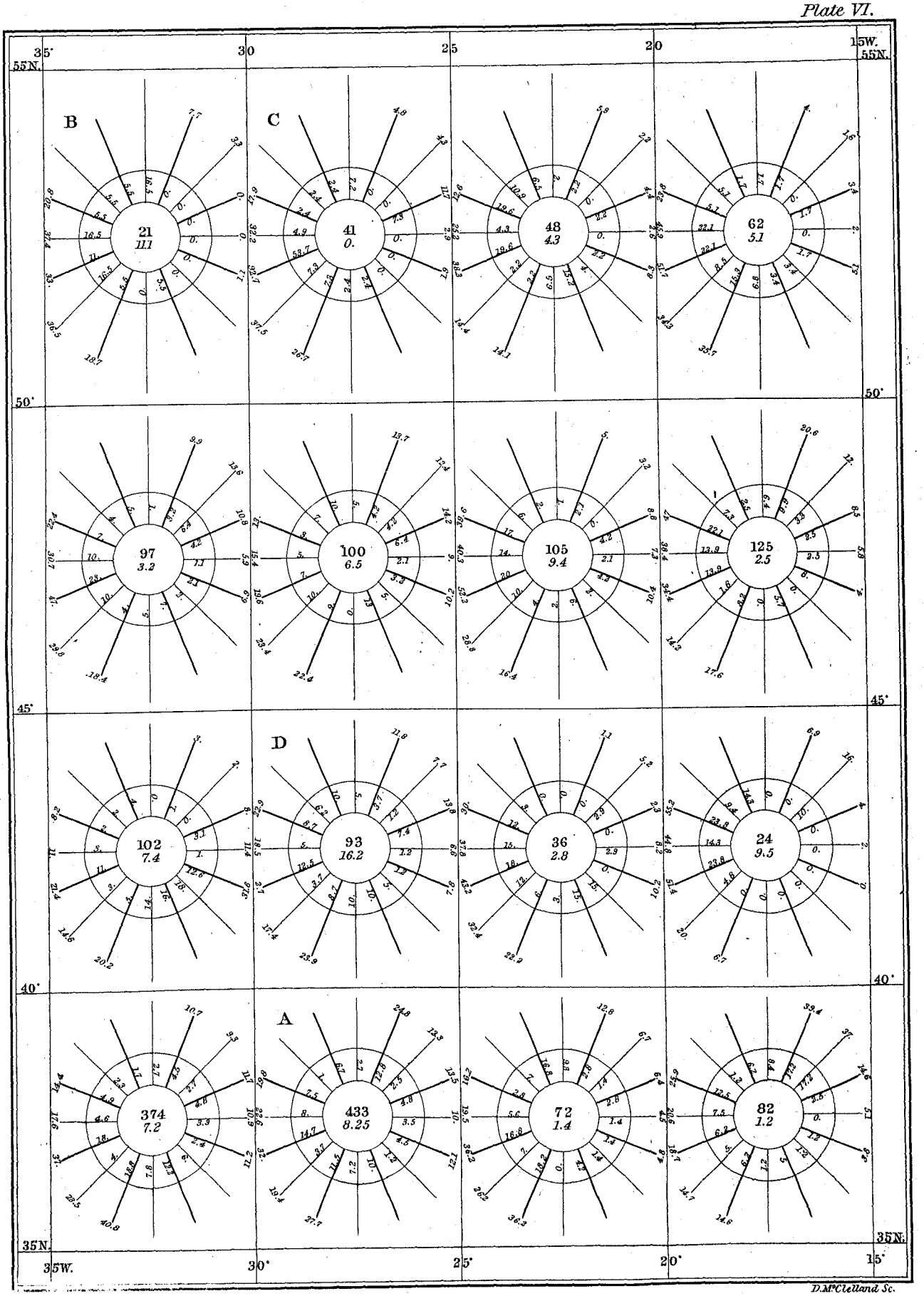

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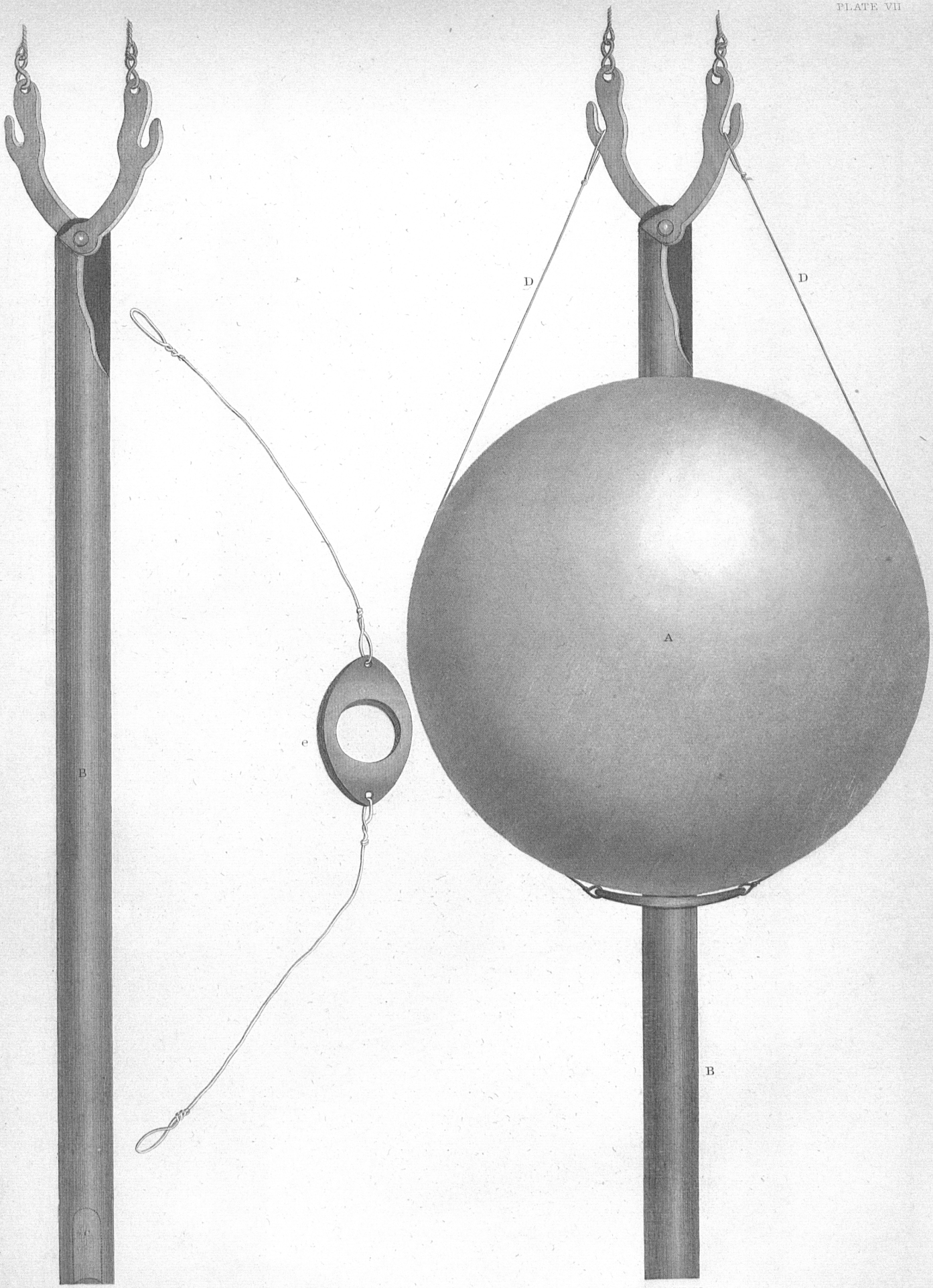

SOUNDING APPARATUS, INVENTED BY PASSED MIDSM J. M. BROOKE, U.S.N.

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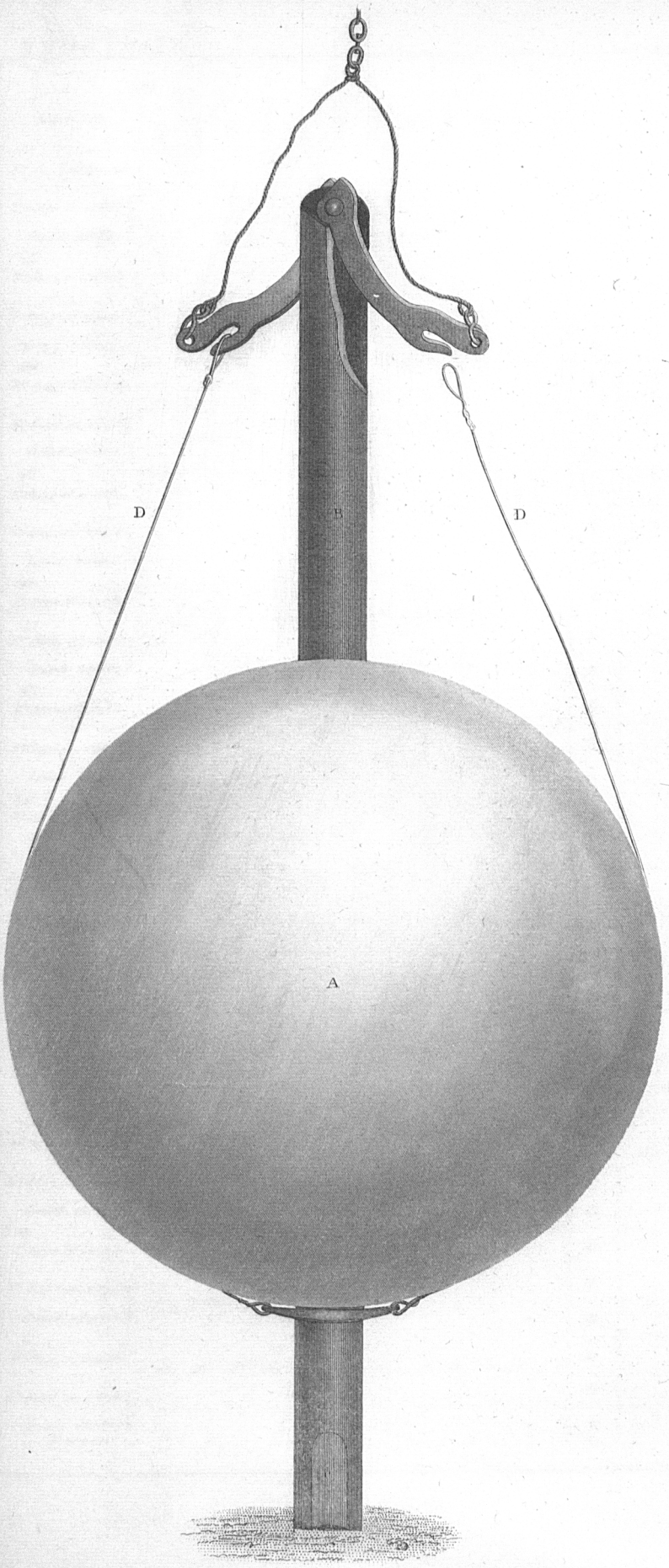

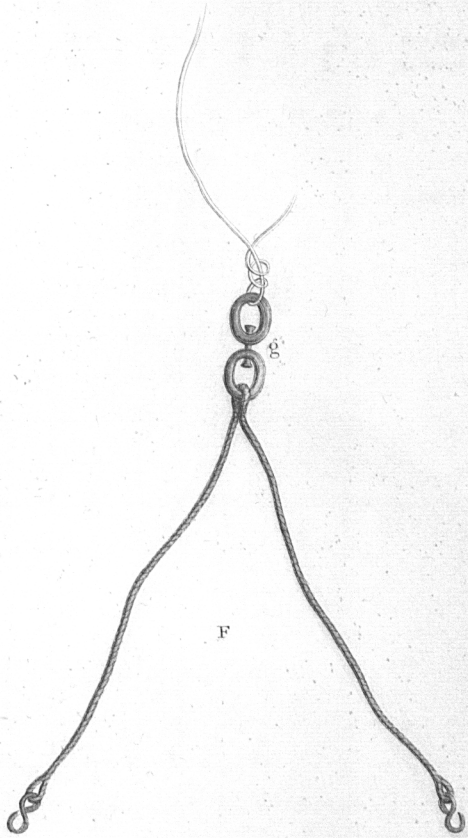

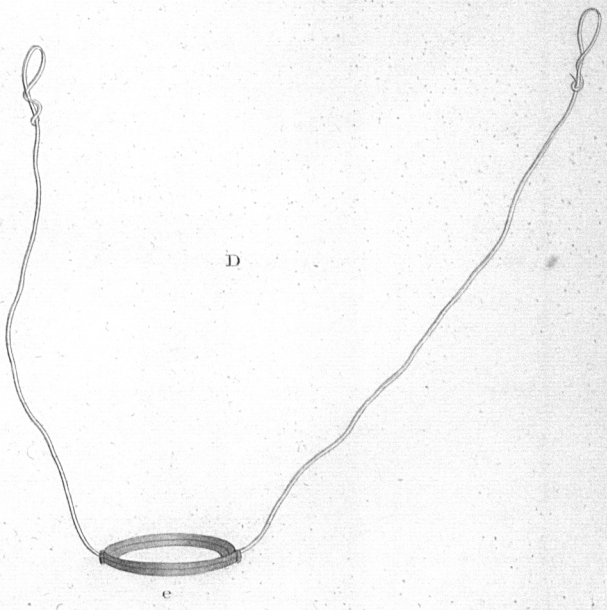

Engraved & Printed by J.M.Butler Philad.a

130° 125° 130° 125° W.

Lat. North		Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.		Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Lat. South
60°	D													D	10	89	110	85	44	74	73	82	29	10	13	8	Equator 0°
Nº days of search	S													S		III IIII	IIII IIII	IIII	II IIII	IIII IIII IIII	IIII IIII	I IIII	II		I	III	
Nº days on which found whales	R													R													S.Lat. 5°
55°	D									2				D	3		6	4	4		2			5			
Nº days of search	S													S													
Nº days on which found whales	R									I				R													10°
50°	D							7		13				D	15			8			2	3	1				
Nº days of search	S							III						S				I									
Nº days on which found whales	R													R													15°
45°	D							10	5	17	2			D	12		2	4		4	3	3	2				
Nº days of search	S							IIII	IIII					S													
Nº days on which found whales	R													R													20°
40°	D							4	7	11	8	4		D	11	9		8		16		3					
Nº days of search	S								III					S													
Nº days on which found whales	R													R													25°
35°	D										9	9	9	D	4	20	14		6	15	4		5				
Nº days of search	S													S			I										
Nº days on which found whales	R													R													30°
30°	D	28	7								4	5	3	D		16	7			4					2	2	
Nº days of search	S										I			S													
Nº days on which found whales	R													R													35°
25°	D	3		2	5		2	1	3				4	D				3	3		2						
Nº days of search	S													S													
Nº days on which found whales	R													R													40°
20°	D	4	5	6	2	5							2	D	2	2	9	4			4				3		
Nº days of search	S													S													
Nº days on which found whales	R													R													45°
15°	D	3	3		4	6	2							D	7	9	13	1	1	2	3	2	2				
Nº days of search	S	I	I											S													
Nº days on which found whales	R													R													50°
10°	D	2	7	6	8	4		5	3	6				D			4	5							2		
Nº days of search	S	II	I			I				I				S													
Nº days on which found whales	R													R													55°
5°	D	5	25	25	23	45	37	4		4	6	7	2	D													
Nº days of search	S		I IIII	II IIII	I	IIII	IIII						I	S													
Nº days on which found whales	R													R													60°
0° Equator																											

D. McClelland Sc.

August and September Hurricane of 1848.

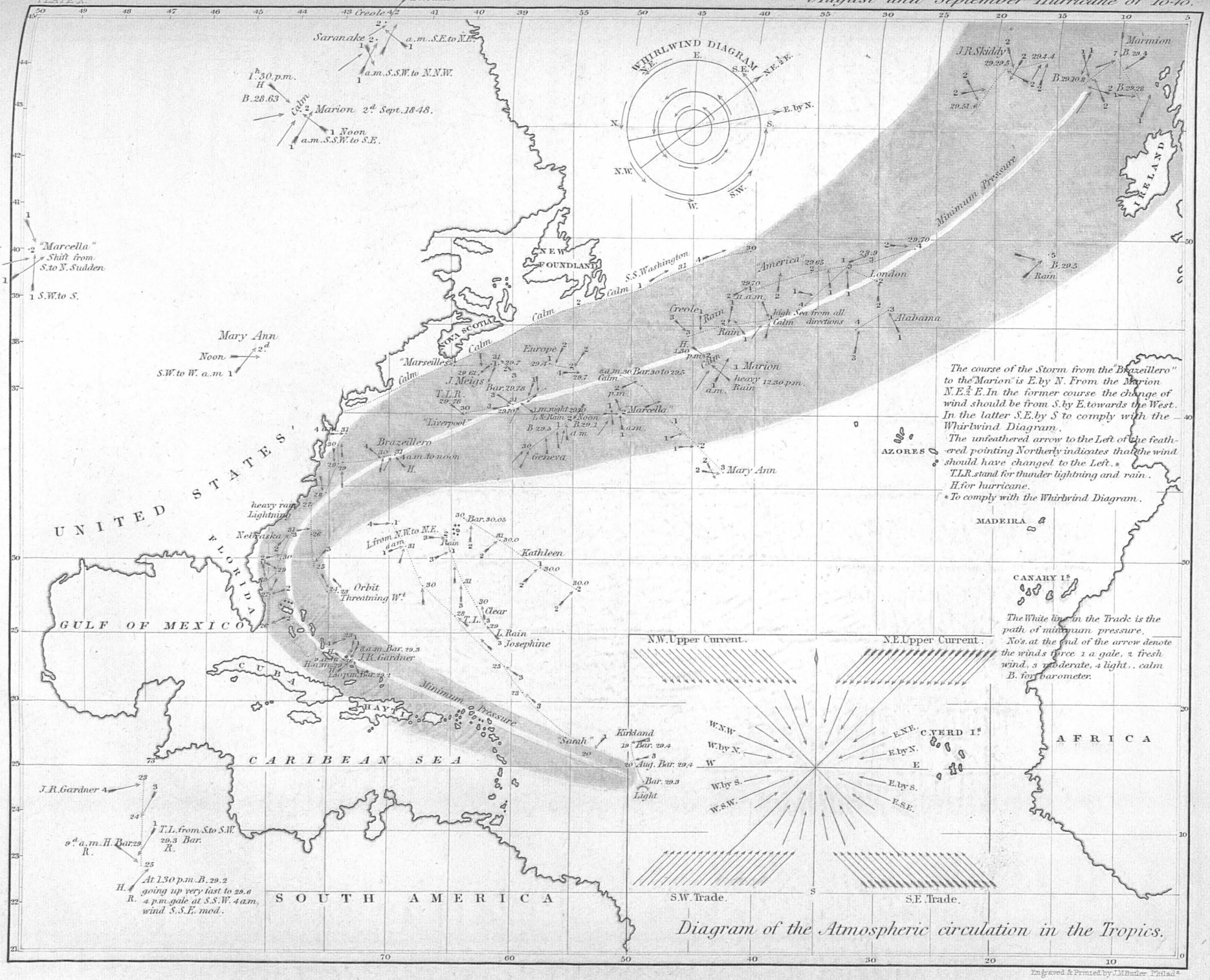

Diagram of the Atmospheric circulation in the Tropics.

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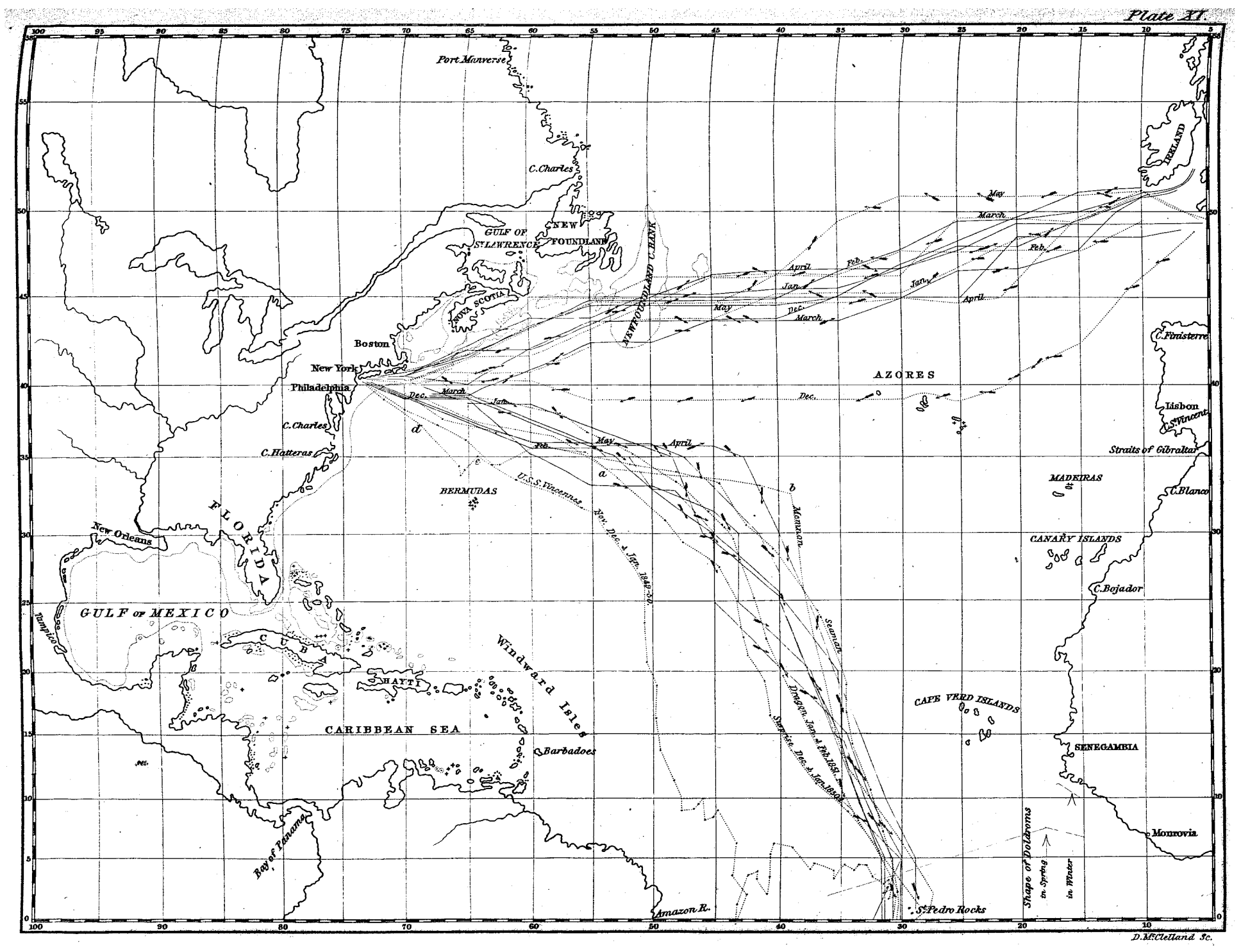
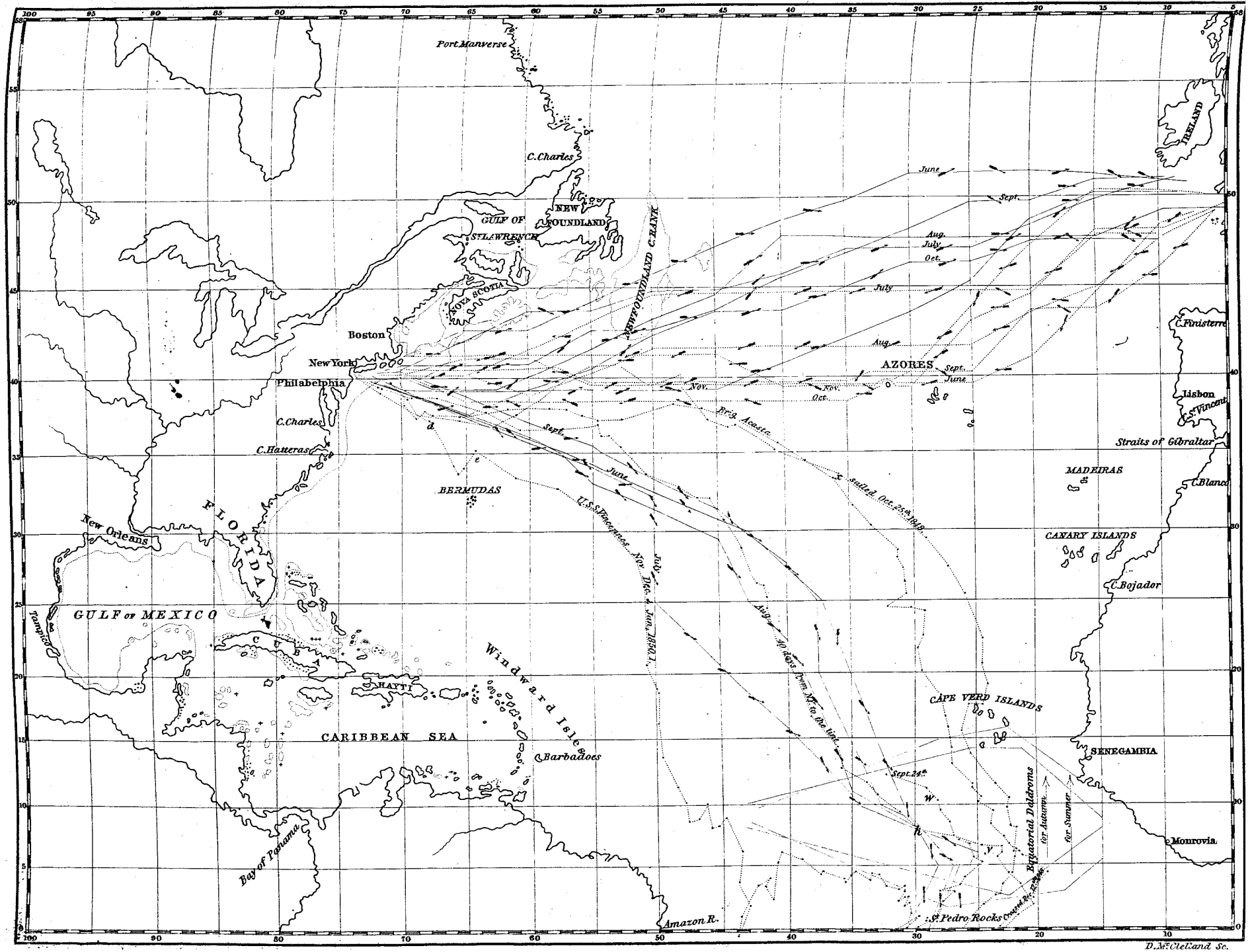


D. McClelland Sc.



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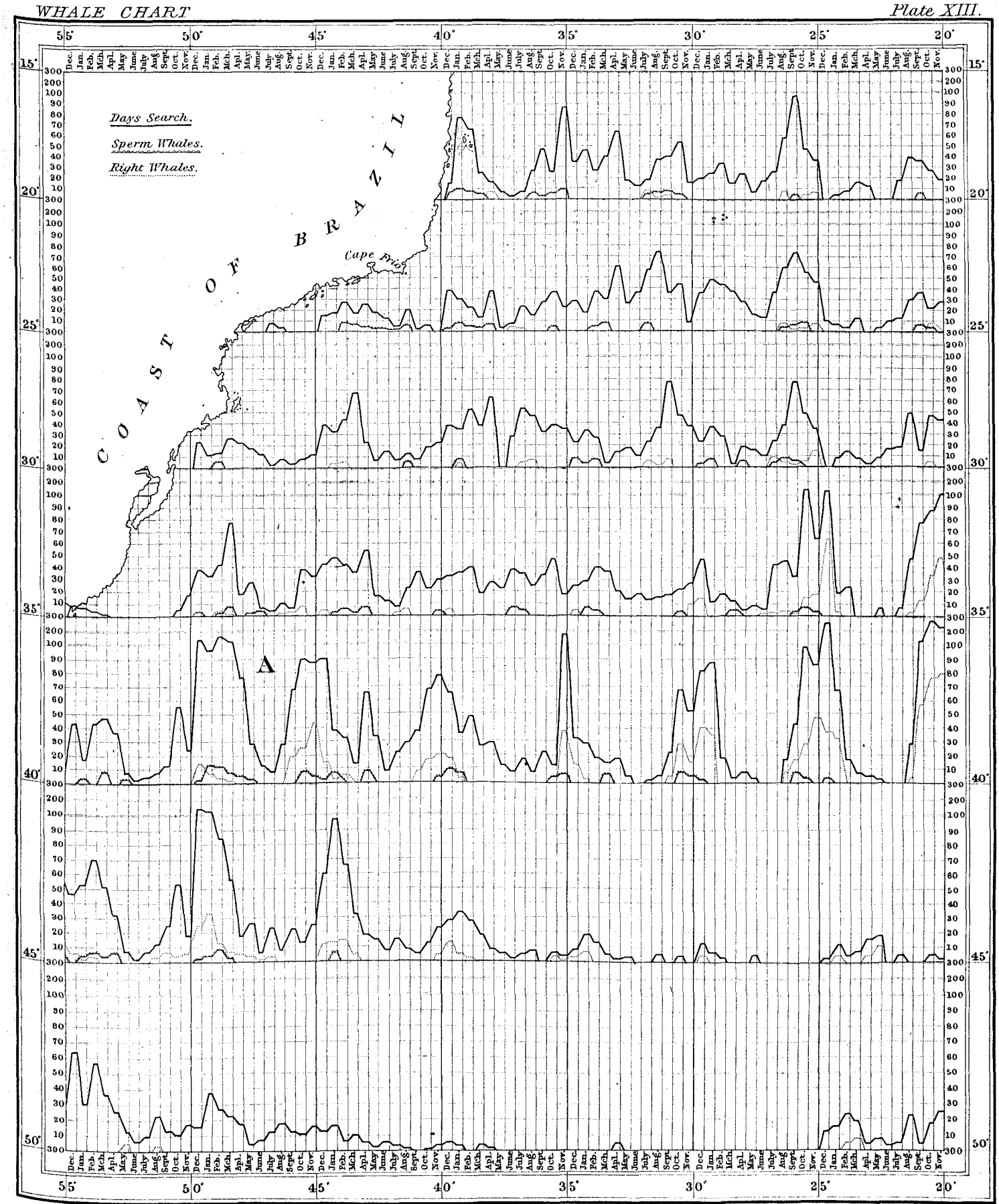
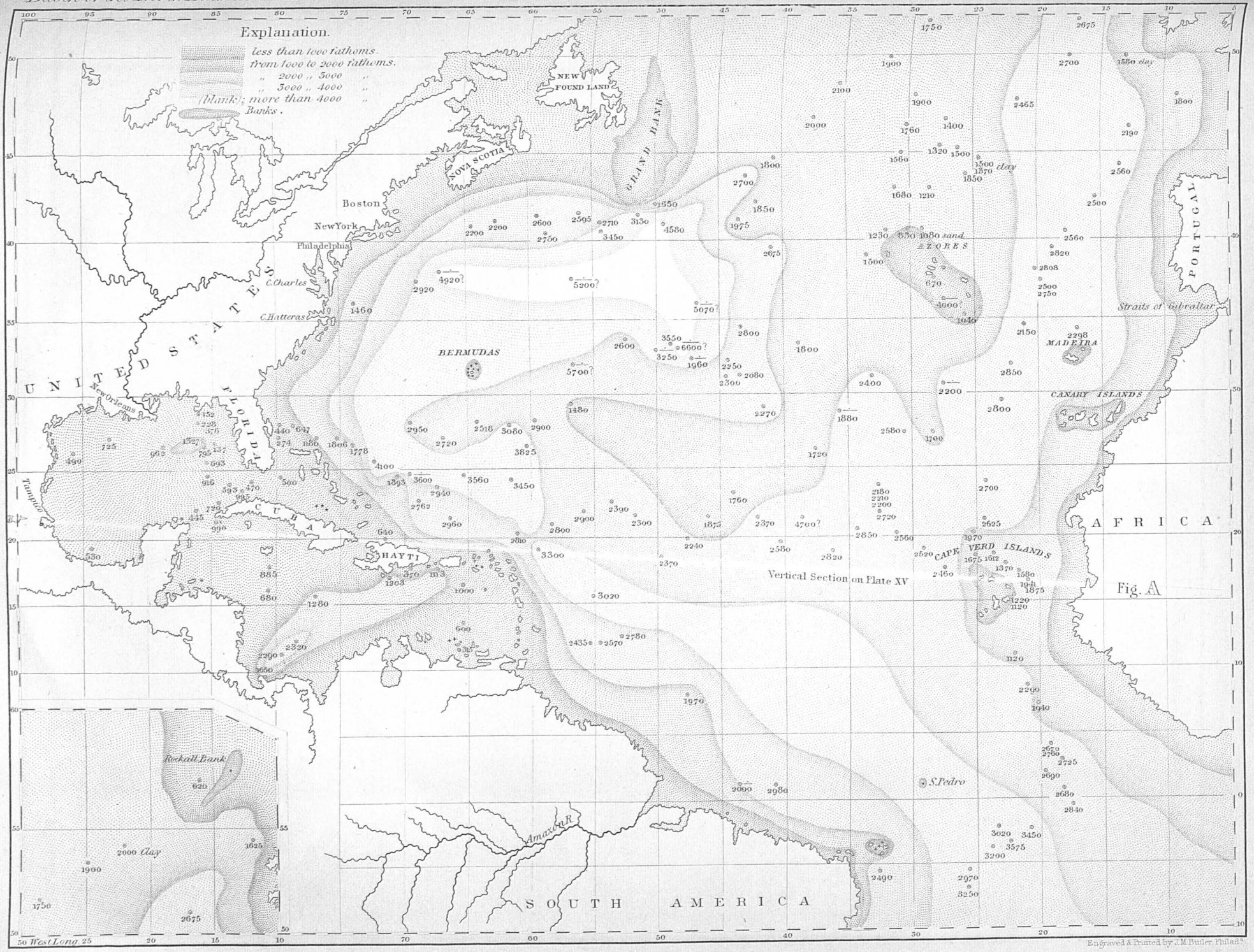


D.McClelland Sc.



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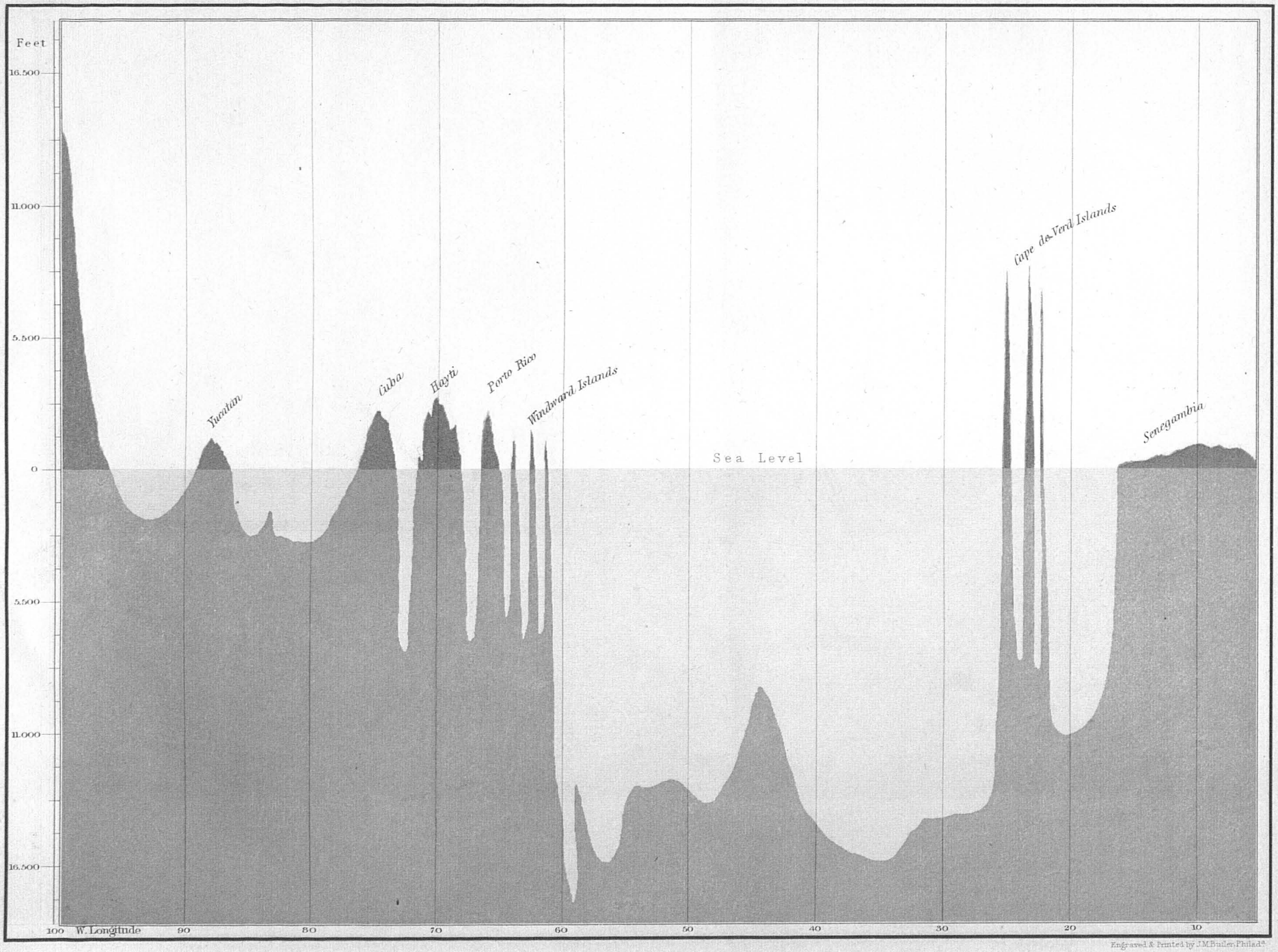
VERTICAL SECTION — NORTH ATLANTIC

PLATE XV.



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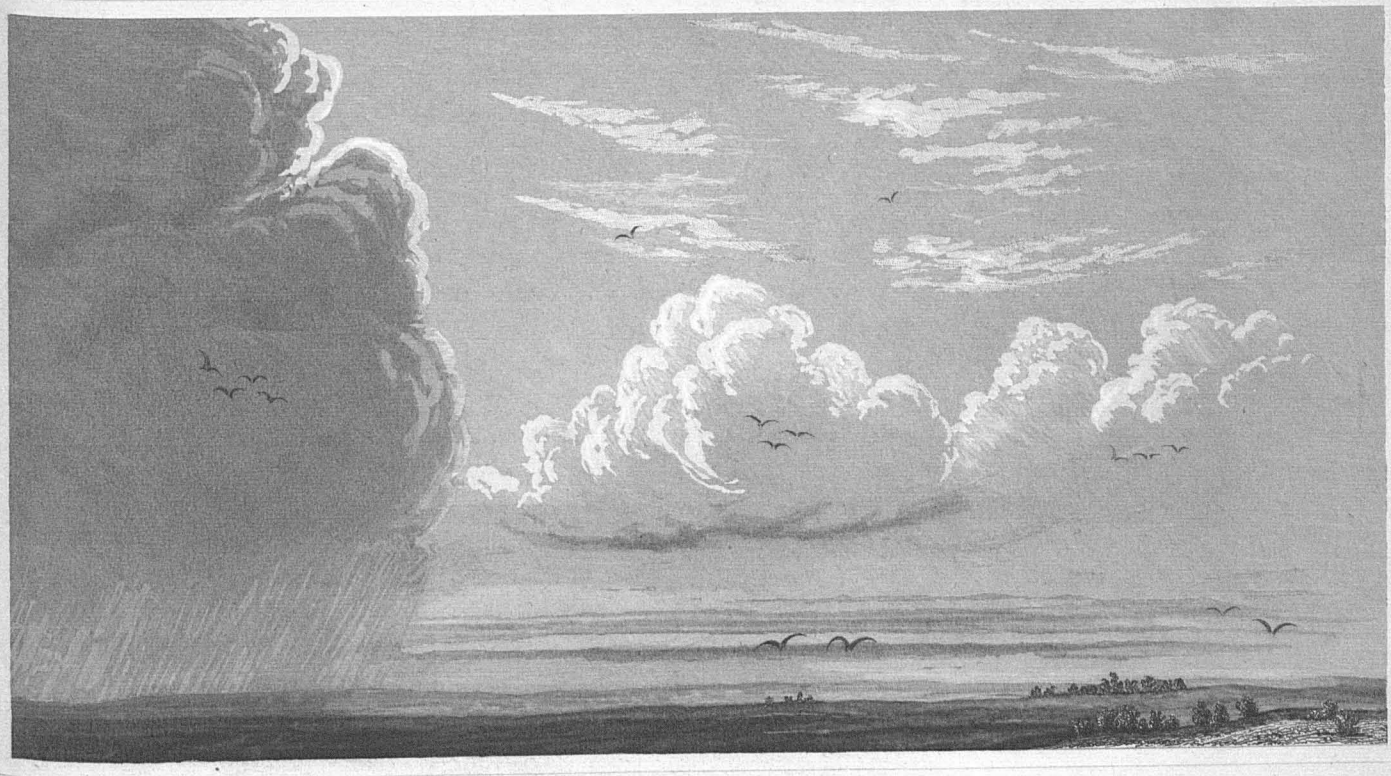
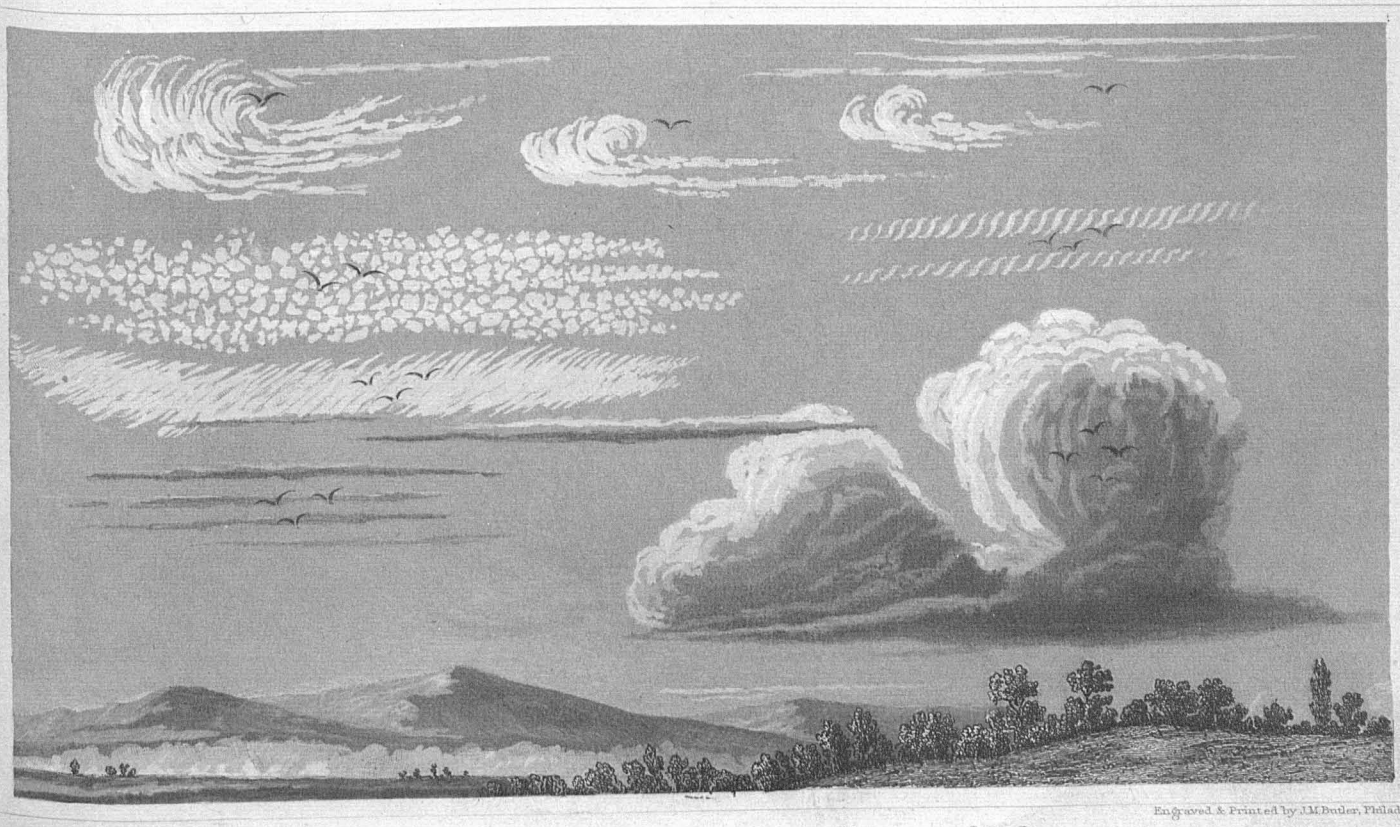
CLOUDS.

PRIMARY FORMS.



Stratus (Str.) Cirrus (Cir.) Cumulus (Cum.) Nimbus (Nimb.)

SECONDARY FORMS.



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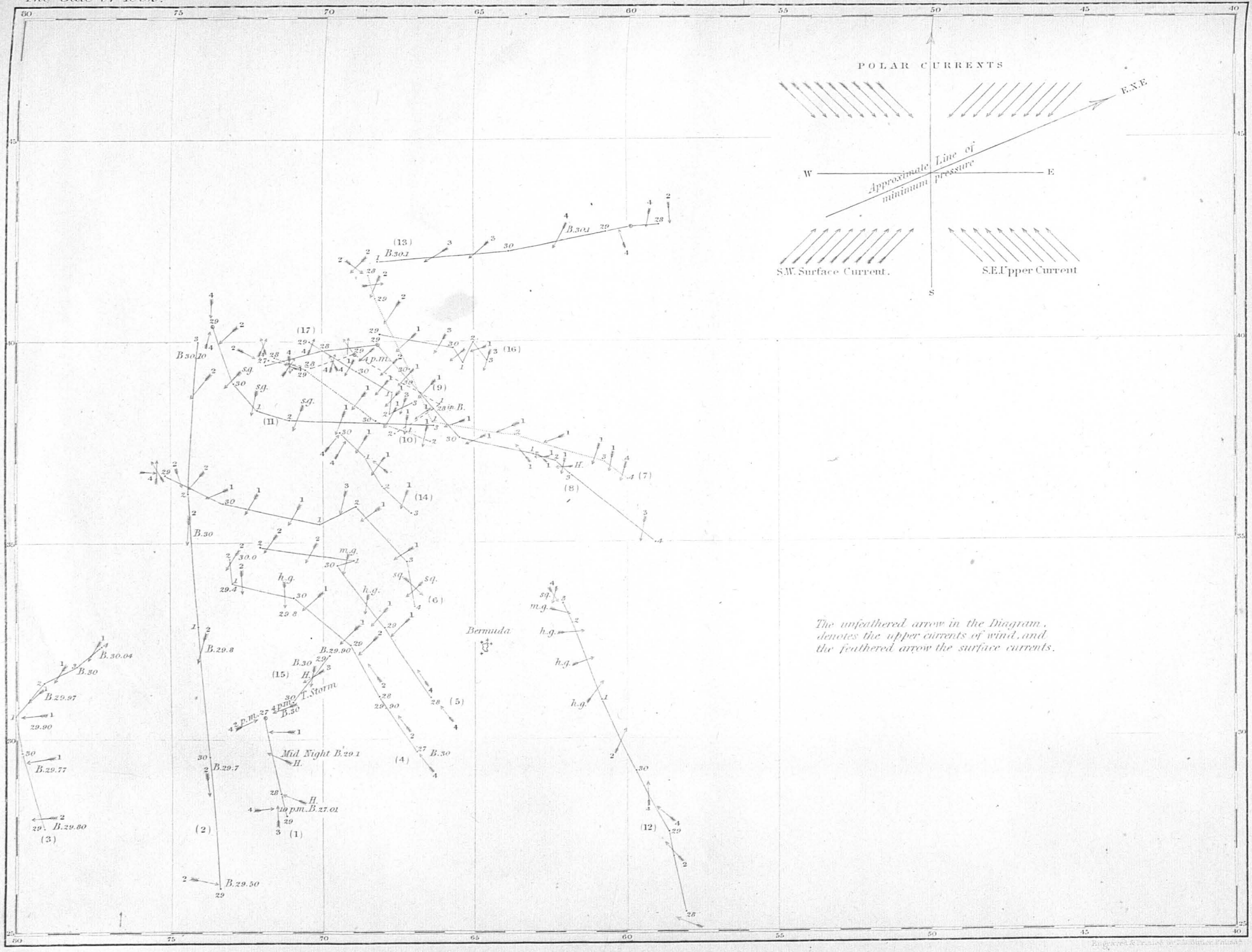
Cirrus Cirrocumulus (Cir-Cum.) Cirrostratus (Cir-Str.) *various forms* Cumulostratus (Cum-Str.)


POLAR CURRENTS
E.N.E
W
E
S
Approximate Line of minimum pressure
S.W. Surface Current.
S.E. Upper Current
Bermuda
(1)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)
(10)
(11)
(12)
(13)
(14)
(15)
(16)
(17)
T. Storm
Mid Night B.29.1
10 p.m. B.27.01
4 p.m.
2 p.m.
The unfeathered arrow in the Diagram, denotes the upper currents of wind, and the feathered arrow the surface currents.