XIV. *Researches on the Tides.—Eighth Series. On the Progress of the Diurnal Inequality Wave along the Coasts of Europe. By the Rev.* W. Whewell, *M.A. F.R.S., Fellow of Trinity College, Cambridge.*

Received June 14,—Read June 15, 1837.

In the Seventh Series of these Researches I have pointed out the laws which the diurnal inequality of the height of high water follows, and which I believe had never before been collected from the facts of observation, or indeed stated at all. I have also shown that these laws are modified so as to exhibit very remarkable differences at different places, and to give rise to some difficulty in conceiving the mechanical propagation of the tide-wave. I suggested what appeared to me a possible solution of the difficulty; but as this suggestion was founded upon the facts of a few places, and as other modes of propagation might perhaps also be conceived and adapted to the same facts, the subject remained incomplete.

I resolved therefore to attempt to trace the progress of the wave which brings the diurnal inequality, on some of the coasts on which simultaneous observations were made at my request in June 1835, and the present memoir will give some account of the conclusions to which I have been led by this investigation.

The diurnal inequality of the height of high and low water may be conceived to arise from an oscillating wave, of which the maximum height comes to each place once in twenty-four (lunar) hours; the minimum height arriving, of course, at the intermediate twelve hours. If the time of the maximum height of this wave arriving at any port coincides every day with the time of high water, the alternate high water, being at twelve hours' interval, will be affected alternately with the greatest and least heights of the diurnal wave; and the intermediate low waters will coincide with the mean height of this wave, and will not be affected at all. In this case there will be a decided diurnal inequality in the height of the high water, but no diurnal inequality in the height of low water. In like manner if the time of the maximum height of the diurnal wave coincide with the time of low water, the height of low water will be marked with a diurnal inequality, while the height of high water will exhibit no such feature. But if the diurnal wave arrive every day at a time intermediate between high and low water, it will elevate both the high water and the low water which are nearest to it, and will depress both the high and the low water which happen in the other half of the day. Hence both the high waters taken separately, and the low waters taken separately will be marked by a diurnal inequality; and this inequality

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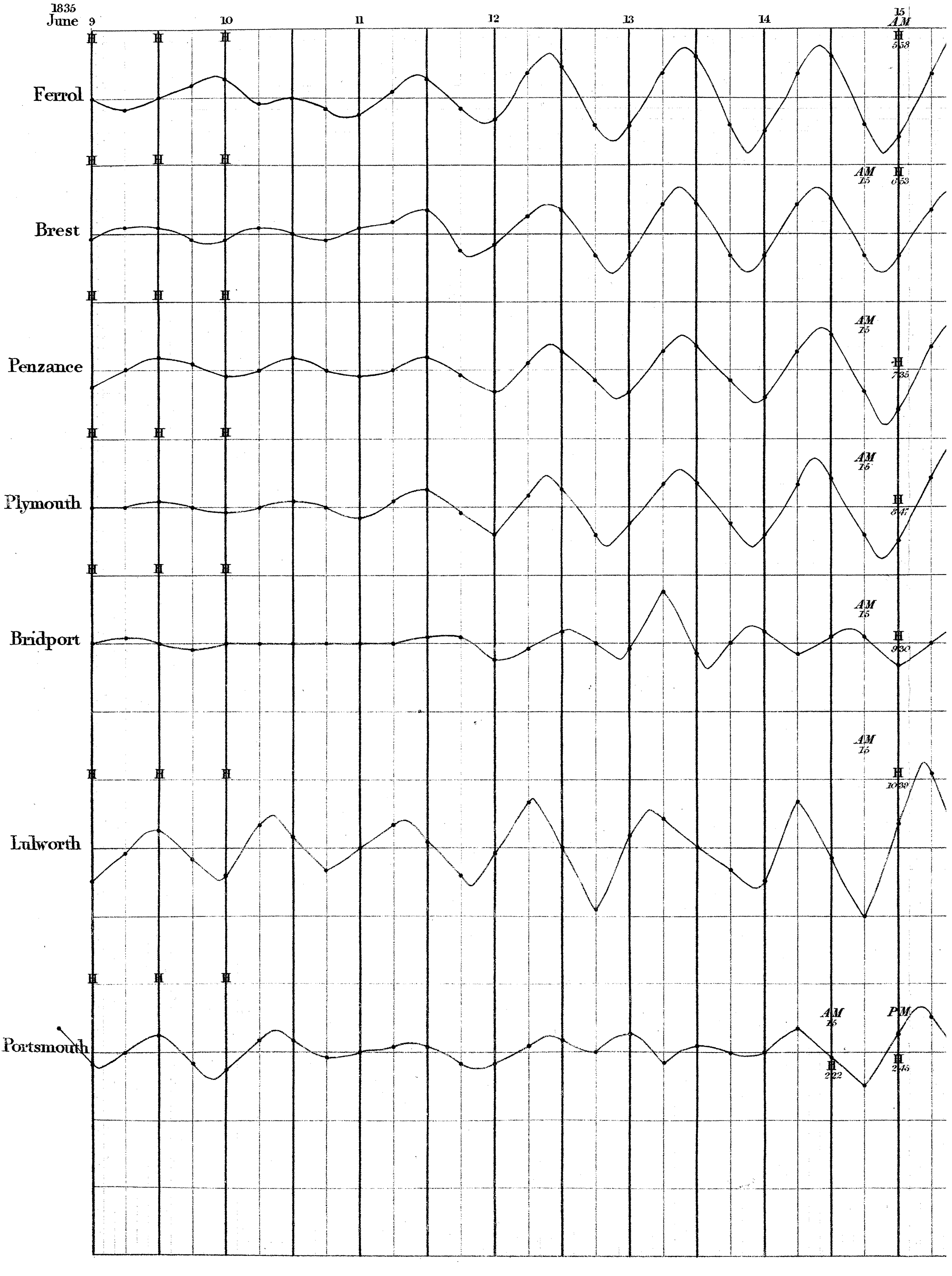
will be greater for high water or for low water, according as the time of the maximum of the diurnal wave is nearer to the time of high or of low water.

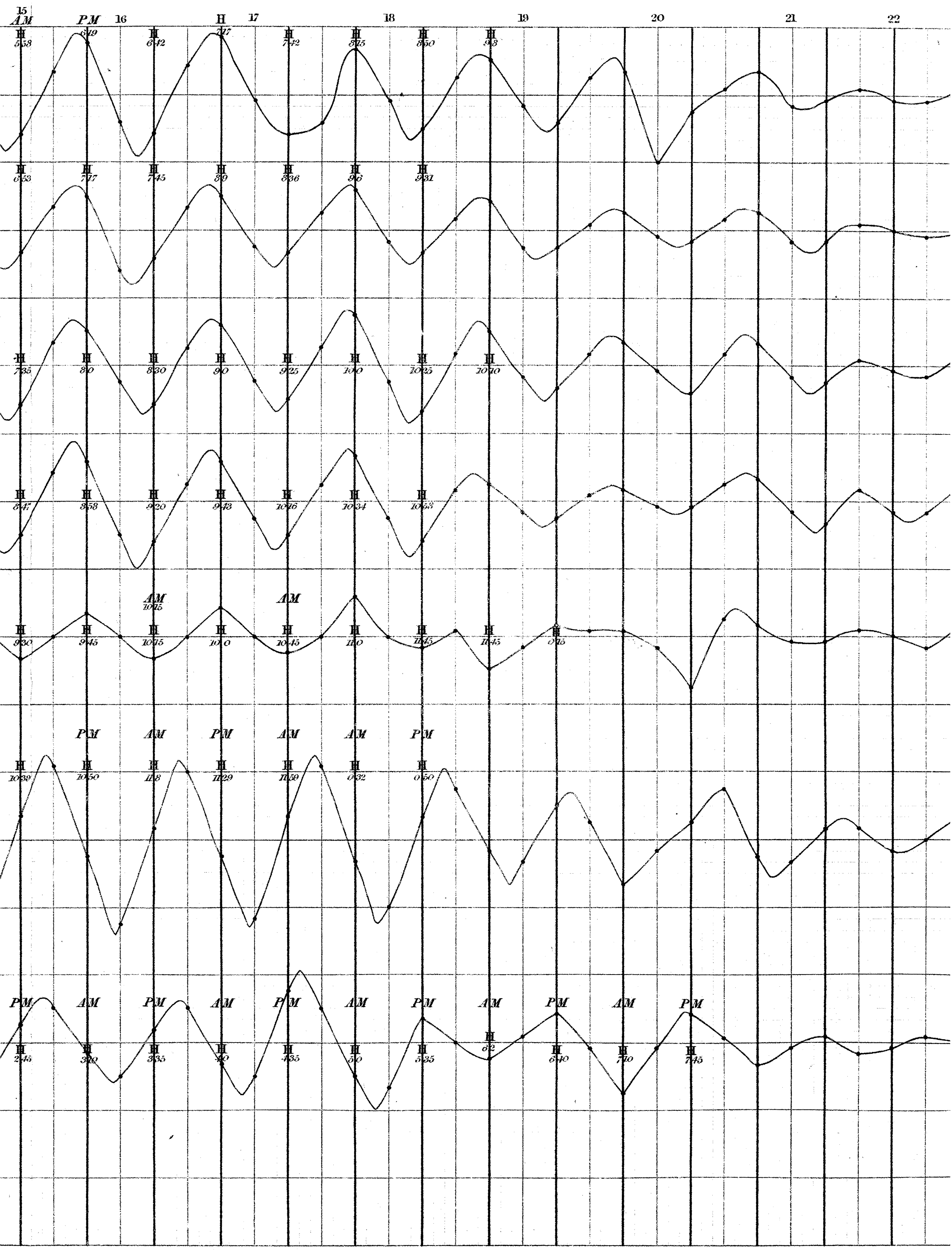
Hence by taking the diurnal inequality of high and of low water at any place, and by combining these effects, we may determine the time of the arrival of the diurnal portion of the tide, and also its magnitude; and may thus separate this tide wave from the semidiurnal wave which brings *every* tide. And the time and magnitude of the diurnal wave being thus determined at a series of places along any coast, we trace its progress nearly in the same manner as we do that of the tide itself.

This is what I have done in the Tables subjoined at the end of this memoir. The heights of high water, for example, observed in June 1835 (from the 9th to the 28th) were laid down as ordinates, and a line was drawn connecting them. This line, when the diurnal inequality was manifest, was a zigzag line, such as is represented for Plymouth and for Singapore, in the figures to the Seventh Series of these Researches, and for several places in America and Europe in the Sixth Series. The line of *mean heights* was then drawn, cutting off all the diurnal inequalities. The same was done for low water; and the diurnal inequalities of the high and low waters, thus cut off, were tabulated in order. In general they were, of course, alternately two additive and two subtractive sums. These sums were laid down as ordinates at certain intervals, which intervals represent half tides (six lunar hours); and the curve drawn through the extremities of these ordinates is the diurnal wave according to its changes from day to day at the same place. The assemblage of the circumstances of such waves at different places gives the progress of the wave along the coast.

The forms of the curves thus representing the diurnal wave being determined for a sufficient number of places, it is easy to see what relations among these forms would indicate the different modes of propagation of the diurnal inequality which may be supposed. In all cases this inequality, depending as it does upon the moon's declination north and south, would increase from nothing to a maximum, and decrease to nothing again in about a fortnight; after which the inequality becomes negative, increases to a negative maximum, and decreases to nothing again in another fortnight, and so on. The epochs at which the inequality vanishes *correspond* to the times when the moon crosses the equator, but occur *after* those times at intervals varying from a few hours to four or five days, and perhaps more. It appeared to me, from the cases which I considered in my last memoir, that the epoch gradually increases as we proceed along the coast in the direction of the progress of the semidiurnal tide wave; and that this increase of epoch goes on much more rapidly than the increase of epoch for the inequalities due to the moon's parallax and declination; so that the diurnal inequality is propagated much more slowly than the other inequalities, and employs, for example, two days or more to make its way from the coasts of Spain to those of England; or, as I have before expressed it, the diurnal inequality *creeps* along the coast from day to day. Another mode in which we might explain different modifications of the diurnal inequality which the observations at

DIURNAL WAVE





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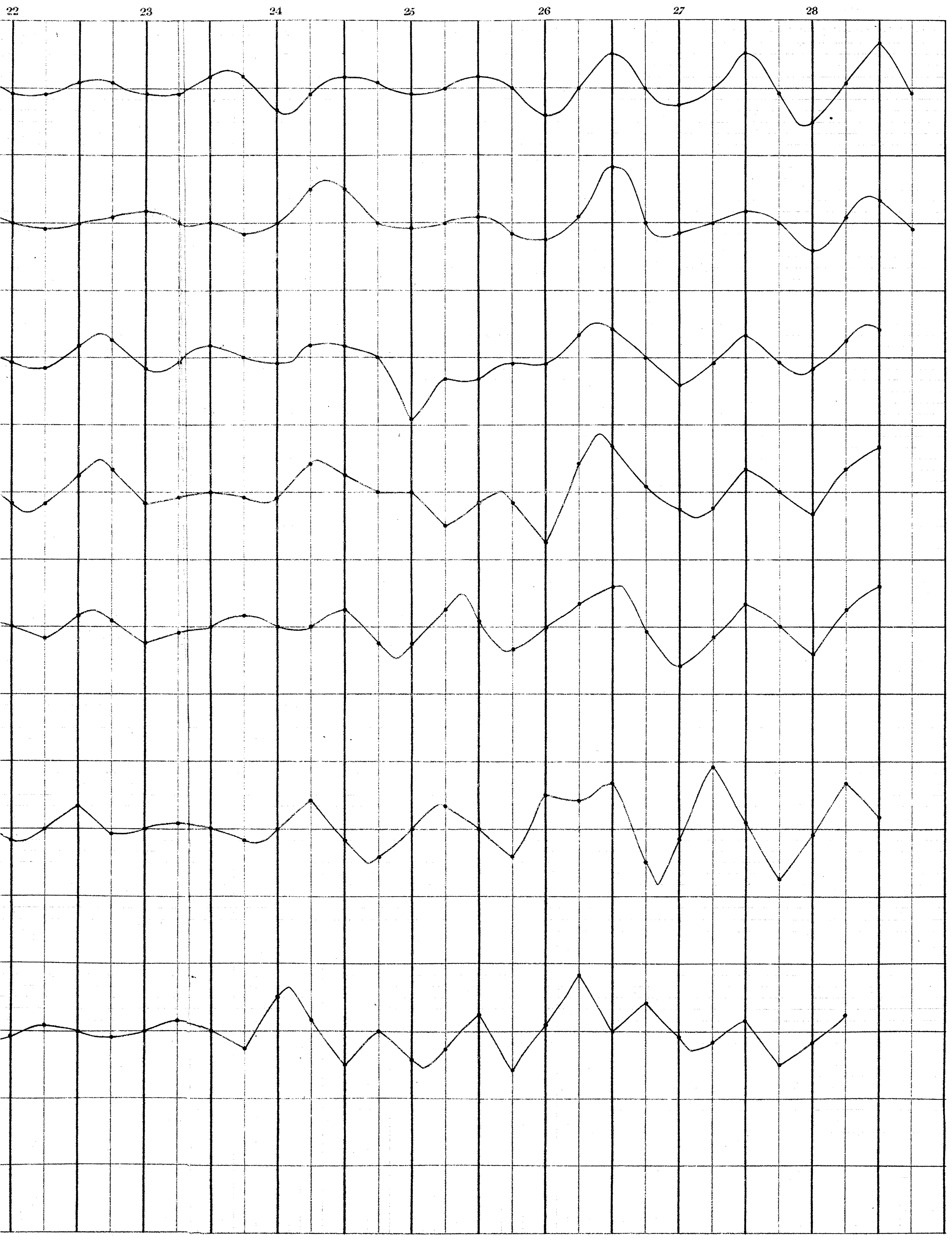
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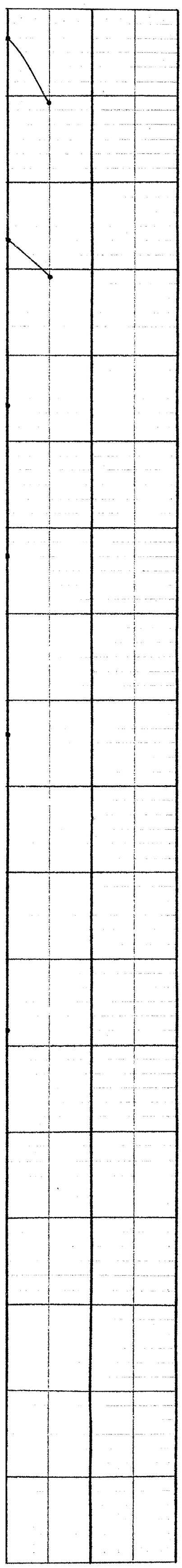

different places exhibit is this: we may suppose that the diurnal wave has the same epoch as the semidiurnal wave, but that the former wave travels with *a different velocity* from the latter. The consequence of this would be that the diurnal inequality would at one port be thrown entirely upon the high water, at a place at some distance, where the diurnal wave had gained (or lost) six (lunar) hours upon the semidiurnal wave, the diurnal inequality would fall entirely upon the low water, and would not appear in the high water at all; and at intermediate places it would affect both high and low waters. If neither of these cases appear to agree with the facts, there appears to be no supposition remaining but that the diurnal wave travels irregularly, so as to affect only or principally sometimes high water, sometimes low water, sometimes both, with no regular progression. And in this case it may be conceived that the diurnal wave at some places vanishes or becomes very small, as I have shown in the Sixth Series of these Researches that the semidiurnal wave does, even in the near neighbourhood of places where it is of considerable magnitude.

The form of the curve which represents the diurnal wave at a series of ports would be modified in the following manner on these different suppositions. If the epoch of this wave changes more rapidly than that of the other inequalities, the sinuous curve which represents the diurnal wave, will have its zero ordinates, and its maximum ordinates, gradually transferred from one half day to a succeeding one, and so on, as we proceed in the direction of its propagation. Each of the sinuous *swells*, corresponding to the successive tides, may remain in the same place, but the *assemblage* of them, corresponding to a semimenstrual series of north or of south lunar declinations, will glide forwards by an alteration of the values of the maximum ordinates in these diurnal swells. On the other hand, if the epoch were the same at different places, and the velocity of the diurnal wave different from that of the semidiurnal wave, *each* diurnal swell will slide on, separating itself more and more from the corresponding high (or low) water, but undergoing no progressive change in its magnitude.

The form of the diurnal wave curve was thus determined for several series of places, and I will state the conclusions to which these series respectively led*.

First Series.—Ferrol, Port Magee (west end of Valentia Island), Doonkeghan (Mayo), Sligo, Ballynass (in the north-west of Ireland), Scrabsters (near Thurso), Buckie, Uzon (near Montrose), North Berwick (Frith of Forth), Berwick-upon-Tweed, and Clay Hole (Lincolnshire).

This series begins on the west coast of Spain, and proceeding by the west coast of Ireland to the north of Scotland, turns round the north-east point of Scotland, and goes on along the east coast of Britain.

It appears, in the first place, by the inspection of these curves, that there is no such slow propagation of the diurnal inequality as I had supposed. The inequality vanishes at all these places about the 10th and 22nd of June, the moon's declination having

* The curves for a series of places on the coasts of the British Channel are given in Plate XIV.

vanished on the 6th and on the 18th. Thus the epoch is the same, or nearly the same, at all these places, namely, about four days, which is the value I had already assigned to it from several years' observations at Plymouth. It appears to be half a day, or perhaps a day greater than this on the east coast of Britain, but on that coast the tide has been from half a day to a day longer in arriving; so that we have here nothing to favour the opinion that the diurnal inequality is transferred at a different rate from the other inequalities of the tides, and the suggestions contained in my last memoir respecting the laws and causes of the supposed peculiar movement of the diurnal inequality must be rejected. They were founded principally on observations made at Leith, in which the diurnal inequality was very imperfectly exhibited; the rejection of them is founded on observations made at sixty-five places, taken in order along the coasts of England, Ireland, and Scotland; for I have examined the diurnal inequality at many places on those coasts, besides those for which I have drawn the curves of the first series, and I find a general agreement in the features of contiguous places.

The slow propagation of the diurnal inequality from day to day being thus rejected, we have next to consider the motion of the diurnal wave for each day, by means of our curves. It will be observed that in each curve the alternate strong ordinate lines belong to high waters, and the intermediate lines to low waters. The maxima of the *swells* of the curves, above and below the axis, are the summits of elevation and depression of the diurnal wave, and by the position of these summits with regard to high and low water, we see whether the diurnal wave arrives before or after the semidiurnal wave, and by how much. And as we know at each place how long the semidiurnal wave arrives after the moon's transit, we thus can refer the diurnal wave to the moon's transit.

In doing this we must make a distinction between the superior and inferior transit, which does not affect the semidiurnal waves. The diurnal wave *belonging* to the superior transit will (by theory) increase the tide when the moon's declination is north, and diminish the tide when the declination is south. Hence if we consider our diurnal wave as belonging to the moon's superior transit, since from June 6th to June 18th, 1835, the moon's declination is south, we must take the lower summits of the curve from June 10th to June 22nd; and the mode of proceeding is obvious.

At Ferrol, for example, it will be seen that the lower summits of the diurnal wave occur in general about two hours before the high water; and this is the high water which follows a superior transit; for on June 16th, for instance, it is the morning tide which occurs at $6^h 42^m$, the moon's transit occurring June 16th $4^h 53^m$ A.M. Now the tide at Ferrol, taking the average interval (the "corrected establishment" of my former Researches), follows the moon's transit at an interval of 2 hours and thirty minutes. Therefore the diurnal wave at Ferrol follows the moon's superior transit at an interval of thirty minutes.

The following is the result of the investigation in this series of places.

Comparing the diurnal wave, which brings the diurnal inequality of high and of low water, with the semidiurnal wave, which brings every tide, we find that

At Ferrol, the diurnal wave is about $2\frac{3}{4}$ hours earlier.

At Port Magee, about 4 hours earlier.

At Doonkeghan, about 2 hours earlier.

At Sligo, about $1\frac{1}{2}$ hour earlier.

At Ballynass, about 1 hour *later*.

At Scrabsters, about 4 hours earlier.

At Buckie, about 4 hours earlier.

At Uzon, about 5 hours earlier.

At North Berwick, about 3 hours earlier.

At Berwick-upon-Tweed, about 4 hours earlier.

At Clay Hole, about 2 hours earlier.

These quantities are unavoidably somewhat vague; for the place of the summit of the wave, as determined by four points of the curve, is necessarily liable to uncertainty, arising from its form not being known; besides which it is affected by accidental causes. And it may be seen by the diagrams that the distance of the summit from high or low water often differs considerably on different days. The curve at Ballynass, where the diurnal wave differs most from the general average, is very irregular. The above quantities, therefore, do not afford us any clear evidence of a *progressive* separation of the diurnal from the semidiurnal wave. And the variations which take place in the diurnal inequality at different places, may be referred to a partial acceleration or retardation of the diurnal wave. Thus on the east coast of Scotland (at Uzon, near Montrose), the diurnal wave shoots on before the semidiurnal, so as to arrive five hours sooner than that; consequently it nearly coincides with low water, and the diurnal inequality of low water is great, while that of high water almost vanishes. But at North Berwick, in the Frith of Forth, this displacement of the diurnal wave is almost corrected, the diurnal inequality affecting high and low waters almost equally.

We appear to be led by this course of investigations to the conclusion, that the differences of diurnal inequality at different places are governed by local circumstances, and do not form a progressive series. We need the less be surprised at this, having already seen (in the Sixth Series of these Researches,) that the amount of the rise of the tide differs very much even within small distances along the coast, or across the sea, and follows no progressive course of increase or decrease. And we may hence explain the cases, many of which occur, in which places having no diurnal inequality are interposed in a line of coast along which the inequality prevails: for example, at Baltimore, near the south-west point of Ireland, the diurnal inequality is not perceptible, either at high or low water, in the observations of June 1835, (which were carefully made,) although it is very conspicuous both on the west and on the south coast of the island.

Second Series.—I now proceed to consider another series of places taken on the coasts of the British Channel, namely, Ferrol, Brest, Cherbourg, Havre, on the continental coast, and Penzance, Plymouth, Bridport, Lulworth and Portsmouth on our own shores.

As before, comparing the diurnal with the semidiurnal wave, we find that

At Ferrol, the diurnal wave is $2\frac{3}{4}$ hours earlier.

At Brest, $3\frac{1}{2}$ hours earlier.

At Penzance, $2\frac{1}{4}$ hours earlier.

At Plymouth, $2\frac{1}{2}$ hours earlier.

At Cherbourg, 4 hours earlier.

At Havre, 3 hours earlier.

So far the two waves appear to go on nearly with the same velocity; but the Isle of Wight appears to produce a disturbance.

For proceeding onwards, we find that

At Bridport, the diurnal wave coincides with the semidiurnal.

At Lulworth, the diurnal wave is five hours *later*.

At Portsmouth, it is $4\frac{1}{2}$ hours *later*.

It appears, therefore, that at this point, where St. Alban's Head and the Isle of Wight interpose themselves in its course, the diurnal wave receives a check which almost reverses its position, and makes the inequalities very different at places before and after that point. Nor does this assertion rest upon any arbitrary mode of combining the facts, but it appears in the facts themselves. For instance, if we compare the high waters at Plymouth, and at Lepe, near Southampton, we shall find that their relation is contrary, the morning high waters being lower than the mean, and the evening high waters higher than the mean, from June 14 to 18 at Plymouth, and the same being the case at Lepe; although the morning tide of one place is identical with the evening tide of the other.

We may observe, that we have here a new proof of that, of which the recent examination of the tides has supplied many proofs, that we can by no means reason on the supposition that the waters of the ocean approximate to a level surface, or that an elevation at one place is necessarily shared by the surrounding seas. We may also observe, that the part of the Channel where the diurnal wave is thus held back, had already been found to be marked by peculiar tidal features; the cotidal lines turning round the promontories above mentioned as a kind of hinges, in consequence of the slow progress of the tide-wave near the shore. It is probable that the peculiarities which we thus discover to coexist in the motion of the diurnal and of the semidiurnal wave would be found to be connected, if we could analyse the hydrodynamical laws of the ocean.

The motion of the diurnal wave being thus irregular, we can account for the variety of values of the diurnal inequality at different places. We can also conceive this wave to move in a manner even more irregular than we have yet described; and some of the facts do appear to indicate this further irregularity. For example, the diurnal inequality appears sometimes, for several days, to leap from its proper tides to the alternate tides, without vanishing in the transition, as in rule it does. Now this irregular movement may be accounted for by supposing that the diurnal wave, which usually completes its oscillation and returns in twenty-four (lunar) hours, does sometimes occupy a longer or shorter time in the oscillation. If, for instance, this wave, after arriving four hours before the *superior* high water of one day, arrive again twenty hours afterwards and therefore eight hours before the superior tide of the next day, it will be only four hours after the *inferior* high water of the second day; and therefore the diurnal inequality will pass from the superior to the inferior tide by a leap. There appear to be several cases implying a change of this kind, but the subject is so complex and so laborious that I shall not now pursue it.

I venture to observe, that what has been recently done in the prosecution of our knowledge of the tides, proves the claims which it has for the same kind of attention and support which is given to other branches of astronomy. The immense labour of following out any one portion of this subject may be judged of, from a very slight attention to any part of the researches of Mr. Lubbock and myself upon it. In the present memoir I have selected the best-conditioned and most carefully made observations out of the general mass of those made in June 1835. I have had the curves of high and low water drawn for seventy-one such places. From among these, I have taken the nineteen places mentioned in this memoir, and have caused the diurnal wave curves to be tabulated and drawn, of which a series is represented in the diagram. These calculations and diagrams have been performed by Mr. D. Ross of the Admiralty, without whose services, placed at my disposal by the First Lord of the Admiralty, it would have been impossible for me to proceed. And even with all the assistance which can thus be given, the superintendence of the subject of the tides alone might fully employ one man of science, with great advantage to the progress of our knowledge; the subject being now so far opened that it is pretty clear in what manner research may be profitably pursued.

There is another reason why tide investigations should be made a national work in civilised maritime states. The peculiarities of the tides in each country are such as to make each shore a study by itself, and our best generalizations will be collected from results obtained in separate parts and combined. I have given less of my labour to the coasts of the United States of North America than might have been due to the interest of the tides of that part of the Atlantic, because I was obliged to limit my labour in some direction, and I hoped, and do hope, that the subject will be taken up by the government of that country as well as our own.

Suffolk Street,
June 15, 1837.

List of Places examined for the Progress of the Diurnal Wave.

Spain.

Ferrol.

Coast of France.

Brest.
St. Servan.
Cherbourg.
Havre.
D'Ouessant.

Scotland toward Thames.

4 *a** Scrabsters.
6 *a* Buckie.
6 *a'* Cullen.
6 *e* Fraserburgh.
7 *e* Cove Bay.
8 *c* Uzon.
10 *a* North Berwick.
11 *a* Berwick-upon-Tweed.
14 *h* Clay Hole.
18 *f* Kessingland.

Thames to Land's End.

259 Kingsdown.
26 *e* No. 3 Tower, near Dovor.
26 *k* Fort Sutherland.
29 *l* Chichester Harbour.
30 *l* Langstone Harbour.
30 *d* Portsmouth.
30 *g* Hamble River.
31 *a* Cowes Harbour.
31 *b* Ryde.
31 *d* Sandown.
31 *g* Freshwater.
31 *i* Newtown.
32 *b* Lepe.
32 *g* Christchurch.
34 *a* Lulworth.
34 *c* Weymouth.
35 *c* Bridport Harbour.
35 *e* Lyme Cobb.
36 *a'* Weston.
36 *d* Dawlish.
37 *d* Torcross.
37 *f* Salcombe.
37 *h* Challabro.
38 *c* Bovisand.
Plymouth.
38 *f* Port Winkle.
39 *c* Polruan.
40 *d* Coverack.
41 *b* Penzance.

Coast of Ireland.

49 Arthurstown.
53 *e* Baltimore.
54 White Horse Station.
55 *b* Ballinskelligs.
55 *c* Port Magee.
56 *b* Dingle.
57 *a* Castle Gregory.
58 *a* Kilrush.
59 *c* Ballyonughan.
59 *g* Littermore.
61 *c* Innisbuffin.
62 Elly Bay.
63 *a* Doonkeghan.
63 *b* Port Tulin.
63 *f* Kilcummin.
64 *dd* Sligo.
65 *b* Trybane.
65 *e* Port Nov.
66 Guidore.
66 *c* Port Ballynass.
68 *f* Torr Head.
70 *f* Ballywater.
71 *c* St. John's Point.
72 *e* Dunany Point.
73 *c* Balbriggan.
73 *m* Howth.

* These numbers and letters refer to the Coast Guard Stations as arranged in the Sixth Series of these Researches.

Tables of the Effect of the Diurnal Inequality on Low and High Water in June 1837.

[From these Tables curves were constructed, by means of which the conclusions contained in the preceding memoir respecting the diurnal wave were established.]

	Ferrol.				Ferrol.				Ferrol.		
	Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.
1835.		h m		1835.		h m		1835.		h m	
June 9 A.M.	H.	53	0	June 16 A.M.	L.	35	− 5	June 23 A.M.	H.	56	− 1
	L.	6 57	− 2		H.	6 49	− 7		L.	7 17	− 1
P.M.	H.	1 19	0	P.M.	L.	42	+ 5	P.M.	H.	1 13	+ 2
	L.	7 29	+ 2		H.	7 17	+10		L.	7 17	+ 2
10 A.M.	H.	1 40	+ 3	17 A.M.	L.	1 22	− 1	24 A.M.	H.	1 40	− 4
	L.	7 50	− 1		H.	7 43	− 7		L.	7 33	− 1
P.M.	H.	2 7	0	P.M.	L.	1 52	− 5	P.M.	H.	1 50	+ 2
	L.	8 12	− 2		H.	8 15	+ 8		L.	7 50	+ 1
11 A.M.	H.	2 33	− 3	18 A.M.	L.	2 22	− 1	25 A.M.	H.	2 13	− 1
	L.	8 38	+ 1		H.	8 50	− 6		L.	8 18	0
P.M.	H.	2 48	+ 3	P.M.	L.	3 2	+ 3	P.M.	H.	2 29	+ 2
	L.	9 12	− 2		H.	9 8	+ 6		L.	8 42	0
12 A.M.	H.	3 28	− 4	19 A.M.	L.	3 37	− 2	26 A.M.	H.	2 49	− 5
	L.	9 26	+ 4		H.	10 7	− 5		L.	8 40	0
P.M.	H.	3 47	+ 5	P.M.	L.	3 50	+ 3	P.M.	H.	3 4	+ 5
	L.	9 56	− 5		H.	10 23	+ 4		L.	9 10	0
13 A.M.	H.	4 11	− 5	20 A.M.	L.	4 33	−12	27 A.M.	H.	3 30	− 3
	L.	10 10	+ 4		H.	11 6	− 3		L.	9 9	0
P.M.	H.	4 17	+ 7	P.M.	L.	5 1	+ 1	P.M.	H.	3 46	+ 5
	L.	10 56	− 5		H.	11 16	+ 3		L.	9 24	− 1
14 A.M.	H.	5 3	− 6	21 A.M.	L.	5 30	− 2	28 A.M.	H.	4 14	− 6
	L.	10 58	+ 4		H.	11 58	− 1		L.	9 49	+ 1
P.M.	H.	5 19	+ 7	P.M.	L.	5 52	+ 1	P.M.	H.	4 14	+ 8
	L.	11 42	− 5	22 A.M.	H.	1	− 1		L.	10 30	− 1
15 A.M.	H.	5 58	− 7		L.	6 5	− 1				
	L.	11 52	+ 4	P.M.	H.	32	+ 1				
P.M.	H.	6 19	+ 9		L.	6 32	+ 1				

	Brest.				Brest.				Brest.		
June 9 A.M.	H.	1 49	− 1	June 16 A.M.	L.	1 40	− 7	June 23 A.M.	H.	1 49	+ 2
	L.	8 10	+ 1		H.	7 45	− 5		L.	8 2	0
P.M.	H.	2 17	+ 1	P.M.	L.	2 5	+ 4	P.M.	H.	2 7	0
	L.	8 38	− 1		H.	8 9	+ 6		L.	8 24	− 2
10 A.M.	H.	2 44	− 1	17 A.M.	L.	2 31	− 3	24 A.M.	H.	2 27	0
	L.	9 2	+ 1		H.	8 36	− 4		L.	8 45	+ 6
P.M.	H.	3 15	0	P.M.	L.	3 1	+ 3	P.M.	H.	2 50	+ 6
	L.	9 30	− 1		H.	9 6	+ 7		L.	9 7	0
11 A.M.	H.	3 38	+ 1	18 A.M.	L.	3 29	− 2	25 A.M.	H.	3 7	− 1
	L.	9 57	+ 2		H.	9 31	− 4		L.	9 22	0
P.M.	H.	3 59	+ 4	P.M.	L.	3 53	+ 2	P.M.	H.	3 24	+ 1
	L.	10 19	− 3		H.	10 4	+ 5		L.	9 40	− 2
12 A.M.	H.	4 25	− 2	19 A.M.	L.	4 32	− 3	26 A.M.	H.	3 42	− 3
	L.	10 45	+ 3		H.	10 36	− 3		L.	10 1	+ 1
P.M.	H.	4 51	+ 4	P.M.	L.	5 0	+ 1	P.M.	H.	4 4	+10
	L.	11 9	− 4		H.	11 8	+ 3		L.	10 23	0
13 A.M.	H.	5 12	− 4	20 A.M.	L.	5 36	− 1	27 A.M.	H.	4 25	− 2
	L.	11 33	+ 5		H.	11 40	− 2		L.	10 40	0
P.M.	H.	5 38	+ 5	P.M.	L.	6 4	+ 2	P.M.	H.	4 37	+ 2
	L.	11 58	− 4	21 A.M.	H.	2	+ 3		L.	10 55	0
14 A.M.	H.	6 2	− 4		L.	6 27	− 2	28 A.M.	H.	4 56	− 5
P.M.	L.	23	+ 5	P.M.	H.	0 32	− 2		L.	11 9	+ 1
	H.	6 28	+ 6		L.	6 56	+ 1	P.M.	H.	5 12	+ 4
15 A.M.	L.	49	− 4	22 A.M.	H.	59	0		L.	11 30	− 1
	H.	6 53	− 4		L.	7 18	− 1				
P.M.	L.	1 11	+ 3	P.M.	H.	1 28	0				
	H.	7 17	+ 6		L.	7 47	+ 1				

Tables, &c. (Continued.)

	Penzance.				Penzance.				Penzance.		
	Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.
1835.		h m		1835.		h m		1835.		h m	
June 9 A.M.	H.	2 50	− 3	June 16 A.M.	L.	2 55	− 3	June 23 A.M.	H.	2 55	− 2
	L.	9 30	0		H.	8 30	− 7		L.	9 25	− 1
P.M.	H.	3 10	+ 2	P.M.	L.	3 25	+ 3	P.M.	H.	3 20	+ 2
	L.	9 50	+ 1		H.	9 0	+ 7		L.	9 45	0
10 A.M.	H.	3 30	− 1	17 A.M.	L.	3 50	− 3	24 A.M.	H.	3 35	− 1
	L.	10 15	0		H.	9 25	− 6		L.	10 0	+ 2
P.M.	H.	3 55	+ 2	P.M.	L.	4 5	+ 3	P.M.	H.	3 50	+ 2
	L.	10 40	0		H.	10 0	+ 9		L.	10 15	0
11 A.M.	H.	4 20	− 1	18 A.M.	L.	4 30	− 3	25 A.M.	H.	4 15	−11
	L.	11 5	0		H.	10 25	− 8		L.	10 45	− 4
P.M.	H.	4 50	+ 2	P.M.	L.	5 5	+ 2	P.M.	H.	4 35	− 4
	L.	11 40	− 1		H.	11 10	+ 6		L.	10 55	− 1
12 A.M.	H.	5 20	− 4	19 A.M.	L.	5 50	− 2	26 A.M.	H.	4 50	− 1
	L.	11 55	+ 1		H.	11 30	− 4		L.	11 10	+ 4
P.M.	H.	5 40	+ 3	P.M.	L.	6 20	+ 2	P.M.	H.	5 0	+ 5
13 A.M.	L.	30	− 2		H.	11 55	+ 4		L.	11 30	0
	H.	6 5	− 4	20 A.M.	L.	6 45	− 1	27 A.M.	H.	5 15	− 5
P.M.	L.	50	+ 3	P.M.	H.	35	− 5		L.	11 40	− 1
	H.	6 25	+ 4		L.	7 15	+ 2	P.M.	H.	5 25	+ 2
14 A.M.	L.	1 10	− 2	21 A.M.	H.	55	+ 4		L.	12 0	− 1
	H.	6 45	− 5		L.	7 35	− 2	28 A.M.	H.	5 45	− 2
P.M.	L.	1 35	+ 3	P.M.	H.	1 10	− 3	P.M.	L.	20	+ 3
	H.	7 15	+ 6		L.	8 5	+ 1		H.	6 10	+ 5
15 A.M.	L.	2 5	− 4	22 A.M.	H.	1 55	− 1				
	H.	7 35	− 7		L.	8 25	− 2				
P.M.	L.	2 25	+ 4	P.M.	H.	2 30	+ 2				
	H.	8 0	+ 6		L.	9 0	+ 3				

	Plymouth.				Plymouth.				Plymouth.		
June 9 A.M.	H.	3 55	0	June 16 A.M.	L.	3 11	− 6	June 23 A.M.	H.	3 32	− 2
	L.	10 3	0		H.	9 20	− 7		L.	9 46	− 1
P.M.	H.	4 13	+ 1	P.M.	L.	3 34	+ 3	P.M.	H.	4 0	0
	L.	10 20	0		H.	9 43	+ 7		L.	10 5	− 1
10 A.M.	H.	4 33	− 1	17 A.M.	L.	3 43	− 3	24 A.M.	H.	4 15	− 1
	L.	11 0	0		H.	10 16	− 6		L.	10 13	+ 5
P.M.	H.	5 2	+ 1	P.M.	L.	4 20	+ 3	P.M.	H.	4 23	+ 3
	L.	11 43	0		H.	10 34	+ 8		L.	10 40	0
11 A.M.	H.	5 54	− 2	18 A.M.	L.	4 34	− 3	25 A.M.	H.	4 50	0
P.M.	L.	1	+ 1		H.	10 58	− 7		L.	11 4	− 6
	H.	6 8	+ 3	P.M.	L.	5 8	+ 2	P.M.	H.	5 18	− 2
12 A.M.	L.	22	− 1		H.	11 27	+ 3		L.	11 25	− 2
	H.	6 33	− 5	19 A.M.	L.	5 36	− 2	26 A.M.	H.	5 45	− 9
P.M.	L.	39	+ 2	P.M.	H.	8	− 3		L.	11 47	+ 5
	H.	6 43	+ 3		L.	6 13	+ 1	P.M.	H.	5 54	+ 8
13 A.M.	L.	1 5	− 5	20 A.M.	H.	31	+ 2	27 A.M.	L.	25	+ 1
	H.	7 16	− 3		L.	6 40	− 1		H.	6 15	− 3
P.M.	L.	1 27	+ 4	P.M.	H.	1 5	− 1	P.M.	L.	42	− 3
	H.	7 24	+ 4		L.	7 21	+ 3		H.	6 42	+ 4
14 A.M.	L.	1 47	− 3	21 A.M.	H.	1 28	+ 4	28 A.M.	L.	55	0
	H.	8 7	− 5		L.	7 52	− 2		H.	7 15	− 4
P.M.	L.	2 13	+ 4	P.M.	H.	2 7	− 4	P.M.	L.	1 21	+ 4
	H.	8 24	+ 5		L.	8 17	+ 2		H.	7 25	+ 8
15 A.M.	L.	2 36	− 5	22 A.M.	H.	2 28	− 2				
	H.	8 47	− 6		L.	8 41	− 2				
P.M.	L.	2 54	+ 5	P.M.	H.	3 4	+ 3				
	H.	8 58	+ 7		L.	9 21	+ 4				

Tables, &c. (Continued.)

Bridport.

1835.	Tide.	Time. h m	Diurnal Inequal.
June 9 A.M.	H.	4 15	0
	L.	10 0	+ 1
P.M.	H.	4 30	0
	L.	10 30	− 1
10 A.M.	H.	5 0	0
	L.	10 45	0
P.M.	H.	5 30	0
	L.	11 0	0
11 A.M.	H.	5 45	0
	L.	11 30	0
P.M.	H.	6 30	+ 1
12 A.M.	L.	30	+ 1
	H.	7 0	− 3
P.M.	L.	45	− 1
	H.	7 20	+ 2
13 A.M.	L.	1 15	0
	H.	8 15	− 1
P.M.	L.	1 45	+ 9
	H.	8 30	− 2
14 A.M.	L.	2 0	0
	H.	8 40	+ 2
P.M.	L.	2 15	− 2
	H.	9 0	+ 1
15 A.M.	L.	2 30	+ 1
	H.	9 30	− 4
P.M.	L.	3 0	0
	H.	9 45	+ 4

1835.	Tide.	Time. h m	Diurnal Inequal.
June 16 A.M.	L.	4 0	0
	H.	10 15	− 4
P.M.	L.	4 0	0
	H.	10 0	+ 5
17 A.M.	L.	4 15	0
	H.	10 45	− 3
P.M.	L.	4 30	0
	H.	11 0	+ 7
18 A.M.	L.	5 0	0
	H.	11 45	− 2
P.M.	L.	5 15	+ 1
	H.	11 45	− 6
19 A.M.	L.	5 45	− 2
P.M.	H.	15	+ 2
	L.	6 15	+ 1
20 A.M.	H.	45	+ 1
	L.	6 30	− 2
P.M.	H.	1 15	− 9
	L.	7 0	+ 3
21 A.M.	H.	1 45	+ 2
	L.	7 15	− 1
P.M.	H.	2 30	− 1
	L.	8 0	+ 1
22 A.M.	H.	3 0	0
	L.	8 45	− 2
P.M.	H.	3 30	+ 2
	L.	9 15	+ 1

1835.	Tide.	Time. h m	Diurnal Inequal.
June 23 A.M.	H.	4 0	− 3
	L.	9 30	− 1
P.M.	H.	4 13	0
	L.	10 0	+ 2
24 A.M.	H.	5 0	0
	L.	10 30	0
P.M.	H.	5 15	+ 3
	L.	11 0	− 3
25 A.M.	H.	5 15	− 3
	L.	11 15	+ 3
P.M.	H.	5 45	+ 1
	L.	11 45	− 4
26 A.M.	H.	6 0	0
	L.	12 0	+ 4
P.M.	H.	6 15	+ 7
27 A.M.	L.	30	− 1
	H.	6 30	− 8
P.M.	L.	1 0	− 2
	H.	7 0	+ 4
28 A.M.	L.	1 15	0
	H.	7 30	− 5
P.M.	L.	1 30	+ 3
	H.	8 0	+ 7

Cherbourg.

	Tide.	Time.	Diurnal Inequal.
June 9 A.M.	H.	6 23	− 2
P.M.	L.	49	0
	H.	6 41	+ 2
10 A.M.	L.	1 20	0
	H.	7 1	− 1
P.M.	L.	1 40	0
	H.	7 21	+ 2
11 A.M.	L.	2 9	− 1
	H.	7 52	− 2
P.M.	L.	2 34	+ 2
	H.	8 17	+ 2
12 A.M.	L.	2 57	− 3
	H.	8 43	− 5
P.M.	L.	3 24	+ 4
	H.	9 4	+ 7
13 A.M.	L.	3 52	− 5
	H.	9 26	− 4
P.M.	L.	4 14	+ 7
	H.	9 47	+ 4
14 A.M.	L.	4 31	− 4
	H.	10 21	− 4
P.M.	L.	4 58	+ 7
	H.	10 34	+ 4
15 A.M.	L.	5 17	− 6
	H.	11 3	− 4
P.M.	L.	5 40	+ 8
	H.	11 21	+ 4

	Tide.	Time.	Diurnal Inequal.
June 16 A.M.	L.	6 8	− 7
	H.	11 52	− 5
P.M.	L.	6 30	+ 9
17 A.M.	H.	12	+ 5
	L.	7 1	− 8
P.M.	H.	38	− 3
	L.	7 20	+ 9
18 A.M.	H.	59	+ 4
	L.	7 47	− 8
P.M.	H.	1 40	− 3
	L.	8 18	+ 6
19 A.M.	H.	2 6	+ 2
	L.	9 1	− 3
P.M.	H.	2 46	+ 1
	L.	9 42	+ 3
20 A.M.	H.	3 19	− 1
	L.	9 51	− 3
P.M.	H.	3 51	0
	L.	10 34	+ 5
21 A.M.	H.	4 5	+ 1
	L.	10 50	− 4
P.M.	H.	4 38	0
	L.	11 17	0
22 A.M.	H.	5 7	− 1
	L.	11 38	0
P.M.	H.	5 30	+ 2

	Tide.	Time.	Diurnal Inequal.
June 23 A.M.	L.	13	0
	H.	5 58	− 1
P.M.	L.	39	+ 1
	H.	6 18	+ 1
24 A.M.	L.	52	− 2
	H.	6 43	− 1
P.M.	L.	1 25	+ 8
	H.	6 40	+ 5
25 A.M.	L.	1 44	− 3
	H.	7 24	− 2
P.M.	L.	1 49	+ 2
	H.	7 21	+ 2
26 A.M.	L.	2 29	− 3
	H.	7 49	− 5
P.M.	L.	2 25	+ 8
	H.	8 0	+ 12
27 A.M.	L.	2 40	− 1
	H.	8 32	− 3
P.M.	L.	3 1	+ 1
	H.	8 35	+ 3
28 A.M.	L.	3 31	− 4
	H.	8 58	− 6
P.M.	L.	3 44	+ 7
	H.	9 11	+ 5

TABLES, &c. (Continued.)

	Havre.				Havre.				Havre.		
	Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.
1835.		h m		1835.		h m		1835.		h m	
June 9 A.M.	L.	3 0	0	June 16 A.M.	H.	1 15	+ 4	June 23 A.M.	L.	2 32	− 1
	H.	7 55	− 2		L.	8 45	− 5		H.	8 1	− 1
P.M.	L.	3 26	0	P.M.	H.	1 55	− 4	P.M.	L.	2 55	+ 1
	H.	8 22	+ 2		L.	8 53	+ 2		H.	8 32	+ 2
10 A.M.	L.	3 49	0	17 A.M.	H.	2 11	+ 3	24 A.M.	L.	3 25	− 4
	H.	8 45	− 3		L.	9 19	− 2		H.	8 51	− 5
P.M.	L.	4 15	0	P.M.	H.	3 4	− 1	P.M.	L.	3 35	+10
	H.	9 16	+ 3		L.	9 53	+ 3		H.	9 14	+ 4
11 A.M.	L.	4 54	− 2	18 A.M.	H.	3 13	+ 2	25 A.M.	L.	3 54	− 2
	H.	9 39	− 2		L.	10 10	− 4		H.	9 43	− 1
P.M.	L.	5 8	+ 2	P.M.	H.	3 53	− 1	P.M.	L.	4 18	+ 3
	H.	10 8	+ 3		L.	10 44	+ 6		H.	10 11	+ 2
12 A.M.	L.	5 38	− 3	19 A.M.	H.	4 12	0	26 A.M.	L.	4 51	− 4
	H.	10 21	− 4		L.	11 16	− 1		H.	9 53	− 4
P.M.	L.	5 59	+ 2	P.M.	H.	4 51	+ 1	P.M.	L.	5 2	+ 3
	H.	10 43	+ 3		L.	11 41	+ 1		H.	10 36	+13
13 A.M.	L.	6 33	− 3	20 A.M.	H.	5 22	− 2	27 A.M.	L.	5 21	0
	H.	11 17	− 2	P.M.	L.	8	− 1		H.	10 25	− 2
P.M.	L.	6 49	+ 5		H.	6 12	+ 2	P.M.	L.	5 41	+ 1
	H.	11 41	+ 3	21 A.M.	L.	46	+ 6		H.	10 35	+ 2
14 A.M.	L.	7 10	− 6		H.	6 15	− 2	28 A.M.	L.	6 4	− 5
P.M.	H.	7	− 4	P.M.	L.	1 19	− 4		H.	11 1	− 6
	L.	7 27	+ 5		H.	6 41	+ 1	P.M.	L.	6 23	+ 7
15 A.M.	H.	21	+ 3	22 A.M.	L.	1 44	− 1		H.	11 13	+ 4
	L.	7 47	− 7		H.	7 19	− 2				
P.M.	H.	1 0	− 4	P.M.	L.	2 1	+ 1				
	L.	8 15	+ 8		H.	7 39	+ 2				

	Lulworth.				Lulworth.				Lulworth.		
June 9 A.M.	L.	45	+ 4	June 16 A.M.	L.	6 20	−15	June 23 A.M.	H.	4 40	0
	H.	5 38	− 6		H.	11 8	+ 2	P.M.	L.	30	+ 1
P.M.	L.	1 10	− 1	P.M.	L.	6 52	+12		H.	5 20	0
	H.	6 2	+ 3		H.	11 29	− 3	24 A.M.	L.	55	− 2
10 A.M.	L.	1 45	− 2	17 A.M.	L.	7 20	−14		H.	5 45	0
	H.	6 36	− 5		H.	11 59	+ 4	P.M.	L.	1 10	+ 5
P.M.	L.	2 10	+ 4	P.M.	L.	7 45	+13		H.	5 59	− 2
	H.	6 46	+ 2	18 A.M.	H.	32	− 4	25 A.M.	L.	1 40	− 5
11 A.M.	L.	2 40	− 4		L.	8 10	−12		H.	6 30	0
	H.	7 25	0	P.M.	H.	50	+ 4	P.M.	L.	2 1	+ 4
P.M.	L.	3 7	+ 4		L.	8 30	+ 9		H.	6 59	0
	H.	7 58	+ 1	19 A.M.	H.	1 10	− 2	26 A.M.	L.	2 38	− 5
12 A.M.	L.	3 34	− 5		L.	8 52	− 4		H.	7 38	+ 6
	H.	8 20	− 1	P.M.	H.	1 40	+ 6	P.M.	L.	2 58	+ 5
P.M.	L.	3 49	+ 8		L.	9 10	+ 3		H.	7 59	+ 8
	H.	8 39	0	20 A.M.	H.	2 12	− 8	27 A.M.	L.	3 15	− 6
13 A.M.	L.	4 12	−11		L.	9 35	− 2		H.	8 17	− 2
	H.	8 52	+ 2	P.M.	H.	2 38	+ 3	P.M.	L.	3 40	+11
P.M.	L.	4 36	+ 5		L.	10 12	+ 9		H.	8 25	+ 1
	H.	9 18	0	21 A.M.	H.	2 59	− 3	28 A.M.	L.	3 55	− 9
14 A.M.	L.	5 5	− 4		L.	10 52	− 3		H.	8 40	− 1
	H.	9 55	− 6	P.M.	H.	3 35	+ 2	P.M.	L.	4 15	+ 8
P.M.	L.	5 30	+ 8		L.	11 10	+ 2		H.	8 50	+ 2
	H.	10 25	− 2	22 A.M.	H.	4 5	− 2				
15 A.M.	L.	5 53	−12		L.	11 40	0				
	H.	10 39	+ 4	P.M.	H.	4 25	+ 4				
P.M.	L.	6 5	+13		L.	11 55	− 1				
	H.	10 50	− 3								

TABLES, &c. (Continued.)

	Portsmouth.				Portsmouth.				Portsmouth.		
	Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.
1835.		h m		1835.		h m		1835.		h m	
June 9 A.M.	L.	2 20	+ 4	June 16 A.M.	H.	3 10	− 2	June 23 A.M.	L.	2 15	− 1
	H.	9 55	− 2		L.	8 10	− 6		H.	9 37	0
P.M.	L.	2 55	0	P.M.	H.	3 35	+ 2	P.M.	L.	2 37	+ 2
	H.	10 15	+ 3		L.	8 35	+ 6		H.	9 57	0
10 A.M.	L.	3 15	− 2	17 A.M.	H.	4 0	− 4	24 A.M.	L.	2 57	− 3
	H.	10 45	− 3		L.	9 0	− 6		H.	10 17	+ 6
P.M.	L.	3 45	+ 2	P.M.	H.	4 35	+ 9	P.M.	L.	3 17	+ 2
	H.	11 10	+ 2		L.	9 35	+ 6		H.	10 39	− 6
11 A.M.	L.	4 11	− 1	18 A.M.	H.	5 0	− 6	25 A.M.	L.	3 39	0
	H.	11 32	0		L.	10 0	− 8		H.	10 55	− 5
P.M.	L.	4 33	+ 1	P.M.	H.	5 35	+ 4	P.M.	L.	3 55	− 3
12 A.M.	H.	11	+ 1		L.	10 38	0		H.	11 10	+ 3
	L.	5 11	− 2	19 A.M.	H.	6 2	− 3	26 A.M.	L.	4 10	− 7
P.M.	H.	34	− 2		L.	11 2	+ 1		H.	11 35	+ 1
	L.	5 34	+ 1	P.M.	H.	6 40	+ 5	P.M.	L.	4 36	+10
13 A.M.	H.	48	+ 2		L.	11 40	− 1		H.	11 57	0
	L.	5 50	0	20 A.M.	H.	7 10	− 9	27 A.M.	L.	5 2	+ 5
P.M.	H.	1 10	+ 3	P.M.	L.	10	− 1	P.M.	H.	21	− 1
	L.	6 10	− 2		H.	7 45	+ 5		L.	5 21	− 2
14 A.M.	H.	1 36	+ 1	21 A.M.	L.	45	+ 1	28 A.M.	H.	41	+ 2
	L.	6 37	0		H.	7 55	− 4		L.	5 41	− 6
P.M.	H.	2 0	0	P.M.	L.	0 55	− 1	P.M.	H.	1 0	− 2
	L.	7 0	+ 4		H.	8 22	+ 1		L.	6 0	+ 3
15 A.M.	H.	2 22	− 1	22 A.M.	L.	1 23	− 2				
	L.	7 22	− 6		H.	8 47	− 1				
P.M.	H.	2 45	+ 3	P.M.	L.	1 47	+ 1				
	L.	7 45	+ 6		H.	9 15	0				

	Port Magee.				Port Magee.				Port Magee.		
June 9 A.M.	H.	1 50	− 3	June 16 A.M.	L.	1 40	− 3	June 23 A.M.	H.	2 20	− 2
	L.	8 0	− 2		H.	8 15	− 4		L.	8 43	− 1
P.M.	H.	2 30	+ 2	P.M.	L.	2 30	+ 1	P.M.	H.	2 34	+ 1
	L.	8 40	+ 2		H.	8 30	+ 4		L.	8 53	+12
10 A.M.	H.	2 52	− 2	17 A.M.	L.	2 43	− 2	24 A.M.	H.	3 10	+ 1
	L.	9 7	− 1		H.	9 10	− 3		L.	9 23	+10
P.M.	H.	3 18	+ 2	P.M.	L.	3 18	+ 9	P.M.	H.	3 40	+ 4
	L.	9 32	0		H.	9 30	+ 1		L.	9 55	+ 3
11 A.M.	H.	3 47	− 1	18 A.M.	L.	3 40	− 1	25 A.M.	H.	4 0	− 2
	L.	9 57	+ 1		H.	10 0	− 1		L.	10 10	− 1
P.M.	H.	4 9	+ 2	P.M.	L.	4 15	+ 1	P.M.	H.	4 0	+ 1
	L.	10 20	− 1		H.	10 20	+ 1		L.	10 15	+ 5
12 A.M.	H.	4 30	− 2	19 A.M.	L.	4 35	− 2	26 A.M.	H.	4 18	− 5
	L.	10 41	+ 3		H.	11 5	− 2		L.	10 30	+ 3
P.M.	H.	4 54	+ 3	P.M.	L.	5 20	+11	P.M.	H.	4 24	+ 3
	L.	11 9	− 5		H.	11 20	+ 3		L.	10 30	− 2
13 A.M.	H.	5 19	− 3	20 A.M.	L.	5 30	+ 5	27 A.M.	H.	4 43	− 3
	L.	11 30	+ 6		H.	12 0	− 2		L.	10 58	+ 1
P.M.	H.	5 44	+ 4	P.M.	L.	6 20	0	P.M.	H.	5 17	+ 5
	L.	12 0	− 5	21 A.M.	H.	40	0		L.	11 25	− 1
14 A.M.	H.	6 10	− 2		L.	6 45	− 4	28 A.M.	H.	5 30	− 3
P.M.	L.	17	+ 6	P.M.	H.	1 10	0		L.	11 47	+ 3
	H.	6 25	+ 2		L.	7 15	+ 1	P.M.	H.	5 45	+ 2
15 A.M.	L.	33	− 5	22 A.M.	H.	1 35	0				
	H.	6 53	− 2		L.	7 45	− 1				
P.M.	L.	1 15	+ 8	P.M.	H.	1 45	+ 1				
	H.	7 10	+ 3		L.	7 50	+ 1				

Tables, &c. (Continued.)

Doonkeghan.

1835.	Tide.	Time. h m	Diurnal Inequal.
June 9 A.M.	H.	3 24	− 1
	L.	9 34	− 5
P.M.	H.	3 49	+ 1
	L.	9 58	+ 7
10 A.M.	H.	4 2	− 1
	L.	10 2	− 2
P.M.	H.	4 36	+ 3
	L.	10 26	+ 2
11 A.M.	H.	4 55	− 4
	L.	11 1	− 3
P.M.	H.	5 29	+ 5
	L.	11 29	+ 1
12 A.M.	H.	5 50	− 6
P.M.	L.	11 43	+ 2
	H.	6 3	+ 9
13 A.M.	L.	15	− 3
	H.	6 26	− 8
P.M.	L.	18	+ 4
	H.	6 46	+ 9
14 A.M.	L.	1 14	− 6
	H.	7 40	− 9
P.M.	L.	1 11	+ 5
	H.	7 40	+12
15 A.M.	L.	1 57	− 6
	H.	8 16	−12
P.M.	L.	2 12	+ 6
	H.	8 32	+13

1835.	Tide.	Time. h m	Diurnal Inequal.
June 16 A.M.	L.	3 0	− 6
	H.	9 20	−12
P.M.	L.	3 25	+ 9
	H.	10 4	+14
17 A.M.	L.	4 20	− 7
	H.	10 30	− 6
P.M.	L.	4 15	+ 6
	H.	10 50	+ 9
18 A.M.	L.	5 11	− 5
	H.	11 40	−12
P.M.	L.	5 54	+ 5
19 A.M.	H.	10	+ 8
	L.	6 17	− 6
P M.	H.	28	− 7
	L.	6 30	+ 9
20 A.M.	H.	35	+ 9
	L.	7 15	− 6
P.M.	H.	1 50	− 6
	L.	8 3	+ 5
21 A.M.	H.	2 5	+ 3
	L.	8 10	− 6
P.M.	H.	2 20	− 3
	L.	8 35	+ 5
22 A.M.	H.	2 45	+ 3
	L.	9 0	+ 6
P.M.	H.	3 30	+ 1
	L.	9 20	+ 6

1835.	Tide.	Time. h m	Diurnal Inequal.
June 23 A.M.	H.	3 30	− 2
	L.	9 42	− 4
P.M.	H.	3 45	+ 1
	L.	10 2	+ 4
24 A.M.	H.	4 10	− 1
	L.	10 15	0
P.M.	H.	4 27	+ 4
	L.	10 37	0
25 A.M.	H.	4 38	−11
	L.	10 45	− 2
P.M.	H.	5 0	+ 1
	L.	11 9	+ 1
26 A.M.	H.	5 17	− 2
	L.	11 5	+ 3
P.M.	H.	5 27	+ 6
	L.	11 40	− 3
27 A.M.	H.	5 51	− 9
	L.	11 40	+ 1
P.M.	H.	5 52	+ 9
28 A.M.	L.	20	− 2
	H.	6 20	− 8
P.M.	L.	20	+ 9
	H.	6 27	+ 7

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	Tide.	Time.	Diurnal Inequal.
June 9 A.M.	H.	3 45	+ 1
	L.	10 0	− 6
P.M.	H.	4 20	− 1
	L.	10 30	+ 6
10 A.M.	H.	4 40	0
	L.	10 45	− 3
P.M.	H.	5 15	+ 2
	L.	11 25	+ 4
11 A.M.	H.	5 40	− 2
	L.	11 40	0
P.M.	H.	6 0	+ 4
12 A.M.	L.	10	0
	H.	6 20	− 5
P.M.	L.	30	0
	H.	6 45	+ 7
13 A.M.	L.	1 0	0
	H.	7 15	− 8
P.M.	L.	1 15	+ 3
	H.	7 30	+ 9
14 A.M.	L.	1 40	− 6
	H.	8 0	−10
P.M.	L.	2 0	+ 3
	H.	8 15	+11
15 A.M.	L.	2 15	− 3
	H.	8 45	−13
P.M.	L.	2 30	+ 3
	H.	9 0	+14

	Tide.	Time.	Diurnal Inequal.
June 16 A.M.	L.	3 20	− 6
	H.	9 40	−15
P.M.	L.	3 25	+ 4
	H.	9 50	+15
17 A.M.	L.	4 10	− 3
	H.	9 55	−15
P.M.	L.	4 20	+ 2
	H.	10 40	+10
18 A.M.	L.	5 0	− 2
	H.	11 30	−10
P.M.	L.	5 50	+ 5
19 A.M.	H.	10	+13
	L.	6 30	− 5
P.M.	H.	1 0	−11
	L.	7 10	+ 8
20 A.M.	H.	1 30	+13
	L.	7 50	− 4
P.M.	H.	2 0	−11
	L.	8 0	+ 2
21 A.M.	H.	2 15	+ 9
	L.	8 25	− 5
P.M.	H.	2 35	− 6
	L.	8 50	+ 1
22 A.M.	H.	3 10	+ 9
	L.	9 25	− 1
P.M.	H.	3 30	0
	L.	9 40	+ 4

	Tide.	Time.	Diurnal Inequal.
June 23 A.M.	H.	3 55	0
	L.	10 10	− 6
P.M.	H.	4 20	0
	L.	10 30	+ 4
24 A.M.	H.	4 35	+ 6
	L.	10 40	0
P.M.	H.	4 50	+ 9
	L.	11 0	0
25 A.M.	H.	5 10	− 4
	L.	11 20	0
P.M.	H.	5 30	+ 3
	L.	11 45	0
26 A.M.	H.	6 0	− 2
P.M.	L.	10	0
	H.	6 20	+ 7
27 A.M.	L.	30	0
	H.	6 35	− 9
P.M.	L.	35	0
	H.	6 45	+19
28 A.M.	L.	1 0	0
	H.	7 10	− 8
P.M.	L.	1 15	0
	H.	7 30	+ 7

TABLES, &c. (Continued.)

	Port Ballynass.				Port Ballynass.				Port Ballynass.		
	Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.
1835.		h m		1835.		h m		1835.		h m	
June 9 A.M.	H.	4 30	− 1	June 16 A.M.	L.	3 54	0	June 23 A.M.	H.	4 12	0
	L.	11 10	− 2		H.	10 0	−12		L.	10 18	0
P.M.	H.	4 45	+ 1	P.M.	L.	4 30	0	P.M.	H.	4 25	0
	L.	11 15	+ 2		H.	10 30	+15		L.	10 30	+ 1
10 A.M.	H.	5 0	− 3	17 A.M.	L.	4 43	+ 1	24 A.M.	H.	4 37	+ 3
	L.	11 55	− 1		H.	10 58	− 5		L.	10 45	− 1
P.M.	H.	5 40	+ 2	P.M.	L.	4 50	− 2	P.M.	H.	4 50	− 1
11 A.M.	L.	10	+ 1		H.	11 25	+ 3		L.	11 2	+ 3
	H.	6 5	0	18 A.M.	L.	5 30	0	25 A.M.	H.	5 20	+ 2
P.M.	L.	56	0		H.	11 50	− 5		L.	11 30	− 4
	H.	6 20	+ 1	P.M.	L.	6 2	0	P.M.	H.	5 35	− 5
12 A.M.	L.	54	0	19 A.M.	H.	30	+10		L.	11 55	0
	H.	6 45	− 2		L.	6 20	0	26 A.M.	H.	6 10	+15
P.M.	L.	1 20	0	P.M.	H.	56	− 4	P.M.	L.	13	− 1
	H.	6 57	+ 4		L.	6 50	0		H.	6 20	+ 1
13 A.M.	L.	1 42	+ 1	20 A.M.	H.	1 18	+ 7	27 A.M.	L.	30	+ 3
	H.	7 35	− 6		L.	6 35	+ 1		H.	6 45	− 1
P.M.	L.	2 1	− 1	P.M.	H.	1 55	− 5	P.M.	L.	54	0
	H.	7 50	+ 7		L.	7 40	− 2		H.	6 40	+ 3
14 A.M.	L.	2 25	− 1	21 A.M.	H.	2 15	+ 4	28 A.M.	L.	1 10	0
	H.	8 10	− 4		L.	8 0	+ 1		H.	7 20	− 4
P.M.	L.	2 35	0	P.M.	H.	2 45	− 3	P.M.	L.	1 18	0
	H.	8 34	+ 5		L.	8 34	− 1		H.	7 25	+ 5
15 A.M.	L.	3 0	0	22 A.M.	H.	3 5	+ 3				
	H.	9 2	− 4		L.	9 25	+ 2				
P.M.	L.	3 1	− 1	P.M.	H.	3 36	− 1				
	H.	9 25	+ 7		L.	9 40	0				

	Scrabsters.				Scrabsters.				Scrabsters.		
June 9 A.M.	L.	20	+10	June 16 A.M.	H.	15	+ 9	June 23 A.M.	L.	2	+ 1
	H.	6 45	− 0		L.	6 45	− 9		H.	6 35	+ 1
P.M.	L.	45	− 6	P.M.	H.	1 0	− 6	P.M.	L.	40	− 2
	H.	7 0	0		L.	7 0	+14		H.	6 50	− 2
10 A.M.	L.	1 10	+ 5	17 A.M.	H.	1 20	+10	24 A.M.	L.	1 15	+ 1
	H.	7 30	0		L.	7 40	−15		H.	7 25	+ 1
P.M.	L.	1 45	− 4	P.M.	H.	1 50	−13	P.M.	L.	1 40	0
	H.	8 0	0		L.	7 50	+ 4		H.	7 45	+ 6
11 A.M.	L.	2 0	+ 8	18 A.M.	H.	2 10	+ 9	25 A.M.	L.	2 0	0
	H.	8 15	− 1		L.	8 40	− 5		H.	8 0	− 3
P.M.	L.	2 25	− 3	P.M.	H.	2 50	− 4	P.M.	L.	2 15	0
	H.	8 40	+ 1		L.	9 0	+ 6		H.	8 25	+ 1
12 A.M.	L.	2 55	− 6	19 A.M.	H.	3 20	+ 4	26 A.M.	L.	2 35	− 1
	H.	9 20	− 2		L.	9 20	−10		H.	8 40	− 3
P.M.	L.	3 10	+ 3	P.M.	H.	3 45	− 5	P.M.	L.	2 50	+ 4
	H.	9 45	+ 5		L.	9 45	+11		H.	9 0	+ 7
13 A.M.	L.	3 45	− 3	20 A.M.	H.	4 10	+ 8	27 A.M.	L.	3 0	− 2
	H.	10 10	− 2		L.	10 30	− 7		H.	9 15	− 4
P.M.	L.	4 15	+ 3	P.M.	H.	4 45	− 6	P.M.	L.	3 15	− 1
	H.	10 30	+ 1		L.	10 50	+ 3		H.	9 30	+ 3
14 A.M.	L.	4 40	− 4	21 A.M.	H.	5 10	0	28 A.M.	L.	3 38	− 5
	H.	11 0	− 5		L.	11 20	− 5		H.	9 45	− 4
P.M.	L.	5 10	+ 9	P.M.	H.	5 35	+ 2	P.M.	L.	3 55	+ 4
	H.	11 20	+ 9		L.	11 45	+ 9		H.	10 3	+ 6
15 A.M.	L.	5 35	−11	22 A.M.	H.	5 50	0				
	H.	11 50	− 9		L.	11 55	− 1				
P.M.	L.	6 0	+ 9	P.M.	H.	6 15	0				

TABLES, &c. (Continued.)

	Buckie.				Buckie.				Buckie.		
	Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.
1835.		h m		1835.		h m		1835.		h m	
June 9 A.M.	L.	4 10	+ 3	June 16 A.M.	H.	3 30	+ 8	June 23 A.M.	L.	4 0	+ 5
	H.	10 30	0		L.	10 0	− 7		H.	10 0	− 2
P.M.	L.	4 30	− 3	P.M.	H.	4 5	− 5	P.M.	L.	4 20	− 1
	H.	11 0	+ 1		L.	10 15	+17		H.	10 20	− 2
10 A.M.	L.	5 0	+ 4	17 A.M.	H.	4 0	+ 9	24 A.M.	L.	4 50	− 1
	H.	11 15	0		L.	11 10	−10		H.	10 35	0
P.M.	L.	5 20	− 2	P.M.	H.	5 10	−11	P.M.	L.	5 0	+ 2
	H.	11 45	0		L.	11 20	+10		H.	11 0	0
11 A.M.	L.	6 0	0	18 A.M.	H.	5 25	+ 1	25 A.M.	L.	5 30	+ 2
P.M.	H.	5	0	P.M.	L.	10	− 6		H.	11 10	− 1
	L.	6 25	0		H.	6 10	− 1	P.M.	L.	5 45	0
12 A.M.	H.	20	+ 1	19 A.M.	L.	25	+12		H.	11 40	+ 4
	L.	6 40	− 3		H.	6 15	+ 1	26 A.M.	L.	6 10	− 2
P.M.	H.	40	− 1	P.M.	L.	1 0	− 9	P.M.	H.	10	− 2
	L.	7 0	+ 5		H.	7 15	− 5		L.	6 20	+ 2
13 A.M.	H.	1 5	0	20 A.M.	L.	1 30	+ 6	27 A.M.	H.	30	+ 3
	L.	7 20	− 5		H.	7 35	+ 7		L.	6 40	0
P.M.	H.	1 30	+ 1	P.M.	L.	2 0	− 7	P.M.	H.	35	− 3
	L.	7 40	+ 9		H.	8 0	− 6		L.	7 0	0
14 A.M.	H.	1 50	+ 2	21 A.M.	L.	2 20	+ 3	28 A.M.	H.	1 10	+ 3
	L.	8 20	− 9		H.	8 15	0		L.	7 20	− 6
P.M.	H.	2 20	− 4	P.M.	L.	2 45	− 5	P.M.	H.	1 40	− 2
	L.	8 35	+ 8		H.	8 35	+ 1		L.	7 40	+ 4
15 A.M.	H.	2 35	+ 4	22 A.M.	L.	3 10	+ 5				
	L.	9 5	−10		H.	9 0	− 1				
P.M.	H.	3 15	− 5	P.M.	L.	3 20	+ 4				
	L.	9 15	+10		H.	9 45	+ 4				

	North Berwick.				North Berwick.				North Berwick.		
June 9 A.M.	H.	23	0	June 16 A.M.	H.	6 16	+ 3	June 23 A.M.	H.	26	+ 4
	L.	6 36	+ 7	P.M.	L.	23	−10		L.	6 40	+ 4
P.M.	H.	48	+ 1		H.	6 45	− 5	P.M.	H.	47	− 3
	L.	7 0	− 4	17 A.M.	L.	53	+16		L.	6 54	− 4
10 A.M.	H.	1 11	0		H.	7 10	+ 9	24 A.M.	H.	1 12	0
	L.	7 21	+ 2	P.M.	L.	1 22	−11		L.	7 15	− 3
P.M.	H.	1 40	+ 1		H.	7 46	− 6	P.M.	H.	1 29	0
	L.	7 43	− 2	18 A.M.	L.	1 54	+ 8		L.	7 33	0
11 A.M.	H.	2 11	− 1		H.	8 10	0	25 A.M.	H.	1 50	0
	L.	8 15	+ 1	P.M.	L.	2 24	−10		L.	7 54	+ 1
P.M.	H.	2 34	+ 2		H.	8 45	+ 6	P.M.	H.	2 0	+ 1
	L.	8 37	0	19 A.M.	L.	2 58	+15		L.	8 5	+ 1
12 A.M.	H.	3 0	− 3		H.	8 58	+ 3	26 A.M.	H.	2 19	0
	L.	9 4	− 3	P.M.	L.	3 24	− 6		L.	8 24	− 1
P.M.	H.	3 24	+ 2		H.	9 44	− 5	P.M.	H.	2 41	− 1
	L.	9 32	+ 4	20 A.M.	L.	3 50	+ 6		L.	8 44	0
13 A.M.	H.	3 46	− 2		H.	10 16	+ 4	27 A.M.	H.	3 4	+ 1
	L.	9 56	− 6	P.M.	L.	4 22	− 5		L.	9 5	− 3
P.M.	H.	4 12	+ 3		H.	10 40	− 2	P.M.	H.	3 20	0
	L.	10 16	+ 8	21 A.M.	L.	5 0	+ 6		L.	9 17	+ 5
14 A.M.	H.	4 34	0		H.	11 10	− 3	28 A.M.	H.	3 36	0
	L.	10 41	−10	P.M.	L.	5 16	− 9		L.	9 38	− 9
P.M.	H.	4 57	0		H.	11 32	+ 3	P.M.	H.	3 58	0
	L.	11 4	+10	22 A.M.	L.	5 37	+ 5		L.	10 0	+ 4
15 A.M.	H.	5 24	0		H.	11 57	− 3				
	L.	11 32	− 9	P.M.	L.	6 6	− 2				
P.M.	H.	5 50	− 2								
	L.	11 56	+10								

TABLES, &c. (Continued.)

1835.	Berwick-upon-Tweed. Tide.	Time. h m	Diurnal Inequal.
June 9 A.M.	H.	27	− 3
	L.	6 37	+ 7
P.M.	H.	49	+ 2
	L.	7 5	− 5
10 A.M.	H.	1 25	0
	L.	7 32	+ 3
P.M.	H.	1 44	0
	L.	8 4	− 3
11 A.M.	H.	2 14	0
	L.	8 26	+ 1
P.M.	H.	2 30	0
	L.	8 45	− 1
12 A.M.	H.	2 47	− 1
	L.	9 15	− 2
P.M.	H.	3 15	+ 1
	L.	9 30	+ 3
13 A.M.	H.	3 30	− 1
	L.	10 7	− 5
P.M.	H.	4 20	+ 2
	L.	10 28	+ 9
14 A.M.	H.	4 50	0
	L.	10 45	− 7
P.M.	H.	5 19	0
	L.	11 2	+ 6
15 A.M.	H.	5 33	+ 2
	L.	11 32	− 7
P.M.	H.	6 5	− 4
	L.	12 0	+12

1835.	Berwick-upon-Tweed. Tide.	Time. h m	Diurnal Inequal.
June 16 A.M.	H.	6 25	+ 5
P.M.	L.	35	−10
	H.	7 3	− 4
17 A.M.	L.	1 8	+14
	H.	7 33	+ 8
P.M.	L.	1 36	−11
	H.	8 10	− 6
18 A.M.	L.	2 10	+11
	H.	8 30	0
P.M.	L.	2 35	− 8
	H.	9 5	+ 4
19 A.M.	L.	2 37	+ 2
	H.	9 15	+ 7
P.M.	L.	3 4	− 3
	H.	9 40	− 4
20 A.M.	L.	4 10	+ 6
	H.	10 7	+ 4
P.M.	L.	4 35	− 6
	H.	10 45	− 3
21 A.M.	L.	4 48	+ 5
	H.	11 15	− 1
P.M.	L.	5 5	−10
	H.	11 55	+ 5
22 A.M.	L.	5 47	+ 6
P.M.	H.	25	− 3
	L.	6 20	− 3

1835.	Berwick-upon-Tweed. Tide.	Time. h m	Diurnal Inequal.
June 23 A.M.	H.	56	+ 5
	L.	7 0	+ 4
P.M.	H.	1 4	− 4
	L.	7 4	− 3
24 A.M.	H.	1 30	+ 2
	L.	7 40	0
P.M.	H.	1 54	− 1
	L.	8 0	+ 1
25 A.M.	H.	2 17	+ 1
	L.	8 20	+ 1
P.M.	H.	2 23	− 1
	L.	8 30	+ 2
26 A.M.	H.	2 29	+ 2
	L.	8 55	− 3
P.M.	H.	2 45	− 3
	L.	9 5	+ 2
27 A.M.	H.	3 8	+ 3
	L.	9 20	− 3
P.M.	H.	3 28	− 2
	L.	9 35	+ 5
28 A.M.	H.	4 0	0
	L.	9 46	− 7
P.M.	H.	4 20	0
	L.	10 5	+ 6

	Clay Hole.		
June 9 A.M.	H.	4 50	− 4
	L.	10 55	+ 7
P.M.	H.	5 0	+ 1
	L.	12 0	− 5
10 A.M.	H.	5 33	0
P.M.	L.	8	+ 6
	H.	5 53	+ 1
11 A.M.	L.	48	− 3
	H.	6 18	− 1
P.M.	L.	55	+ 2
	H.	6 46	+ 1
12 A.M.	L.	1 33	− 2
	H.	7 3	0
P.M.	L.	1 50	0
	H.	7 40	− 1
13 A.M.	L.	2 20	0
	H.	7 53	+ 1
P.M.	L.	2 45	0
	H.	8 23	0
14 A.M.	L.	3 0	+ 6
	H.	8 45	+ 1
P.M.	L.	3 35	−10
	H.	9 23	− 4
15 A.M.	L.	3 30	+ 8
	H.	9 30	+ 6
P.M.	L.	4 22	− 7
	H.	10 15	− 9

	Clay Hole.		
June 16 A.M.	L.	4 13	+ 8
	H.	10 10	+ 8
P.M.	L.	5 5	− 8
	H.	11 0	−15
17 A.M.	L.	5 0	+ 7
	H.	10 50	+18
P.M.	L.	6 5	− 5
18 A.M.	H.	5	−16
	L.	5 40	+ 9
P.M.	H.	1	+ 3
	L.	6 35	−10
19 A.M.	H.	1 5	− 4
	L.	6 40	+27
P.M.	H.	50	+ 7
	L.	7 35	− 4
20 A.M.	H.	2 15	−20
	L.	7 45	+ 4
P.M.	H.	2 20	+ 4
	L.	8 48	− 6
21 A.M.	H.	2 55	− 4
	L.	8 55	+ 6
P.M.	H.	3 2	− 2
	L.	9 37	−11
22 A.M.	H.	3 47	+ 5
	L.	10 7	+ 6
P.M.	H.	4 7	− 8
	L.	10 17	− 3

	Clay Hole.		
June 23 A.M.	H.	4 25	+ 6
	L.	10 57	+10
P.M.	H.	4 50	− 3
	L.	10 50	− 1
24 A.M.	H.	5 5	0
	L.	11 35	+ 1
P.M.	H.	5 25	0
	L.	11 45	− 2
25 A.M.	H.	5 55	− 3
P.M.	L.	1	− 1
	H.	6 10	+14
26 A.M.	L.	35	+15
	H.	6 20	− 2
P.M.	L.	43	− 8
	H.	6 45	− 1
27 A.M.	L.	56	+16
	H.	6 59	+ 4
P.M.	L.	1 35	+ 2
	H.	7 35	− 2
28 A.M.	L.	1 35	− 4
	H.	7 55	0
P.M.	L.	2 13	− 8
	H.	8 13	0

TABLES, &c. (Continued.)

	Uzon.				Uzon.				Uzon.		
	Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.		Tide.	Time.	Diurnal Inequal.
1835.		h m		1835.		h m		1835.		h m	
June 9 A.M.	H.	3	0	June 16 A.M.	H.	5 45	0	June 23 A.M.	L.	5 59	+ 3
	L.	6 5	+ 5		L.	11 48	− 4	P.M.	H.	22	+ 6
P.M.	H.	17	0	P.M.	H.	6 32	− 7		L.	6 35	− 2
	L.	6 26	− 5	17 A.M.	L.	6	+13	24 A.M.	H.	33	− 1
10 A.M.	H.	45	0		H.	6 38	+ 9		L.	6 47	0
	L.	6 52	+ 3	P.M.	L.	57	−12	P.M.	H.	43	− 2
P.M.	H.	1 6	+ 1		H.	7 35	− 8		L.	7 6	+ 2
	L.	7 16	− 1	18 A.M.	L.	1 12	+ 8	25 A.M.	H.	1 15	+ 1
11 A.M.	H.	1 25	− 1		H.	7 47	+ 1		L.	7 26	− 2
	L.	7 39	+ 1	P.M.	L.	1 46	− 8	P.M.	H.	1 25	− 1
P.M.	H.	1 49	+ 2		H.	8 40	+ 5		L.	7 44	+ 2
	L.	8 9	+ 1	19 A.M.	L.	2 24	+16	26 A.M.	H.	1 46	0
12 A.M.	H.	2 15	− 2		H.	8 43	+ 5		L.	8 5	− 2
	L.	8 31	− 3	P.M.	L.	3 10	− 7	P.M.	H.	2 10	− 2
P.M.	H.	2 44	+ 1		H.	9 25	− 5		L.	8 14	+ 3
	L.	8 52	+ 4	20 A.M.	L.	3 29	+ 7	27 A.M.	H.	2 26	+ 2
13 A.M.	H.	3 3	− 1		H.	9 27	+ 2		L.	8 33	− 4
	L.	9 22	− 6	P.M.	L.	3 55	− 6	P.M.	H.	2 45	− 1
P.M.	H.	3 36	+ 1		H.	10 40	− 2		L.	8 47	+ 4
	L.	9 46	+ 9	21 A.M.	L.	4 23	+ 5	28 A.M.	H.	2 57	0
14 A.M.	H.	3 55	− 2		H.	10 25	0		L.	9 14	− 7
	L.	10 11	−10	P.M.	L.	4 49	− 9	P.M.	H.	3 31	0
P.M.	H.	4 37	− 3		H.	11 42	+ 5		L.	9 21	+ 9
	L.	10 38	+ 9	22 A.M.	L.	5 18	+ 6				
15 A.M.	H.	4 48	− 3		H.	11 30	− 4				
	L.	10 55	−11	P.M.	L.	5 40	− 2				
P.M.	H.	5 30	+ 6		H.	11 50	+ 2				
	L.	11 24	+ 8								

DIURNAL WAVE

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