

extreme right of Fig. 1,) until the stage, containing all the plates, is so moved that the trace in the lowermost row comes beneath the pointer; then to bring M and N respectively on the traces on the topmost and on the middle plates, and then to make the dot as before.

FRANCIS GALTON.

No. 2.—SUMMARY OF THE RESULTS OBTAINED FOR SQUARE 3
FOR JANUARY.

The district referred to lies in Latitude between the Equator and the parallel of 10° N., and in Longitude between the meridians of 20° and 30° W. The Committee have directed that a specimen chart showing the results for each degree square should be lithographed and distributed to men of science and to seamen to obtain opinions as to the value of the proposed method of publication.

Remarks explanatory of this chart have been drawn up, and from these the following observations have been extracted:—

ISOBARS AND ISOTHERMS.

“*Air and Sea.*—With the object of showing more clearly the relative distribution of pressure and temperature, the accompanying isobars and isotherms of air and sea-surface have been drawn.

“In all cases the means of four single-degree squares have been combined.

“They seem to show a relation between the lowest pressure and highest temperature, also between the temperature of air and sea. The isobars and both isotherms are very similar in their direction, and the air is just one degree colder than the sea, which might perhaps be expected in the winter months.

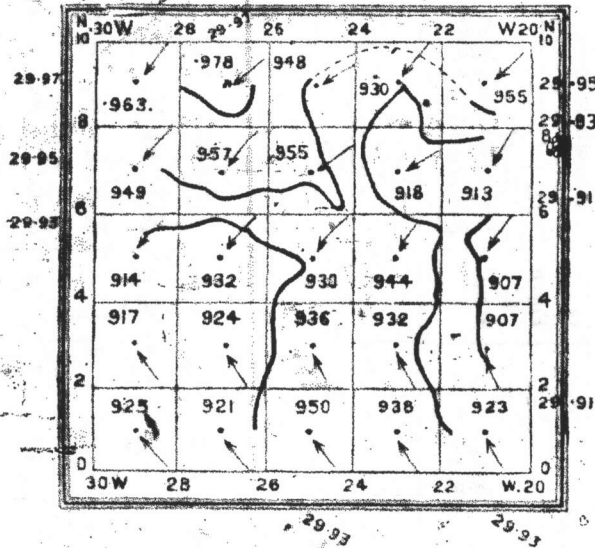
“Table 3, page 35, shows that between 4° and 7° N. a south-easterly current prevails, and as it is said in remarking on the currents that this is probably a back drift of water heaped in the doldrums by the counter actions of the N.E. and S.E. trades on each side of them, it is not remarkable that to the eastward or south-eastward of this zone of the square we find the warmest water, as it is water that has been accumulating for some time in this low latitude.

“So far as we can judge, the zone of easterly current shifts north or south with the doldrums and hottest water, depending for its latitude on the position of the doldrums in the month.

“By referring to the Monthly Charts of “Currents and Surface Temperature of the North Atlantic,” published by this office, it will be seen that the sea surface isotherm of 70° dips to the south-eastward, and comes very near the north-eastern corner of

Square 3 in January: This fact, considered together with the Harmattan winds bringing the hot dust from Africa, and the easterly current bringing the hot doldrum water into the same neighbourhood, may account for the remarkable difference of temperature in both air and sea which is found on the eastern side of the square between 5° and 10° N., as well as for the very unsettled weather which prevails where the N.E. trade is blowing.

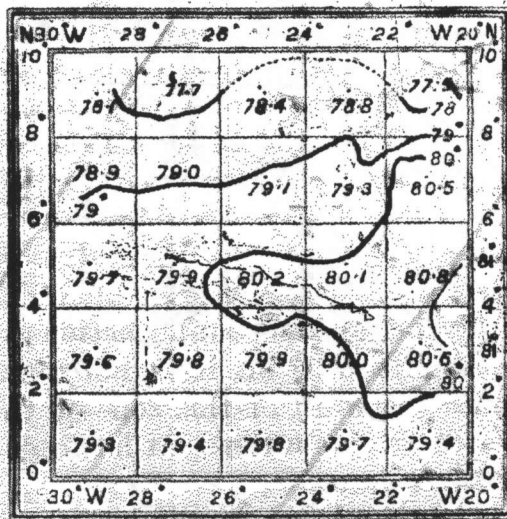
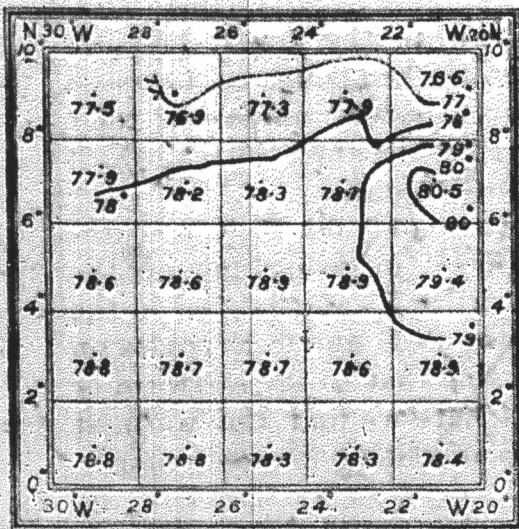
ISOBARS FOR EACH .02 OF AN INCH.



Note.—The prevailing wind is represented by an arrow, its length being in proportion to the mean force by Beaufort's scale; the greatest force is about 5 of that scale.

ISOTHERMS OF AIR FOR EACH DEGREE FAHRENHEIT.

ISOTHERMS OF SEA-SURFACE FOR EACH DEGREE FAHRENHEIT.



The isotherm of 81° is found by considering the temperature of 1.5 fathoms.

Note.—The dotted lines in these diagrams show the probable pressure or temperature.

It is an interesting coincidence that the square which has the highest pressure has very nearly the lowest temperature, of both air and sea, whilst the two which have the lowest pressures are those which have the warmest sea, and include one of those with the warmest air; the other with the warmest air is immediately to the northward.

WIND.

TABLE 1.

LATERAL STRIPS.

Lateral Strips.	No. of Observations.	N. to E. by N. or N. by E.		E. to S. by E. or E. by S.		S. to W. by S. or S. by W.		W. to N. by W. or W. by N.		Variables.		Calms.	Mean Force of Strip.	Prevailing Wind.		Strongest Wind.		
		No. of Observations.	Mean Force.	No. of Observations.	Mean Force.	No. of Observations.	Mean Force.	No. of Observations.	Mean Force.	%.	Mean Force.			No. of Observations.	Direction.	No. of Observations.	Direction.	Mean Force.
0° to 1° N.	279	9	3.0	70	3.2	7	2.5	3	2.1	6	2.2	5	2.9	43	S.E.	1	S.S.W.	5.0
1° - 2°	383	12	2.4	51	3.0	12	2.1	4	2.1	11	2.2	10	2.4	37	S.S.E.	2	E.N.E.	4.5
2° - 3°	385	18	2.9	49	2.8	7	2.3	6	2.3	11	1.7	9	2.4	44	S.E. by S.	3	N.N.W.	3.5
3° - 4°	406	28	3.0	37	2.8	7	2.0	7	2.4	9	2.2	12	2.4	128	S.S.E.	4	N.E. by N.	4.9
4° - 5°	362	48	3.2	21	2.7	5	1.7	9	1.8	10	1.9	7	2.5	41	S.S.E.	5	N.E. by N.	3.8
5° - 6°	304	58	3.3	18	2.8	1	1.6	2	2.1	8	1.5	11	2.6	45	N.E. by N.	6	N.E. by N.	3.6
6° - 7°	219	74	4.0	8	3.3	1	2.0	4	2.4	6	2.0	11	3.4	42	N.E. by N.	7	E.S.E.	6.0
7° - 8°	170	85	4.3	7	3.9	—	—	4	3.4	3	2.5	1	4.1	32	N.E. by N.	8	N.E. by E.	4.5
8° - 9°	136	98	4.4	1	4.5	—	—	—	—	1	4.0	—	4.4	20	N.E.	9	N.E. by E.	4.7
9° - 10°	126	97	4.4	2	4.0	—	—	—	—	1	5.0	—	4.4	27	N.E.	10	N.E.	4.7

* About half of the calms in this strip were found between 20° and 22° W.

TABLE 2.
VERTICAL STRIPS.

Vertical Strip.	No. of Observations.	N. to E. by N. or N. by E.		E. to S. by E. or S. by E.		S. to W. by S. or S. by W.		W. to N. by W. or N. by W.		Variables.		Calm Force of Strip.	Prevailing Wind.		Strongest Wind.		
		%	Mean Force.	%	Mean Force.	%	Mean Force.	%	Mean Force.	%	Mean Force.		No. of Observations.	Direction.	No. of Observations.	Direction.	Mean Force.
20° to 21° W.	208	45	3.1	26	2.7	8	2.1	7	1.9	36	1.5	2.5	20	N.N.E.	20	N.N.E.	4.0
21° to 22°	302	28	2.9	30	2.6	10	2.4	6	1.9	12	1.9	2.1	24	N. by E.	3	S.S.W.	3.7
22° to 23°	304	34	3.0	30	2.9	6	1.9	7	2.4	15	1.9	2.4	17	N.N.E.	4	E. by S.	3.9
23° to 24°	330	41	3.2	31	2.8	4	2.4	5	2.1	8	2.3	2.7	23	N.N.E.	17	N.E.	4.1
24° to 25°	353	46	3.6	30	2.9	4	2.3	4	2.4	7	2.1	2.9	31	N.E.	26	E.N.E.	4.1
25° to 26°	289	48	3.9	30	2.8	5	2.0	4	2.0	6	1.7	3.0	28	N.E. by E.	17	N.E. by N.	4.7
26° to 27°	343	43	4.0	33	3.1	5	2.2	5	2.6	7	1.8	3.1	31	N.E. by N.	19	N.E. by E.	4.4
27° to 28°	300	46	3.9	39	3.0	2	1.9	4	2.2	4	1.9	3.2	46	N.E. by N.	10	N.E. by E.	4.3
28° to 29°	224	46	4.3	41	3.5	1	1.8	2	2.5	7	2.5	3.7	32	N.E. by N.	7	E.S.E.	5.0
29° to 30°	117	44	4.2	40	3.5	11	2.0	2	1.3	2	1.8	3.5	17	N.E.	6	N.N.E.	5.2

WIND.

"The accompanying Tables 1 and 2 have been formed from the marginal strips.

"*Lateral Strips.*—To commence with the lateral strips running in the same degree of latitude, it will be seen that the S.E. trade prevails both in direction and force between the Equator and 2° N., that it prevails in direction to 4° N., but the N.E. wind prevails in force. From 4° N. to 10° N. the N.E. wind prevails in both direction and force, for by consulting sub square 84 it will be seen that the one wind in the strip between 8° and 9° N., which is entered in the south-eastern quarter with force 4.5 (Beaufort scale), was really from E. (that point being given to the south-eastern quarter by the method of classifying) though it actually belongs as much to N.E. as to S.E.

"From 1° N. to 4° N. the mean force of all winds in each strip remained 2.4, but the N.E. wind was gradually increasing, whilst the S.E. was diminishing in force.

"It will be noticed that the lowest barometer was between 4° and 5° N., and that it increased at the rate of 7 or 8 thousandths of an inch for each degree of latitude from this to 10° N. Table 1 shows that the frequency of the N.E. wind increased 20% here:

"The isobars already alluded to show how the pressure increased in a north-easterly direction from 4° to 10° N., just where the N.E. wind increased in per-centage and force.

"The close proximity of most calm, lowest pressure, and hottest air and sea, is very interesting.

"The relation between direction and force of wind, and disposition of pressure in these low latitudes, will be much more clearly shown when we are able to combine the observations of several months in cases where a trade wind blows for several months together in the same square.

"*Vertical Strips.*—Table 2 is deduced from the sums of vertical strips at the bottom of the Chart; it shows a marked increase in the force of the wind in the western strips. The least mean force of strip (2.1) lies between 21° and 22° W.; the greatest (3.7) between 28° and 29° W.

"The per-centage of N.E. wind is 45, force 3.1, between 20° and 21° W.; between 21° and 22° W. it falls to 28% , force 2.9; from this it gradually increases to 48% , force 3.9 in 25° to 26° W.; from 26° to 30° W. its per-centage is about 45, and the force increases to 4.3.

"The large amount of N.E. wind between 20° and 21° W. may be due to the great difference of temperature and pressure in the north-eastern part of the square.

"The per-centage of S.E. wind is about 30 from 20° to 26° W., and its force is about 2.8, but between 26° and 30° W. it rises gradually to 41% , and its force increases to 3.5.

“North-westerly wind is much more frequent in the eastern than in the western half of the square.

“The mean force in each strip gradually increases from 22° to 29° W, being 2.1 in the former and 3.7 in the latter; hence a ship passing through the square and keeping in 21° to 22° W. would have an average force of wind to drive her about two knots an hour, whilst another in 28° to 29° W. would have an average force to drive her about five knots.

“In the strip running N. and S. in 29° W. there are 46% of north-easterly winds, average force 4.3, and 41% of south-easterly winds, average force 3.5, leaving only 13% for all other winds and calms, of which only 3% are calms: whilst in the strip between 21° and 22° W. there are 28% north-easterly, force 2.9, and 30% south-easterly, force 2.6, leaving 42% for other winds and calms, of which 14% are calms.

“It has been remarked that from 21° to 26° W. the per-centage of S.E. wind continues about 30, with a mean force of about 2.8, and that the N.E. wind gradually increases in per-centage and force in the same space as you go to the westward.

“An inspection of the wind arrows of the sub-square shows that to the west of 26° W. the S.E. trade pushes itself further north, and approaches nearer to the N.E. trade, which keeps up a steady per-centage of about 46 from 25° to 30° W., though it increases in force as you go to the westward. It will also be noticed that what the S.E. wind gains the N.W. loses, for there is an average of 6% of north-westerly winds in the eastern half of the square against only 3½% in the western half. In the two most western strips there are only 2% of north-westerly winds, of which nearly half were from west, which could not drive a homeward bounder to the eastward. These north-westerly winds are very troublesome to homeward bounders, as they drive them to the eastward where most calms and light winds prevail.

“These figures speak for themselves, showing that so far as SQUARE 3 is concerned *the homeward bounder should not cross the Equator to the eastward of 25° in January.* As the winds near Cape St. Roque do not hang to the southward in January and February, but are well to the eastward, it seems advisable for an outward bounder, also to cross well to the westward in January; but we shall know more of this after working up squares 302 and 303 (see Chart, p. 7). It must also be borne in mind that to the southward of 5° N. a westerly current of a mile an hour may be confidently expected, sometimes amounting to two miles an hour.

“The following table is given to show some of the results which may be deduced from comparing the data of various months. It divides the square into eastern and western halves, each containing 5° of longitude, and gives for January, February, and March the per-centage and force of wind for each quarter of the compass, as well as the per-centage of variables and calms.

5° Strips.	Months.	North-easterly or N. to E. by N.		South-easterly or E. to S. by E.		South-westerly or S. to W. by S.		North-westerly or W. to N. by W.		Variables.	Calms.	
		%	Mean Force.	%	Mean Force.	%	Mean Force.	%	Mean Force.			
Eastern Strip 20° to 25° W.	January	39	3.2	29	2.8	6	2.2	6	2.1	10	2.0	10
	February	43	3.3	21	2.6	6	2.2	15	2.4	9	1.8	5
	March	45	3.0	22	2.7	6	2.2	10	2.5	7	1.6	10
Western Strip 25° to 30° W.	January	45	4.1	37	3.2	5	2.0	3	2.1	5	1.9	5
	February	70	4.1	14	3.0	2	2.8	3	2.2	6	1.9	5
	March	74	3.9	14	3.3	2	2.2	4	2.2	3	2.2	4

The above table shows that the eastern half of the square has but a slight change in the per-centage and force of the N.E. and S.E. winds during the three months, but that the western half has great changes.

There is always more N.E. wind in the western than in the eastern half of the square; but in February the difference amounts to 27%, and in March to 29%. This may be caused by the sun's advance to the northward, heating equatorial South America, and drawing the N.E. wind towards it. We know that N.E. winds are frequently experienced near Cape St. Roque in these months.

In January there is more S.E. wind in the western than in the eastern half of the square, but less in February and March. This shows that the western half of the square is particularly good for the homeward bounder in January.

In the eastern half of the square, during the three months, south-westerly winds are absolutely the same in per-centage and force, and they vary very little in the western half. There is much more north-westerly wind in the eastern than in the western half of the square; the difference is greatest in February. It has already been remarked that this is a very troublesome wind for a homeward bounder. The force of the N.E. wind is always nearly 0.9 of Beaufort's scale, stronger in the western than in the eastern half of the square, whilst that of the S.E. wind is only about 0.5 stronger in the western half. The strength of westerly winds and variables does not seem to differ in the eastern and western halves. Calms are much more abundant in the eastern than in the western half, except in February; but it must not be forgotten that even in February the force of wind is generally greater, and there is less north-westerly wind in the western half."

CURRENTS.
TABLE 3.

LATERAL STRIPS.

Lateral Strip.	No. of Observations.	N. to E. by N. or N.Ey.		E. to S. by E. or S.Ey.		S. to W. by S. or S.Wy.		W. to N. by W. or N.Wy.		None. %.	Prevailing Current.		Strongest Current.			
		%.	Rate.	%.	Rate.	%.	Rate.	%.	Rate.		No. of Observations.	Direction.	Rate.	No. of Observations.	Direction.	Rate.
0° to 1° N.	40	—	—	8	13	22	23	68	24	2	8	W.	26	2	W. by S.	35
1° - 2°	42	—	—	—	—	14	22	79	27	7	10	W.N.W.	24	5	N.W.	34
2° - 3°	45	4	11	5	19	13	10	67	22	11	8	W. by S.	29	2	N.W. by W.	32
3° - 4°	44	14	12	13	14	7	8	43	18	23	7	W.	17	2	N.W. by N.	29
4° - 5°	35	14	18	26	21	14	19	29	15	17	4	E.	21	1	E. by S.	30
5° - 6°	37	13	16	27	17	22	16	11	16	27	4	E.	16	1	W. by S.	37
6° - 7°	27	11	14	26	12	11	15	19	11	33	3	E.S.E.	14	1	S.W. by W.	24
7° - 8°	16	6	6	6	13	38	13	19	22	31	1	W.N.W.	28	1	W.N.W.	28
8° - 9°	23	22	13	9	10	21	14	26	16	22	3	W.N.W.	17	1	W.	24
9° - 10°	19	16	9	—	—	21	8	26	14	37	2	W.S.W.	10	1	N.W.	22

CURRENTS.

TABLE 4.

VERTICAL STRIPS.

Vertical Strips.	No. of Observations.	N. to E. by N. or N.E.		E. to S. by E. or S.E.		S. to W. by S. or S.W.		W. to N. by W. or N.W.		No. of Observations.	Direction.	Rate.		
		%	Rate.	%	Rate.	%	Rate.	%	Rate.					
20° to 21° W.	26	15	9	15	16	12	16	23	29	35	W.N.W.	47	N.W.	50
21° - 22°	31	26	17	6	16	10	11	35	24	23	W.	24	N.W. by N.	27
22° - 23°	32	6	11	9	15	13	17	63	22	9	N.W.	30	N.W. by W.	49
23° - 24°	42	5	19	21	18	22	15	33	19	19	W.	18	N.W.	25
24° - 25°	40	5	11	23	17	25	19	25	17	22	W.N.W.	18	W. by S.	32
25° - 26°	30	7	15	13	15	20	20	47	23	13	W. by N.	24	W. by S.	37
26° - 27°	39	10	9	8	14	10	16	49	22	23	W.	21	W. by N.	48
27° - 28°	39	5	13	5	15	18	15	62	21	10	W.	23	N.W. by W.	27
28° - 29°	32	9	14	3	17	22	13	44	18	22	W.	20	N.W. by W.	28
29° - 30°	17	6	24	17	15	12	10	59	26	6	W.	27	N.W. by W.	36

CURRENTS.

"*Lateral Strips.*—Table 3 gives the currents for strips running in the same degree of latitude, and shows that north-westerly currents prevail very much both in direction and rate up to 4° N. where the south-easterly wind ceases to prevail; in 4° to 5° N., north-westerly currents prevail in direction, being 29% whilst south-easterly are only 26%; but the speed of the south-easterly is 21, or 6 miles per day more than that of the north-westerly.

"In 5° to 6° N. the south-easterly current prevails both in direction and rate; in 6° to 7° N. it prevails in direction, but is less than south-west in rate; in 7° to 8° N. the south-westerly current prevails in direction, but the north-westerly in rate; from 8° to 10° N. the north-westerly current prevails, but it must be remembered that west has been given to the north-westerly quarter in the classification,

"*Conclusions.*—Of course there is much doubt in estimating current by the difference between a ship's observed and dead reckoning position, but it is manifest that from 5° to 6° N., where there is so much calm on the eastern side of the square, and the doldrums prevail in January, easterly currents prevail, having strong westerly currents to the southward, and weaker westerly to the northward.

"Perhaps the greater strength of both trades in the western part of the square, and the excess of force of the N.E. over the S.E., may incline the water (heaped up, as it were, in the doldrums by the drift of the trades), to run as a back current to the south-eastward; the following arrows seem to represent the facts.

Relative force of wind indicated by length of arrow.



"We have already remarked that from a cursory examination of the data for other months, the easterly current seems to move north or south with the doldrums.

"The largest per-centage of north-westerly wind exists where there is the most south-easterly current, as if some similar cause induced a back drift of air as well as of water. This is also found to be the case in February and March.

"*Vertical Strips.*—It seems well to consider the vertical strips in Table 4, by dividing them into two strips of 5° each: by this means we find that the mean of the five prevailing, as also of

* No scale has been used for the length of the arrows, they are only intended to show that the N.E. trade is stronger than the S.E., and that both are stronger on the western than on the eastern side of the square.

the five *strongest* currents in the eastern half of the square are slightly weaker than those in the western. All these currents are westerly in direction, and it will be remembered that the N.E. and S.E. trades are stronger and more prevalent in the western half, which points to the cause of the increased strength of these currents.

"The following summary has been made to show the prevalence of various currents in the eastern and western halves of the square.

5° Strip	N. to E. by N. or North-easterly.		E. to S. by E. or South-easterly.		S. to W. by S. or South-westerly.		W. to N. by W. or North-westerly.		None.
	%	Rate.	%	Rate.	%	Rate.	%	Rate.	
Eastern, 20° to 25° W.	11	14	15	16	16	16	36	22	22
Western, 25° to 30° W.	7	15	9	15	16	15	52	22	15

"From this it will be seen that in the eastern strip (where, we must remember, both trade winds are lightest and least constant,) the per-centage of easterly currents is 26, against 16 in the western strip: whereas in the western strip, the north-westerly currents (which, it must be remembered, include all the west) increase 16% on what they were in the eastern. Table 2 shows that in this same strip, the S.E. trade increases from 30% force 2.8, between 25° and 26° W. to 41% force 3.5, between 28° and 29° W.; so that the connexion between the direction and force of wind, and direction and speed of current, seems to be very close here."

WEATHER.

"*Lateral Strips.*—The lateral strips show that the largest per-centage of *thunder and lightning* is in 4° to 5° N. at the southern verge of the N.E. Trade.

"The largest per-centage of *squalls* is in 3° to 4° N. *Heavy squalls* are experienced from the Equator to 7° N., but most between 4° and 5° N. *Very heavy squalls* are experienced between 3° and 6° N., but only one in each strip.

"There was 32% of *rain* between 3° and 4° N., gradually decreasing as you go N. or S., there being 19% in 5° to 6° N., and also between the Equator and 1° N.

"The *gloomiest* weather is naturally where there is the most rain.

"*Mist* increases from 6% to 7% between the Equator and 4° N. where the S.E. trade ends, but from 4° to 10° N. it increases to 44%, being 15% between 4° and 5° N., and increasing 13% between 6° and 7° N. These facts seem to connect it with the

Harmattan winds which the Admiralty Pilot Charts show to prevail in January on the west coast of Africa.

Vertical Strips.—*Lightning* is 20% between 23° and 24° W., and remains about 15% for three strips on each side of this, but from 26° W. it gradually decreases to the westward.

“*Squalls* are most abundant between 25° and 29° W. *Heavy squalls* are most prevalent between 22° and 24° W. The three *very heavy squalls* lie between 23° and 29° W.

“*Rain* is most abundant between 21° and 22° W., whilst the least rain is between 20° and 21° W. From 25° to 30° W. it decreases in amount as you go to the westward.

“*Mist* prevails in 20° to 21° W. and 23° to 24° W.; there is 12% more in the eastern than in the western half of the square. *Heavy mist* prevails in 24° to 25° W.

“ REMARKS.

“ We shall now refer to the remarks for January, which have been considered worthy of extraction, and will take them in their order, commencing with the currents.

“*Currents.*—They bear out the conclusions derived from Tables 3 and 4, viz., that an easterly current prevails in 5° and 6° N., and strong westerly ones to the southward of this latitude.

“*Remarks on current-rips* are pretty general over the whole square, but they seem to be more decided where the easterly current prevails, which frequently runs counter to a slight easterly wind.

“*Clouds.*—The upper clouds seem to be more generally from the south-westward after passing 7° N. To the southward of this latitude the clouds seem to be very frequently from S.E. when the wind is N.E., or from N.E. when the wind is S.E., as if at first the one Trade rose above the other, carrying its clouds with it at a comparatively low altitude. When near a Trade it is not uncommon to see its clouds flying at a moderate height overhead, with a calm below. The remarks on clouds seem to indicate a more settled state of weather to the westward.

“*Sea.*—The northerly swell extends to the Equator in January, and probably further south it predominates from 5° to 10° N.; occasionally southerly swells are mentioned even between 9° and 10° N., but they seem to be comparatively rare from 6° to 10° N. It is very clear that much of the difficulty which ships experience in the doldrums is the effect of the very confused swells which check their progress in light winds.

“The following tables, giving the sea disturbance in percentages, and dividing the square into eastern and western halves, would perhaps be considered sufficient for navigators, instead of giving a table for each strip.

JANUARY.

PER-CENTAGES OF OBSERVATIONS OF SWELL OR SEA FOR EVERY FOURTH POINT.

TABLE 1.—Containing the per-centages for each 5 strip, and for the whole of the eastern half of Square 3.

Sub-squares	N.W.		N.E.		E.		S.E.		S.		S.W.		W.		N.W.		Confused.		Smooth.	
	N.W. to N.W.	N.W. by N.	N.E. to N.E.	N.E. by E.	E. to E.	E. by S.	S.E. to S.E.	S.E. by S.	S. to S.	S. by W.	S.W. to S.W.	S.W. by W.	W. to W.	W. by N.	W.N.W. to W.N.W.	N.E. and S.E.	Generally.	Smooth.	Very.	
00-04	18	Heavy	9	Heavy	—	—	9	Heavy	9	Heavy	2	Heavy	—	—	1	Heavy	11	10	7	—
10-14	30	16	9	2	—	—	11	—	11	—	—	—	—	—	1	—	4	7	—	—
20-24	23	2	19	3	—	—	6	—	6	—	—	—	—	—	2	2	12	12	—	—
30-34	30	6	4	3	—	—	3	—	3	—	—	—	—	—	3	—	19	13	—	—
40-44	26	9	9	2	—	—	9	—	9	—	2	—	—	—	4	—	14	10	—	—
50-54	18	9	12	1	—	—	14	—	14	—	—	—	—	—	—	16	6	19	3	—
60-64	33	—	32	—	—	—	7	—	7	—	—	—	—	—	—	—	2	18	—	—
70-74	17	13	31	2	—	—	5	—	5	—	—	—	—	—	—	—	7	16	—	—
80-84	13	8	44	4	—	—	—	—	—	—	—	—	—	—	—	—	—	26	—	—
90-94	11	—	24	5	—	—	11	—	—	—	—	—	—	—	—	—	—	49	—	—
Per-centages in the eastern half of Sq. 3	22	6	18	3	1	—	4	2	6	1	0	—	—	—	1	0	8	18	1	1

"The above tables show, first, that northerly and north-easterly swells (especially those which are heavy) prevail in the western half of the square.

"2ndly, that southerly and south-easterly swells (especially those which are heavy) prevail in the eastern half of the square;

"3rdly, that confused swells are pretty equally divided, but that the heaviest are in the western half.

"Lastly, that smooth seas are pretty equally divided, but that there are more "very smooth" in the western than in the eastern half of the square.

"*Wind.*—The wind remarks fully bear out the facts in Table 2, namely, that there is more wind on the western than on the eastern side of the square.

"*Weather.*—The weather remarks show that it is generally unsettled. In 5° N. and 20° W. mention is made of its being misty on the horizon. From 6° to 10° N. the remarks on mist and haze increase. In sub-square 94 there was an awful thunder-storm, with a southerly wind whilst it lasted.

"In the strip between 3° and 4° N. lightning is generally seen to the northward, whilst in that between 5° and 6° N. and further north it is more frequently seen to the southward, indicating that the most disturbed weather is between 4° and 5° N. where the S.E. wind has just lost, and the N.E. just gained, ascendancy, and that the probable cause of the lightning, &c., is their collision. In each of the four months from January to April the largest per-centage of thunder and lightning is at the southern part of the N.E. trade, and not where the two "trades" have a more equal per-centage. The weather seems to be more settled on the western than on the eastern side of the square.

"*General.*—A severe earthquake was experienced in sub-square 09 in 1859, at 1 p.m. 25th. The red dust, so often seen on ships' sails, seems to have abounded from 6° to 10° N.; between 7° and 8° N. it is remarked that the wind blew hot, and the weather is often spoken of as "misty," "very hazy on the horizon," and "close." It is worthy of notice that January is one of the months in which the Harmattan winds blow on the coast of Africa, and that the square of hottest air is to the eastward in 7° N. (see the isotherms).

"Swallows and a snipe were found in 5° to 7° N. A land bird like a lark was caught in sub-square 01, and a moth was seen in 35. The land birds and insects, like the water, seem to be drifted into and to accumulate in the doldrums, as they appear to fly with the prevailing wind.

"Several falling stars have been noticed: when possible, the hour and date of their fall have been given.

"*Conclusion.*—It is hardly necessary to say that the summings up in the marginal strips are not intended to show that the data are uniformly spread throughout the strip; still they are useful guides to the navigator, as is proved by the differences in

the direction and force of wind lying in the strips between 21° and 22° W. and 28° and 29° W. When the navigator has found in any strip a prevalence of the wind or weather which he prefers he may then go along the sub-squares of that strip and see if what he is looking for, or wishes to avoid, prevails more in one sub-square than another; for instance, in the month of January between 3° and 4° N. there is a larger percentage and a stronger south-easterly wind in the western than in the eastern half of the strip.

—“ It will be seen that although a strip may have a good mean force of wind, this may arise from the force being much above the average in certain sub-squares of the strip, leaving others with much calm. Hence, by giving the winds, weather, sea, &c., for each sub-square, the seaman has all the information for his exact position which the logs in this office can afford.

No. 3.—DESCRIPTION of the DAILY WEATHER CHARTS issued by the METEOROLOGICAL OFFICE.

These Charts were first issued on the 11th of March, and were supplied gratis to a number of public offices, institutions, and private persons up to the end of the month, at which time the regular issue to subscribers commenced. The demand for them up to the 31st of March had reached the amount of 200 copies daily.

The rates of subscription, as already explained, at present are—

Five shillings per quarter for a copy forwarded by book-post.
Ten shillings per quarter for a copy delivered by hand in London within a reasonable distance from Lincoln's Inn Fields, where the lithographic establishment is situated.

As regards the process of drawing the Charts, the reduced observations are entered on a chart of larger scale, and from that chart the results relating to the separate elements are copied on to the four small charts in lithographic ink. This portion of the work is usually completed by about 11.30 a.m. The Charts are then sent to the lithographic establishment, and printed by the anastatic process. Copies are ready for despatch to the City soon after 1 o'clock p.m.

A slight explanation of the separate charts for the day in question may not be undesirable, and they will be taken seriatim:

1. *Pressure.* The barometrical readings from some of the most important stations are given; isobars are drawn at intervals of about 2-10ths of an inch, and the principal “gradients” (i.e. the amounts of difference in barometrical readings per 50 miles between the stations) are given.

It will be seen from the Chart and Report that a considerable fall of the barometer, amounting to nearly an inch in the north of Scotland, had occurred since 8 a.m. on the 3rd. The isobar of

29.0 in. embraces the Western Highlands, the lowest readings reported being 28.98 in. at Nairn, and 29.00 in. at Ardrossan. The highest reading is 30.13 in. at Biarritz, but the steepest gradient over a considerable distance is that from Rochefort to Ardrossan, which is $\frac{1.07}{12} = .089$ of an inch per 50 geographical miles. (See Quarterly Weather Report for 1869, p. 43.) Between Pembroke and Ardrossan the gradient is still more serious, being as much as .105 of an inch per 50 miles.

2. *Temperature.* A few readings are given, and the isotherms are drawn at intervals of 5° . There was no great difference of temperature, so that the atmosphere was not in a very disturbed condition.

3. *Wind and Sea disturbance.* The wind was generally fresh to strong, a slight southerly gale (force 8) being reported at Aberdeen and Holyhead.

The only very light winds on our coasts were at Nairn and Thurso. At Christiansund, in Norway, a calm was reported, and it will be noticed how divergent the isobars became across the northern part of the North Sea, so that the gradients in that region were extremely slight.

The long arrows are intended to show the general drift of the air currents, or the direction in which a balloon might be expected to travel if it were drifting free before the wind.

The sea disturbance is given in words.

4. *Cloud and Rain.* This Chart explains itself sufficiently.

The fall of the barometer had been so general that there did not appear to be any fear of a serious gale, so that no warnings were issued till the afternoon.

It may be interesting to state that at 2 p.m. it was found that the barometer had risen 0.20 in. at the north of Ireland, and that a N.W. gale had begun at Valencia. Warnings were issued to the west and north-east coasts of England, being those most likely to feel such a gale seriously, but the disturbance passed off without the force of 9 being reached at any other station, and the drums were lowered next morning.