XVII. *Researches on the Tides.—Sixth Series. On the Results of an extensive system of Tide Observations made on the coasts of Europe and America in June* 1835. *By the Rev.* William Whewell, *M.A., F.R.S., Fellow of Trinity College, Cambridge.*

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Sect. I. *Introduction.*

1. I HAVE already, in communications to the Society, urged the importance which belongs to simultaneous tide observations made at distant places; and I have also stated some of the steps which have been taken in consequence of representations to this effect. Observations were made and continued for a fortnight in June 1834, at the coast-guard stations in Great Britain and Ireland; and I have given an account of some of the results of these observations in a paper already printed in the Transactions*. Being encouraged by the general interest taken in the subject, and by the desire to promote this branch of knowledge manifested by those who had officially the means of doing so, especially by Captain Beaufort, the Hydrographer of the Admiralty, I solicited a repetition of the coast-guard tide observations in June 1835, and also ventured to recommend that a request should be made to other maritime nations, to institute simultaneous tide observations on their coasts. The British observations were undertaken with the same readiness as before by Captain Bowles, the Chief Commissioner of the Coast-Guard Service. The proposal for the foreign observations was entertained and promoted with great zeal by the Board of Admiralty; and the Duke of Wellington, at that time Foreign Secretary of State, being applied to, to forward the scheme, His Grace fully acceded to the application, and made requests to foreign governments to join in the undertaking, in a manner which procured from them the most cordial and effective cooperation. Through the ambassadors of the maritime powers of Europe, and through A. Vail, Esq., the Chargé d'Affaires of the United States, who entered into this design with great interest, arrangements were made, and directions circulated, for simultaneous tide observations from the 8th to the 28th of June. These observations were made, for the most part with great care, under the direction of intelligent officers and men of science.

2. The chain of places of observation extended from the mouth of the Mississippi, round the Keys of Florida, along the coast of North America, as far as Nova Scotia; and from the Straits of Gibraltar, along the shores of Europe, to the North Cape of Norway. The number of places of observation was twenty-eight in America, seven in Spain, seven in Portugal, sixteen in France, five in Belgium, eighteen in the

* Part I. for 1835, p. 83.

Netherlands, twenty-four in Denmark, and twenty-four in Norway; and observations were made by the coast-guard of this country at 318 places in England and Scotland, and at 219 places in Ireland. Among the persons who superintended these observations on an extensive scale, I have profited in an especial manner by the labours of M. Möll, who directed and arranged those made in the Netherlands; M. Tegner, who has performed various reductions on the Danish observations, besides superintending a large portion of them; and M. Beautems-Beaupre, who has for some years been occupied with valuable hydrographical labours on the coasts of France. In several other cases in which the observations have been conducted in a very accurate and scientific manner, I do not find it stated, in the communications which contain the registers, under whose general direction the operations were carried on. The names of the particular observers will be found in the Tables appended to this memoir. I have not used the whole of the observations sent; as some, from the situation of the places, or from other causes, could not be made subservient to my general purpose. For instance, I have for the present omitted some, on account of their manifestly irregular character; others, because, being made at some distance up the course of a river, they gave no information respecting the tides of the ocean. Such data as these last mentioned may still be of use to myself or other investigators on some future occasion.

3. I now proceed to give some account of the general character of these observations, the mode employed in reducing them, and the information which they supply with respect to the phenomena of the tides.

The observers were directed to record the times of high water and of low water, and the height of the surface at each of these times, measured from a fixed point. The time was to be correctly ascertained by the best method which circumstances afforded; and where there was no pier or other permanent scale for the heights, a pole was to be erected. Other contrivances, intended to obviate peculiar difficulties, need not here be described. The high-water observations were to be considered as the most important.

These directions were for the most part faithfully and effectually followed. The observations at different places, made under very different circumstances and by persons of different classes, have, as might be expected, very various degrees of merit; but the general relations, both of accordance and discrepance, among the observations, convince me that in almost every instance they were conducted with care and fidelity. In many of the foreign observations the labour employed in order to obtain accurate results has been immense; and the persons under whose care they have been carried on are men of eminent scientific attainments. On our own coasts, the nature of the service to which the observers belonged led in many cases to the use of ruder methods; but the processes employed were mostly well selected according to the circumstances, and were applied with great practical sagacity. I cannot avoid repeating, with respect to the observations of June 1835, what I have already stated with respect to those of June 1834, that they reflect great credit both upon the intelligence and the punctuality of the officers and men of the coast-guard service.

4. Having had my views seconded by the favour and exertions of so many persons of various ranks and countries, it became me to turn to the best advantage the large mass of materials thus collected. It will, however, be seen on consideration, that the arrangement and reduction of this collection was beyond the powers of an individual. The effective places of observation being about five hundred, there were one thousand tides observed every day for twenty days; and as, for each tide, even taking high water only, the time and height were to be considered, I had forty thousand numbers to deal with as the basis of any calculations by which I might deduce general results from this large experiment.

I found in this, as in other similar instances, the Admiralty ready to assist me. Captain Beaufort kindly allowed Mr. Dessiou, of the Hydrographer's Office, to perform my calculations, as far as the business of the office left him time; but this being quite insufficient for my purpose, Lord Auckland, at that time First Lord of the Admiralty, did me the favour of complying with my suggestion that two additional clerks should be engaged, who might carry on these calculations; and Earl Minto, on his accession to the same office, readily agreed to retain these calculators in the same employment till it should be completed. These gentlemen, Mr. D. Ross and Mr. H. Boddy, have, under Mr. Dessiou's superintendence, performed the calculations, by which I have been enabled to draw from the tide observations of June the inferences which are the subject of this paper.

5. One of my principal objects was to fix with precision the form of the *cotidal lines*, by which the motion of the tide-wave is exhibited, and to which I had already attempted to make an approximation*. For this purpose the times of high water were treated as follows.

At each place the differences between the time of high water and the time of a preceding transit of the moon (which differences I call the *Lunitidal Intervals*) were taken for the whole series of observations. Next, these lunitidal intervals were laid down as the ordinates of a curve, the time of the moon's transit after the sun's being the abscissa. In this manner I had, for each place, a curve, which represented (in the way so frequently referred to by Mr. Lubbock and myself) the semimenstrual inequality of the lunitidal intervals, affected by the various errors and peculiarities of the observations. The inspection of these curves afforded me the means of judging of the best mode of combining them so as to get rid of local and casual anomalies. From these curves also the *mean lunitidal interval*, or *corrected establishment* of each place, was readily obtained. For this purpose a curve was drawn by the eye which should pass *among* the points representing the observations, and should retain, as much as possible, the general form of the semimenstrual curve. The intervals being

* Philosophical Transactions, 1833, Part I.

freed from gross irregularity by this graphical correction, the mean interval was taken, making allowance for parallax and declination.

6. This mean lunitidal interval, or *corrected establishment* of each place, differs from the *vulgar establishment*, or time of high water corresponding to new and full moon; for the time of high water at syzygy is affected by the semimenstrual inequality belonging to the moon's position one or two days earlier, and is therefore later by about 30^m than the mean interval would give it. In my former paper on Cotidal Lines I used the statements of the vulgar establishment at each place; in this, I shall employ the corrected establishment, as a more fixed element; for it is as yet uncertain how far the semimenstrual inequality differs at different places. On this account the cotidal lines for $0^h\ 30^m$, $1^h\ 30^m$, $2^h\ 30^m$, $3^h\ 30^m$, &c., which I shall now obtain, represent nearly the cotidal lines for 1^h, 2^h, 3^h, 4^h, &c. of my former charts.

7. The mean lunitidal interval would be the mean of the greatest and least intervals, if the time of high water were not affected by the moon's declination and parallax; but in consequence of these circumstances a correction of the mean is requisite.

In June 1835, if there had been no corrections for the moon's parallax and declination, the least interval at London would have been on the 16th, the greatest on the 23rd, each 44^m from the mean. But, in fact, the least interval was on the 15th, and was 4^m greater than it would have been without the corrections; and the greatest interval was on the 22nd, and was 9^m greater than it would have been without the corrections. Hence the mean of the observed intervals was $6\frac{1}{2}^m$ greater than it would be if declination and parallax did not affect it. If we use the Liverpool tables in the same way, we find the least interval, on the 14th, 1^m less than without the corrections; the greatest interval, on the 21st, 15^m greater than without the corrections. Hence the mean of the observed greatest and least intervals is 7^m larger than the true mean.

On this account I have found the mean lunitidal interval for each place by reading off the greatest and least ordinates of the curves of observation, graphically corrected as above, and by subtracting 7^m from the mean of these ordinates. The tables containing the result of this operation will be given in the sequel. In these tables the first and second columns contain the least and greatest lunitidal intervals: the third column is the difference of these two: the fourth column, the *reduction**, is the half-difference *minus* 7^m; and this added to the least interval gives the *corrected establishments* in the fifth column.

8. In order to use the corrected establishments thus found for the purpose of drawing cotidal lines, they must be reduced to a common origin of time by adding the west longitude (expressed in time), or subtracting the east longitude. In the Tables of Lunitidal Intervals, the sixth column contains the *longitude*, and the seventh the *Greenwich time* of the corrected establishment.

* When the semimenstrual inequality is unusually small, as in many places on the coast of America, I have used the half-difference *minus* 6^m for the reduction.

9. But there is also another correction necessary in order that the series of establishments thus obtained may rightly express the continued motion of the tide-wave. It is to a certain extent optional whether we will take the lunitidal interval resulting from the moon's transit next preceding, or next but one preceding; but when we pass from one transit to another in going through a series of places, we disconnect the establishments as representing the motion of the same tide-wave.

Thus, let there be two places on the same meridian, and on the afternoon of a certain day let it be high water at these places at two and at three o'clock; then the tide-wave is one hour in passing from one place to the other. But let the times of the moon's transit on this day, in the morning and afternoon, be $2^h\ 24^m$ and $2^h\ 48^m$ respectively; the tide at 3^h is referred to the P.M. transit immediately preceding at $2^h\ 48^m$, and the lunitidal interval is $0^h\ 12^m$; but the tide at 2^h is necessarily referred to the A.M. transit, because the P.M transit happens after the tide: hence the lunitidal interval here is $14^h - 2^h\ 24^m$, or $11^h\ 36^m$. But if the cotidal lines were drawn according to these intervals, $11^h\ 36^m$ and $12^h\ 12^m$, they would give a difference of 36^m only, instead of 60^m.

Such discrepancies will be removed, and the lunitidal intervals reduced to a connected series, so as to give a consistent series of cotidal lines, if we diminish each lunitidal interval in the ratio of $12^h\ 24^m$ (the interval of two lunar transits) to 12^h, that is, if we subtract 1^m for every half hour. Thus, in the above case, the lunitidal interval $11^h\ 36^m$ will become $11^h\ 13^m$, which, compared with $0^h\ 12^m$, or $12^h\ 12^m$, gives 59^m for the time employed in the passage of the tide-wave from the one place to the other. The corrected establishment thus further corrected (and reduced to Greenwich time) I call the *cotidal hour* in the tables of intervals.

The observations being estimated, grouped, and reduced by the above methods, I proceeded to combine them, so as to obtain from them systems of cotidal lines, and other information.

Sect. II. *On the form of the Cotidal Lines.*

10. The above reductions gave me the *cotidal hour*, or mean interval of time at which the tides follow the moon's transit, along the whole coast of America, from Florida to Nova Scotia, and along the oceanic coast of Europe from Gibraltar to the North Cape of Norway. The cotidal hours being laid down along the coasts, and lines drawn through the places where the same hour occurs, in such a manner as to be consistent with a possible motion of the tide-wave, we have the *cotidal lines*.

I have already, in the memoir already referred to *, endeavoured to discover the general form of such lines, both for the ocean at large and for the coasts of the British Isles in particular; and I have now to consider how far my new materials enable me to correct my first attempt. For this purpose the observations now before me are highly valuable, and their inaccuracy is scarcely of any moment. That they

* Essay towards a First Approximation to a Map of Cotidal Lines.

are real and simultaneous observations at a sufficient number of places along the coasts, gives them an immense superiority over the statements which I was formerly compelled to use, and which were for the most part only estimated results, founded upon imperfect observations or none, and often deduced by erroneous methods of estimation.

It is not surprising, therefore, that the differences between the form of the lines now obtained and my former maps should be considerable. At the same time I may observe, that all my views of the general course of the tide-wave have been confirmed by the present examination.

11. With regard to the general character of the corrections which I have had to introduce into my maps, I may state this as one circumstance: the cotidal lines make very acute angles with the shore, and run for great distances nearly parallel to it. I had already, to a certain extent, pointed out that the cotidal lines must have a shape of this kind. "They are convex," it was observed *, "in the direction of their motion, the ends near the shore being held back by the smaller velocity in shallower water, and other resistances." But it is necessary to exaggerate very much this feature in their shape, in order to make them conform to our observations, so that the lines near the shore are made near and almost parallel to each other. In this way the velocity of the tide-wave, which is, of course, to be estimated in a direction nearly perpendicular to the cotidal lines, is very much less near the shore than it is in the open ocean: perhaps we may even consider the velocity of the tide-wave in littoral regions as a quantity of a different order, and governed by different laws, from its velocity in the open ocean: but of this we may speak more distinctly hereafter.

One consequence of this form of the cotidal lines is, that though on a large extent of coast the direction and velocity of the progress of the tide-wave are marked clearly enough, in smaller portions the rate and even the direction of this progress may rapidly and repeatedly change. The cotidal line leaving the shore at so small an angle, may easily catch it again where it projects a little, and thus we have *points of divergence* and of *convergence* of the cotidal lines †.

For example, on the coast of America (see Table I.) the progress of the tide from Cape Hatteras is both southward to Cape Fear, Charlestown, Savannah, and St. Augustine, and northward to Delaware and New York; Cape Hatteras being a point of divergence. But at Newport, still further to the north-east, we find the tide again an hour earlier than New York, and even earlier than at Delaware Breakwater; so that between Cape Hatteras and Newport there must be a point of convergence. To the east of this, again, there is a point of divergence, and the hour of the tide becomes rapidly later as it travels into the bays of Massachusetts, Boston, and Fundy.

In the same manner, on the coast of Spain (see Table II.) the 2^h line touches the shore near Cadiz; it also touches at Cascaes near Lisbon, the tide-hour at interme-

* Philosophical Transactions, 1833, p. 231. † Ibid., p. 153.

diate places being as late as $2\frac{1}{2}^h$; and in the Bay of Biscay the hour at Santander is later than at Bilboa, though the latter place is further east.

In Ireland the $4\frac{1}{2}^h$ line runs along the whole coast of Munster, touching it in many places, and the 5^h line runs along the remaining west and south coast of the island at no great distance.

12. Another circumstance which I may notice in the corrected form of these lines, and which results from the same tendency, is, that the hour-lines which are earlier than the littoral ones spread over the general surface of the ocean more widely, and catch the projecting points of land sooner, than had been supposed. Thus the line of $10\frac{1}{2}^h$ nearly touches Cape Hatteras on the coast of America, and compels us to extend the 10^h and 11^h lines considerably to the west.

13. We may observe also that this expansion of the oceanic and compression of the intervals of the littoral cotidal lines, necessarily give an extremely complex form to the former, since they must in some degree accommodate themselves to all the land which surrounds them. Thus, as we have seen, the $10\frac{1}{2}^h$ hour-line nearly touches Cape Hatteras. It also extends from the eastern to the western coast of the Atlantic. But its course must be very sinuous, for the vulgar establishment at the Bermudas is 7^h 18^m*, which places the 11^h cotidal line nearly there. In these and similar cases it is probable that there are, as I have formerly suggested, "detached spaces within which the tides are later than in the surrounding seas, occupied by converging *rings* or *loops* of cotidal lines."

14. As there are large tracts of coast along which the tide-hour exhibits no steady progression, there are, on the other hand, points where it changes very rapidly. These are generally promontories. Thus on the coast of America we have a rapid change in passing round the projection formed by Nantucket and other islands. On the coast of France, in passing round Cape La Hague and Barfleur, the tide-hour advances from 6^h to 9^h. In the same manner on the opposite coast of England the 7^h and 8^h cotidal lines both touch St. Alban's Head in Dorsetshire, and the 9^h and 10^h lines both touch St. Catherine's Point in the Isle of Wight. The tide in passing round the north coast of Scotland and the Orkneys appears to undergo a comparatively rapid increase of the establishment from about 6^h on the western to 12^h on the eastern coast.

15. But the most rapid of the changes which thus occur in passing round promontories are those which are accompanied by a *meeting of tides*, arriving in opposite directions along two different channels; as the tides on the east coast of Ireland, which arrive both from the north and from the south; and the tides in the eastern part of the English Channel, which are derived through the Straits as well as up the Channel. I have already remarked that two tide-waves travelling in opposite directions along the same channel will make the tide-hour nearly constant along a considerable tract of coast, while it varies rapidly at the extremities of this tract†. I

* Philosophical Transactions, 1833, Part I. p. 172. † Ibid. 1835, Part I. p. 87.

remarked that we find an exemplification of such a case in the tides of the south coast of England, from the Isle of Wight to the Land's End, as observed at the coast-guard stations in June 1834. At the period of writing that paper the observations of the south coast only had been reduced. I can now state that we have a much more remarkable example of the same fact in the tides on the east coast of Ireland. The rapid change of the tide-hour in passing round the northern and southern extremities of this coast is very remarkable, and may be seen in Tables III. and IV. Thus in passing round Rachlin Island and Fair Head, which form the north-eastern point of Ireland, through the narrow strait left by the Mull of Cantire, the tide-hour advances suddenly from $6\frac{1}{2}^h$ to $10\frac{1}{2}^h$. In the same manner in passing round Carnsore Point, from the south to the east coast of the county of Wexford, the tide-hour advances from $5\frac{1}{2}^h$ to $10\frac{1}{2}^h$, and 11^h in a very short distance.

Also when such *hinges* of the tide are once passed, the hour is nearly constant along the whole of the coast, as we have seen that it ought to be from general considerations. Thus all the way from Arklow in the south to Glenarm and Larne in the north of the eastern side of Ireland, the tide-hour at exposed points of the coast is from $10\frac{1}{2}^h$ to 11^h; and a little later in bights, as the Bay of Dublin and the mouth of the Boyne. The "meeting of the tides" may be considered as extending over the whole of this space. In like manner, as I have already stated*, the sea from the Isle of Wight to the Downs is affected (at least as to its tide-hour) both by the channel tide and by that of the German Ocean. Hence the cotidal lines in such cases will cease to extend across the channel, and will become nearly parallel to the shore, as we see the 10^h line on the east coast of Ireland, and the 10^h line on the south coast of England. The lines assume this form by the successive hour-lines projecting more and more in the middle of the channel, as an ellipse may become two parallel lines by retaining its minor axis, and increasing its major axis indefinitely.

16. There is another very curious circumstance connected with these cases of the meeting of tides. In those parts where the tide-hour increases most rapidly (or in other words where the tide-wave travels most slowly) the times of high water are subject to extreme irregularities. This is remarkably seen in the curves which I have used to represent the observations of such places. The lines for Rachlin Island, Ballycastle, Ballintoy, exhibit the most extraordinary irregularities in their course both in June 1834 and 1835. The greatest and least lunitidal intervals at Rachlin Island in June 1835 differ by no less than *five hours and a half*; and there are instances of this interval differing two hours and a half in *two successive tides*. This appears to be partly due to the effect of the diurnal inequality of which we shall have to speak, but still it shows how liable the tide at this place is to the influence of irregularities. And I may observe that this peculiarity in the tides of this place explains the apparent inconsistencies which I formerly noticed in the statements

* Philosophical Transactions, 1835, Part I. p. 89.

respecting these tides*. Knowing the anomalies which prevail in this neighbourhood, I do not now doubt that Captain MUDGE's statements are all entirely correct.

Anomalies, but much smaller in amount, may be noticed at Cahore Point in Wexford, at the bays in the neighbourhood of St. Alban's Head, and at Freshwater in the Isle of Wight. I may observe that the occurrence of such irregularities, at the extremity of the space within which one tide is modified by another, is easily explicable. A difference of height or of wind, from one half-day to another, may cause one tide to affect the other much more or less; and thus the mixture of tides, which so entirely alters the tide-hour, may, at these limits, take place very inconstantly, and to a very variable amount.

Sect. 3. *On a Second Approximation to a Map of Cotidal Lines, and especially of those of the German Ocean.*

17. By means of the observations and reductions above described, I have constructed a map of the cotidal lines which pass near the shores of Europe, and a map for the German Ocean and the British Isles in particular, which are given with this paper. By reference to these maps, and by comparison of them with the Tables of Establishments which I have also given, the reader will see the general results of the observations, and their evidence.

He will also see in one of the maps the difference between this second approximation and the first approximation, which I formerly published. The cotidal hours which I have used in this case, however, correspond to the correct establishment, and not to the vulgar establishment, or time of high water at syzygy, which I used in my former essay. But it is easy to make allowance for this difference; for the correct establishment, at London and Liverpool, is very nearly half an hour smaller than the vulgar establishment, and for our purpose may for the present be considered as exactly so at all places. And hence the $1\frac{1}{2}^h$ cotidal line of my present map represents the 2^h line of the former one, and so on for the rest.

The correct establishment, which is the mean of the lunitidal intervals, may also be considered as the interval at which the high water follows the moon's transit at the highest spring tides and lowest neaps, for these correspond to the mean lunitidal interval.

I have not presented with this paper a map of the cotidal lines of the coast of North America, formed on the new materials; but I may observe that my former map is here considerably in error. The XI. hours cotidal line should strike Cape Hatteras; and the tides diverge from this both to the north and south, as has already been stated in art. 12.

The general views concerning the form of the cotidal lines already stated in Sect. 2, might be used in improving the form of the lines belonging to other places, as well as those to which the recent observations belong. But as a few years will, it may be

* Philosophical Transactions, 1833, p. 182.

hoped, add considerably to our materials for a closer approximation to a map for the whole world, I will not now attempt this, except for the seas to which the observations immediately refer.

18. I have already pointed out the extreme difficulty of forming into a consistent and intelligible scheme the tides of the German Ocean*. But as we have now a connected series of observations along the whole of its coast, we must make the attempt.

The obvious difficulties may be thus stated. Calling the coast from Calais to the north point of Denmark, for the sake of distinctness, the German coast, and considering it as opposite to the British coasts, the series of tide-hours on the two opposite coasts run thus from south to north.

British coast.	X.	XI.	XII.	XI.	X.	IX.	VIII.	VII.	VI.	V.	IV.	III.	II.	I.	XII.
		A				D		B							C
German coast.	11.	12.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	no tide.

Since the tide-wave in most parts of this series moves in opposite directions on the opposite sides of the sea, it is clear that the parts cannot be represented by any motion of a wave along a channel. Nor will it answer well to suppose the wave to run from C to A along the British coast, and back from A to C along the German coast; for the intervals of the lines would, on this supposition, diminish much in passing from the space C B to B A, and increase much again in passing from A B to B C; besides which this view does not take into account the disappearance of the tides on the coast of Denmark, and the connexion of the tides of Holland with those of France.

It appears that we may best combine all the facts into a consistent scheme, by dividing this ocean into two *rotatory* systems of tide-waves; one occupying the space from B to C, that is, from Norfolk and Holland to Norway; and the other the space from A to B, between the Netherlands and England. In the former space the cotidal lines may be supposed to revolve round the point C, where there is no tide; for it is clear that at a point where all the cotidal lines meet, it is high water equally at all hours, that is, the tide vanishes. In the space A B we must suppose similarly a tideless centre, as D, about which the cotidal lines revolve.

This mode of conceiving the progress of the tide does not differ essentially from the hypothesis of a progress from C to A and back from A to C, as already mentioned: for on such a hypothesis the motion might be conceived to be resolved into two rotatory systems, the wave being supposed to pass from VI. to 7. and from 6. to VII., instead of passing from VI. to VII. and from 6. to 7. But this is in reality no difference; for the change really is, that the ridge of the wave passes from the position VI. 6. to VII. 7.; which is equally well represented by either supposition.

This hypothesis of two rotatory systems in the German Ocean is recommended by its giving the most consistent and probable relations among the cotidal lines and

* Philosophical Transactions, 1833, p. 188.

the intervening spaces, as may be seen by reference to the chart; and I have therefore adopted it as the best approximation I can now obtain to the form of these lines.

This theory is, indeed, nothing more than a representation of the facts of the case; yet it gives a view of the mechanism of the tides of the German Ocean different from any which has hitherto been suggested. The southern rotatory system, which exists between the coast of Suffolk and the Netherlands, may be conceived to be kept in constant circulation by impulses received from the adjacent tides, that is, an impulse at 6^h on the coast of Norfolk, and an impulse at 12^h on the coast of Belgium. Thus it resembles a watch or clock, which is kept in continual motion by a sustaining force applied at intervals. The larger rotatory system, lying between the east coast of Scotland and England, and the coast of Germany and Denmark, does not, like the other, return into itself. We may conceive that in this case the tide-wave is turned aside by the opposing coast of Norfolk and Germany, so as to be thrown back upon itself in the neighbourhood of the coasts of Jutland after an interval of six hours. This would explain the vanishing of the tide in that region; for a tide at 12^h combined with a tide at 6^h are equivalent to no tide at all; the high water of the one filling up the low water of the other.

19. Besides this completion of our view of the tides of the German Ocean, our new materials give us the course of the tide-wave on the coast of Norway, which I had not previously ascertained. It appears that the 9^h cotidal line, which must pass somewhere near the Orkneys, also touches the opposite coast of Norway at Stavanger and Tananger; and as we find the hours go on to 12^h, both in proceeding southwards to Cromarty on the one coast and to the Naze on the other, we appear to be entitled to conclude that the 9^h, 10^h, and 11^h lines extend across the ocean here. But Stavanger is a point of divergence from which the tide also travels northwards; for it is 9^h 43^m at Bergen, 10^h 4^m at Christiansund, 11^h 22^m at Andænes in the Lofoden Isles, and 1^h 30^m at Tromsöe, in latitude 69° 38′. We may judge the 2^h line to be not far from the North Cape. And we have thus a tolerably complete view of the cotidal lines of the European seas.

We may observe that here also the tides of islands appear to be later than those of the surrounding seas, so as to compel us to make the cotidal lines form loops and rings. The tide-hour at Lerwick, on the east coast of Shetland, is 10^h 41^m, though the islands appear to lie between the 6^h and 9^h lines.

Sect. IV. *Height of the Tide.*

20. The range of the tide, that is, the height of high water above low water, is very different at different places, and is affected by circumstances which it is very difficult to analyse. It is, however, clear, that the configuration of the coast exercises a very considerable influence upon the amount of this range. Thus the range is very much increased in deep inbends of the shore which are open in the direction of the tide-wave, as the Bristol Channel and the Gulf of Avranches; and much diminished at

promontories under certain circumstances. Thus at the south-east point of Ireland, (at Arklow, Glynn, and Cahore,) the greatest range is not more than three feet, while at a little distance along the coast each way it becomes twelve or thirteen feet: and this small amount of the tide on one side of the channel is the more remarkable, because it is just opposite the enormous range which occurs in the Bristol Channel. In order to exhibit the succession of facts of this kind, I have drawn out Table X., in which the greatest and least range at each place of observation in June 1834 and 1835 are recorded. The agreement of the two years with one another in the cases in which observations have been made in both, shows that these observations are entitled to considerable confidence. It may be observed, moreover, that the formulæ which have been obtained from the best discussions of tide observations do not lead us to expect a complete coincidence of the range in the two years. By the Liverpool tables it results (from the corrections for lunar declination and parallax) that the highest high water in June 1835 would be three feet one inch above the mean high water, while in June 1834 the greatest high water would only be two feet above the mean; and thus the greatest range at Liverpool would be two feet two inches more in June 1835 than in June 1834. It will be found that in our table the range of the tide is in almost all cases greater in 1835 than in 1834 by a quantity different according to the range itself.

21. I have also endeavoured in another manner to represent to the eye the course followed by the range of the tide. In a Map of the British Isles and the German Ocean I have drawn lines parallel to the coast, and expressing, by their number, the range of the tide; as many lines being drawn as there are *yards* in that range. An inspection of this map will make apparent several curious circumstances in the change of magnitude which the tide undergoes in its progress.

By reference either to the table or to the map, it will be seen that the range, which is 16 feet at the Scilly Isles, becomes 13 and 12 feet on the coast of Devonshire and Dorsetshire, and retains this value, with no great change, (proceeding outside the Isle of Wight,) to Selsey: it then increases, so that at Brighton the range is 18 or 19 feet, and at Eastbourne 21, which it is also at Dungeness, and not much less at Dover. At Dunkirk it is 16 feet French, and on the coast of Belgium it is about 4·5 French metres, or 15 feet. But in going along the coast of Holland eastward, it diminishes from 4 Dutch ells, its value near Flushing, to 2·3 ells at Ameland. On the coast of Denmark this diminution goes on: the tide is 10 Danish feet at the mouth of the Elbe; but in going north it becomes 5·6 feet at the point called Bleavand's Huk, or the Horn; 2·7 feet at Nyminde Gab; and only 1·5 foot at Agger, in the inbend of the Skaggerrack, which leads to the Baltic. In this neighbourhood we may conceive the tides to vanish, and hence I have here placed a pole or centre about which the tide-wave revolves, as I have already explained. When we pass this point, and advance northwards along the coast of Norway, the tide again assumes a considerable magnitude. At Tananger it is only 1 foot 9 inches English; at Skeudesnaes 2 feet

1 inch; at Christiansund 6 feet 8 inches; at Lofoden 7 feet 7 inches; and at Tromsöe, in latitude 69° 38′, it is 8 feet 8 inches. At Peterhead, on the coast opposite Norway, it is 12 feet.

I shall not here attempt to reduce these changes to any general rules, but shall proceed to another branch of our results.

Sect. V. *The Diurnal Inequality.*

22. The Diurnal Inequality of the tides is only now beginning to be attended to as it deserves; for it is a regular change, considerable in its amount, and almost universal in its prevalence. It would be easy to enumerate many actual cases in which the safety or loss of a ship has been determined by this inequality. Though the existence of such an inequality in particular places has long been known, its laws have been misunderstood: for example, it has been supposed always to affect the morning and evening tides in opposite ways, which is only an accidental and local expression of its rule. Mr. LUBBOCK* has published the mode in which he has obtained it for Liverpool, while Mr. BYWATER, who has introduced it into his Tide-Tables for that port, and Mr. BUNT, who is constructing Tide-Tables for Bristol, have also collected this inequality from observations. But the connexion of the inequality, as it exists in different parts of the world, was never brought into view till the discussion of the European and American observations of last June. The laws which the inequality follows when thus considered on an extensive plan appear to me to be very curious, as they result from this examination of the facts; and I now proceed to explain them.

23. The inequality is most clearly seen in the heights of high water. I exhibited the results in curves, by erecting a series of ordinates at equal distances to represent the heights of the successive high waters above a fixed point at each place; and the curves which were thus produced showed, in most places, a series of parallel zigzags (the tides being alternately higher and lower); and these curves were so regular, and so exactly accompanied each other, as to prove both the goodness of the observations and the existence of the diurnal inequality. This was the case, in the most marked manner, on the coast of America, where scarcely any exception occurred. Next to this, the inequality was conspicuous, especially during a portion of the series of observations, on the coasts of Spain and Portugal; then on the west coast of France, the coast of Cornwall, and parts of the west coast of Ireland: on the shores of the German Ocean, although the operation of the inequality was obvious, it was less steady and regular.

24. The diurnal inequality depends upon the moon being north or south of the equator; its maximum *corresponds* to (but is not necessarily simultaneous with) the moon's greatest declination; and the period of its vanishing corresponds in like manner with the time of the moon passing the equator. Between periods corre-

* Philosophical Transactions, 1836, Part I., page 57.

sponding to two such passages, the inequality increases from 0 to a maximum, and decreases to 0 again; after which it again increases.

The curves which represent the heights do, in fact, exhibit such alternate increase and diminution of the diurnal inequality: and the inquiry naturally occurs, After how long a time does the moon's position show its effect in the diurnal inequality? In the case of Liverpool it appears, as I have pointed out *, that the diurnal inequality expresses the effect of the forces (upon the equilibrium-spheroid) as they existed six days previously. It is important to know whether this interval is the same in other places.

25. It is very far from being the same, and its changes are very curious. In June 1835 the moon had her greatest south declination on the 12th; her declination vanished on the 19th, early in the morning; and her greatest north declination was on the 26th. On the American coast, the diurnal inequality, as shown by the zigzag form of the curves, followed these changes, not at an interval of days, but almost simultaneously. The curve is strongly indented from the 10th to the 15th: the indentations at most of the places die away on or about the 18th; they then reappear, slipping over one tide, so as to throw the greatest tide from an odd to an even tide, or the reverse; and increase to their greatest magnitude again about the 26th. On that side of the Atlantic, therefore, the difference of the lunar forces on the two successive half-days appears to be felt almost instantaneously. But when we come to the European shore the result is very different. On the coasts of Spain and Portugal, and on the coast of France as far eastward as Cherbourg, the diurnal inequality is very steady and well marked, but it only appears to begin about the 9th or 10th, increases till the 16th or 17th, then decreases, and vanishes on the 21st or 22nd, after which it again increases. Thus the moon's crossing the equator on the 19th is not felt in its effects till two or three days afterwards. In like manner, on the coast of Cornwall, and on the west coast of Ireland, the inequality is well marked till the 21st or 22nd, after which it vanishes, and reappears irregularly only. As we advance further in the direction of the progress of the tide, we find the epoch of the diurnal inequality to be later and later, although the inequality, and therefore its epochs, are less clearly marked. Thus at Cowes, Portsmouth, and Hayling Island, the inequality begins on the 13th and vanishes again on the 23rd; on the east coast of Scotland, and of the North of England, in like manner, it appears on the 12th or 13th; but it seems to pass over a tide, which is equivalent to its vanishing, as early as the 21st. In the German Ocean, however, its course is not very intelligible; for though it appears very marked in the Danish observations, from the 12th to the 22nd, it misses one tide on the 18th. As the Danish tides will be seen by the map to arrive by two different paths, one of which is half a day longer than the other, it is easy to explain this change in the regular alternation of the tides, by supposing that the tide which comes from Scotland was predominant at one period of the lunation, and that which

* Philosophical Transactions, 1836, Part I., page 97.

arrives along the coast of the Netherlands predominant at another period. The short series of observations which we have now before us, does not by any means enable us to determine how far this change in the influence of the two tide-waves is constant and regular. On the coast of the Netherlands, also, this inequality seems to offer a peculiarity; for it vanishes on the 24th, but increases again without missing a tide. In the northern part of Norway it increases from the 12th, vanishes on the 20th, and exists but irregularly afterwards.

The evidence of these statements is seen most clearly by an inspection of the curves of which I have spoken; and the eye catches from these the course of the facts far more distinctly than from any numbers. But it is not necessary to publish all these curves, and I have therefore only annexed a specimen in Plate XXVII., and, for the rest, stated the results of them in numbers in Table XI. The means there given are obtained by a graphical interpolation, such as I have already described, and the other columns exhibit the effects which are mainly due to the diurnal inequality.

26. In these tables the differences of heights are arranged according as the tide occurs A.M. or P.M. But it will be seen at once that this is not, in fact, the circumstance on which the distinction depends; for at most of the places the P.M. tides are greatest till about the 12th, then the A.M. tides are the greatest till the 18th, and afterwards the P.M. tides are again the highest. Hence we see that it is impossible to give the law of this inequality, as is sometimes attempted, by saying that at one season of the year the A.M. tides are greatest, and at another season the P.M. tides are greatest. The real rule, on the coast of America, is, that the tide which follows the superior transit of the moon when she has south declination, and the inferior transit when she has north declination, is the greatest. And hence we see that the sign of this inequality in the tables must change when we come to the half-day without a tide in each semilunation, as it will be seen, by inspecting the tables, that it does: for if the tide which happens at $11^h\ 50^m$ A.M. today be the one which follows a superior transit, the tide which happens at $0^h\ 20^m$ P.M. tomorrow will also follow a superior transit; and therefore the + sign of the diurnal inequality must pass from the A.M. to the P.M. column.

On the west coasts of Portugal, Spain, France, and Ireland, and in the South-west of England, the rule is the same, except that we must state *two days after* the moon's crossing the equator to the south as the times when the inferior transit gives an increase to the next succeeding tide, and *vice versâ*. Thus on the coast of Cornwall the P.M. tide was greater from the 9th to the 19th (the day of full moon), because the moon had gone south of the equator on the 4th, and the P.M. tide followed the inferior transit. On the 20th the A.M tides began to follow the inferior transit, and the sign of the inequality would on this account change; but as the moon went north of the equator on the 19th, the tide following the *superior* transit must become the greatest on the 21st, that is, the P.M. tide: and thus the P.M. tides continue the greatest almost all through the month, as has been stated for Plymouth and other places on various occasions. We now see that this is merely an accidental result of the true rule.

27. The different epoch of the diurnal inequality in different parts of the world is a very curious fact; and the more so, since it is inconsistent with the mode hitherto adopted of explaining the circumstances of the tides by conceiving a tide-wave to travel to all shores in succession. In accordance with this view the tide on the shores of America had been considered as identical with the tide on the coasts of Spain and Portugal, which occurs about the same moment; nor does it appear easy to imagine the form of the tide-waves so that this shall not be the case. Yet we find that the tides on these two sides of the Atlantic cannot be identical in all respects; for on the 9th, 10th, and 11th of June, when the diurnal inequality was great in America, it was nothing in the West of Europe; and on the 18th and 19th, when this inequality had vanished in America, it was great in Europe. It would seem as if the tidal phenomena on this side of the Atlantic corresponded to an epoch (of the equilibrium-theory) two or three days later than the same phenomena in America; and we may perhaps add, that different kinds of phenomena do not appear to travel at the same rate. And thus the equilibrium-theory, though it may explain the general form of the inequalities, cannot give their epochs and amounts by any possible adjustment of constants.

I may add, that the notion of the progress of the tide-wave from south to north in the Atlantic is still further involved in difficulties by its appearing that at the Cape of Good Hope the diurnal inequality showed itself most clearly on the 17th, 18th, and 19th of June; that is, as late as in Spain and Portugal. This appears by observations undertaken at my request by Sir John Herschel; and though these observations, made under very inconvenient circumstances, are not very regular, there can, I think, be no doubt of the reality of the feature to which I have referred.

28. The diurnal inequality appears also, but not so generally, in the curves which represent the times: nor is this difference always in the same direction. Thus on the coast of America, at some places the P.M. tides are later than the mean, and the A.M. earlier, for a great part of June 1835, while at other places the reverse is the case: and the same peculiarity occurs on other coasts.

Though this circumstance appears at first sight anomalous, it is not difficult to explain it, at least hypothetically. The alteration of the time of high water by means of the diurnal inequality results, not only directly from the change of position of the equilibrium-tide, which of course affects all places alike, but also indirectly, from the diurnal inequality of the height; for tide-waves of different heights may both travel with different velocities, and have different spaces to describe: and thus the consequent change of time may either tend to make it sooner or later. If the evening tide be two feet higher than the morning tide, it may on that account travel faster along that part of the channel which they have in common; but then, if the shore be very shallow, an addition of two feet may make the water advance many hundred yards further; and thus, on this account, the time of high water would be later. The diurnal inequality of the heights, therefore, will depend upon local circumstances, not only for its quantity, but for its sign.

It appears by the observations that the diurnal inequality of the times is the most clearly marked in situations where the mixture of two tides ends; as at the north-east point of Ireland, where the tide following the A.M. transit of the moon is later than the mean; at the south-east point of Ireland, where the tide following the A.M. transit is the earlier; at Ostend; at Havre; on the coast of Denmark, where this diurnal inequality amounts to half an hour. The diurnal inequality is also very large in places where the tide has to run far inland, as in the Sound of Christiania in Norway, and in the Zuyder Zee in Holland. At Amsterdam the difference resulting from this inequality appears to be an hour; in the neighbourhood of Christiania it is larger still, but with great anomalies.

Sect. VI. *On the Semimenstrual Inequality.*

29. The amount of the semimenstrual inequality of the time of high water is very different at different places, so far as the evidence of the observations now before us shows; and though these are of too rude a kind to give the amount of the difference, they are sufficient, I think, to prove its existence; especially when coupled with the consideration of a reason for the difference, namely, that the spring tides being higher than the neaps, the tides of the two kinds may travel with velocities which at different places have different relations. Thus I conceive that I have here a confirmation of the opinion which I deduced from the observations of June 1834, that there is a *local* semimenstrual inequality in addition to the general one*. But I do not conceive that this series offers any very decisive proof of my former conjecture, that the semimenstrual inequality is less at promontories than in bays, or that it becomes less and less as the tide-wave advances. The changes of this inequality are not obviously explicable. On the coast of North America the amount of the difference of the greatest and least lunitidal intervals is small, being generally less than 80^m, and at Newport as low as 56^m. On the coast of Portugal at several places this difference is extraordinarily small, so as almost to throw doubt on the accuracy of the observations: at Pera in Algarve it is only 42^m, and at Lagos Bay only 24^m, while at Peniche it is 130^m. On the greater part of the French coast it ranges with great steadiness from 80^m to 100^m, except at the little harbour of Abrevrak, where it is 125^m. At Torr Head (in the north-east of Ireland) we have this difference 146^m, and at Rachlin Island (North of Ireland) it is four hours, even after the graphic correction; but these are cases of extreme irregularity. On many parts of the south coast of England it is small (about 70^m to 74^m), as at Exmouth, Weymouth, St. Alban's Head, St. Lawrence, Swanage Bay, Brighton, and Hastings.

* Philosophical Transactions, 1835, p. 85.

The amount of the semimenstrual inequality of height also varies. In general the greatest range, as will be seen by Table X., is twice or twice and a half the smallest; but this rule is far from universal. And many of the cases which appear to approach to this rule, really deviate from it when allowance is made for the diurnal inequality. Thus on the coast of America, Mount Desert Island, the whole amount of the semimenstrual inequality of high water is about three feet in a tide of thirteen feet, thus reducing the smallest range to eleven; but the diurnal inequality reduces it further to eight feet.

The column headed "Mean" in Table XI. exhibits not only the amount but the law of the semimenstrual inequality of the heights, so far as it is given by the observations of June 1835. It is not likely, however, that so short a series can be of much value for this purpose.

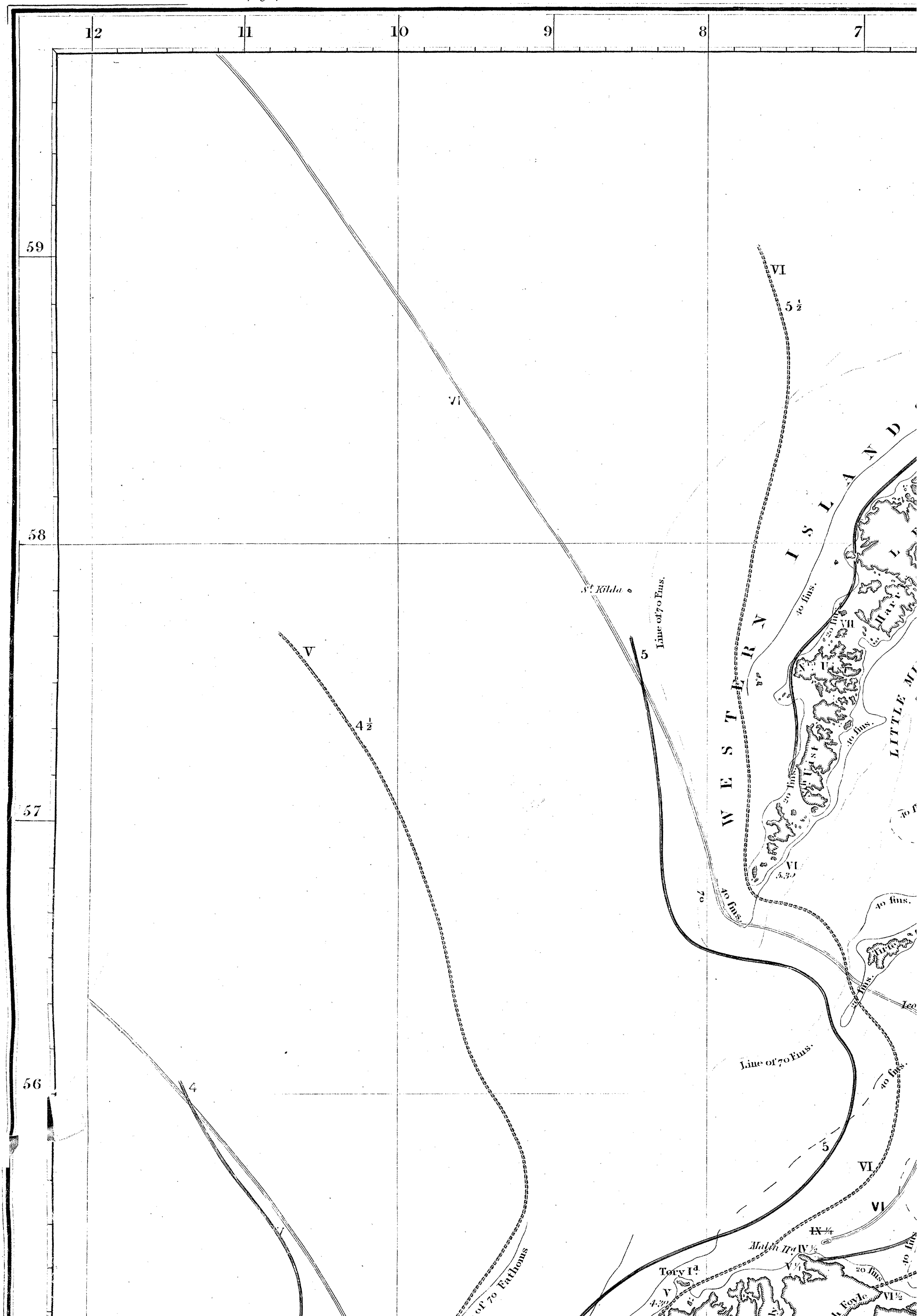
Sect. VII. *General Remarks, and Tables.*

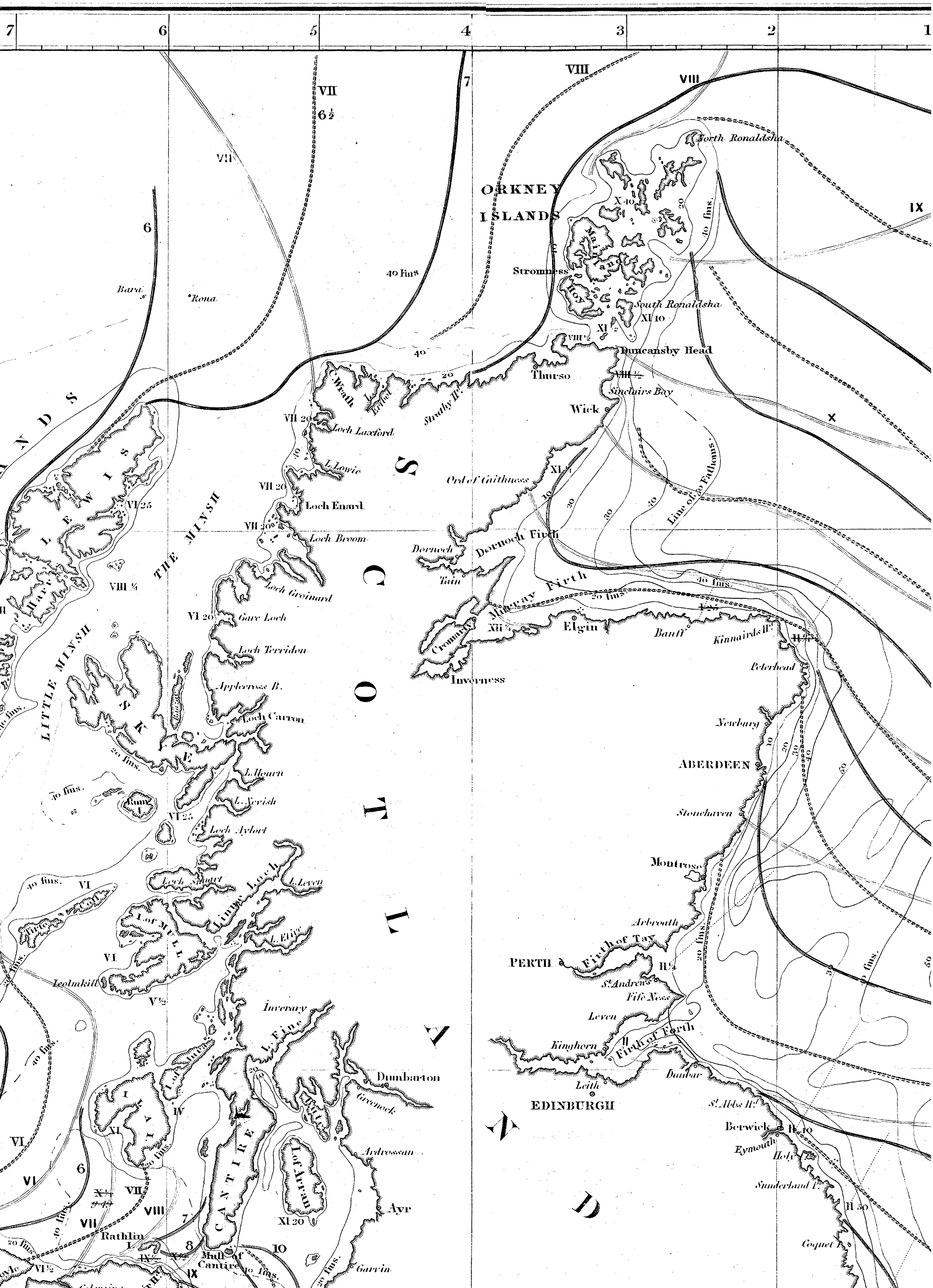
30. The preceding are the principal conclusions which offer themselves as resulting from the tide observations of June 1835. I trust that they will be considered of some value, especially when taken in connexion with the further researches to which they direct us. The form of the cotidal lines, and the progress of the tide-range in going along the shore, are points of considerable interest; but perhaps the most important consequence of this investigation is the prominence it gives to the diurnal inequality. We have here a regular change of the height of the tide, which in many places is not less than the difference of spring and neaps, which operates every day, but which has never yet been introduced into tide tables, and of which the law is not yet precisely known. It is of great importance, both to the theory of the tides and to the purposes of navigation, that this diurnal inequality should be fully analysed. The perplexity produced by the difference of its epoch on the coasts of America and of Europe, may perhaps be removed by the examination of observations at intermediate places. With this view I shall, as soon as I have the means, discuss observations made at Bermuda, and at Halifax in Nova Scotia; and it would be of use also to have observations at Iceland, at the Cape of Good Hope, and on the coast of Africa. It may be observed that observations would be available for this purpose if they gave the height of high water merely, without the time, a kind of observation made with little difficulty and trouble.

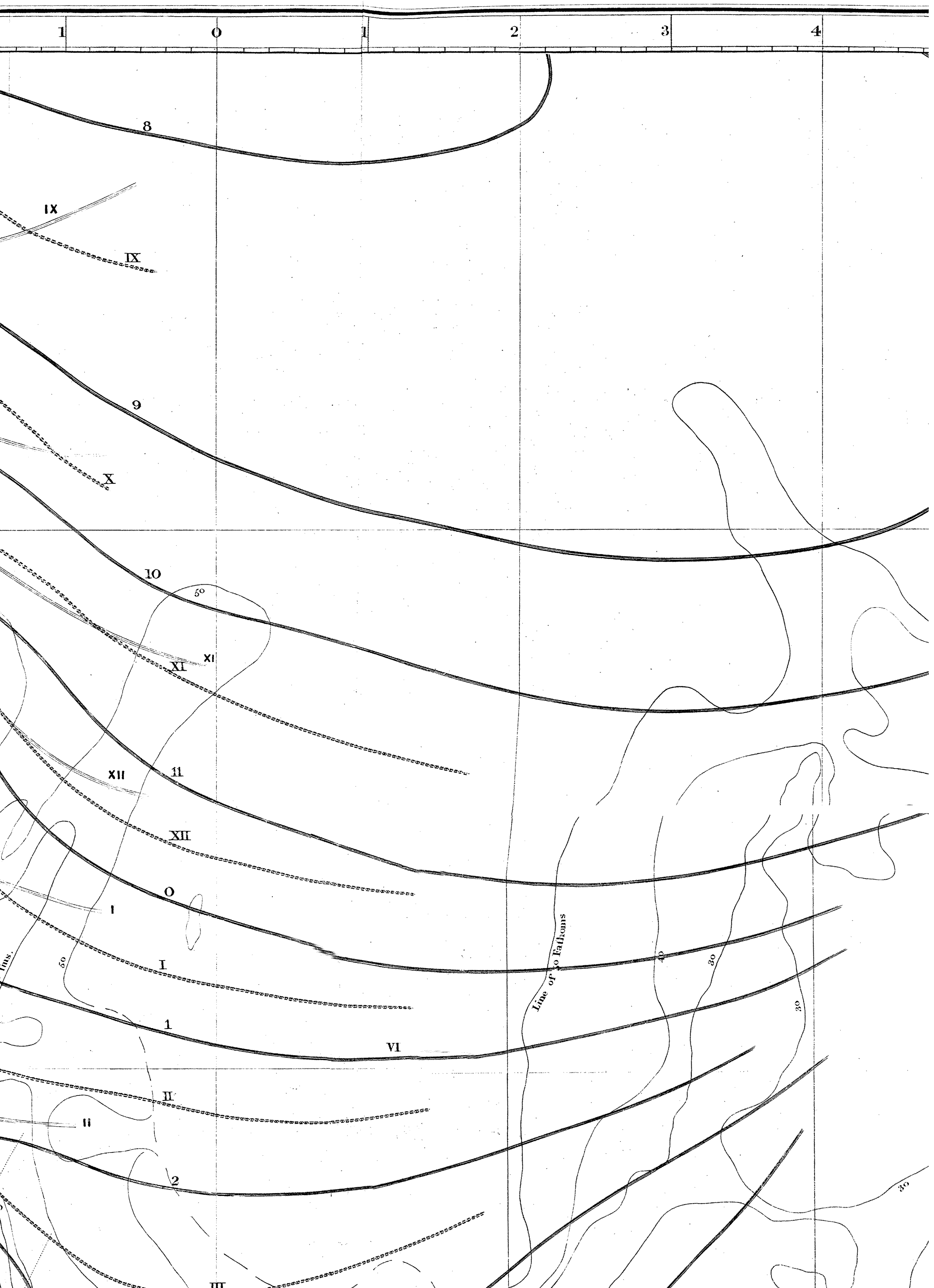
31. I shall now give a list of the Tables and Maps which are the results of the series of tide observations of June 1835, according to the preceding discussions.

Tables I. to IX. The correct establishments and cotidal hours of the places at which the most useful observations were made in June 1835.

Several sets of observations have been omitted in this list, not because they were less carefully or skilfully made, but because on various accounts it was not desirable to combine them with the others.


12
11
10
9
8
7
59
58
57
56
VI
5½
VI
W E S T E R N   I S L A N D S
S^t. Kilda
Line of 70 Fms.
40 fms.
V
4½
5
LITTLE M
VI
5.30
40 fms.
Line of 70 Fms.
4
5
VI
VI
Tory I^d.
of 70 Fathoms


7
6
5
4
3
2
ORKNEY ISLANDS
North Ronaldsha
Mainland
Hoy
Stromness
South Ronaldsha
Duncansby Head
Thurso
Sinclairs Bay
Wick
Line of 50 Fathoms.
Ord of Caithness
Dornoch
Dornoch Firth
Tain
Moray Firth
Cromarty
Inverness
Elgin
Banff
Kinnairds Hd.
Peterhead
Newburg
ABERDEEN
Stonehaven
Montrose
Arbroath
Firth of Tay
PERTH
St. Andrews
Fife Ness
Leven
Kinghorn
Firth of Forth
Leith
EDINBURGH
Dunbar
St. Abbs Hd.
Berwick
Eymouth
Holy I.
Sunderland P.
Coquet I.
C. Wrath
Loch Laxford
L. Lowie
Loch Enard
Loch Broom
Loch Groinard
Gare Loch
Loch Terridon
Applecross B.
Loch Carron
L. Hourn
L. Nevish
Loch Aylort
Loch Sunart
Linnhe Loch
L. Leven
L. Etive
Inverary
L. Fine
Dumbarton
Greenock
Ardrossan
Ayr
Garvin
Bute
I. of Arran
CANTIRE
Mull of Cantire
Rathlin I.
I. of Mull
Icolmkill
Tiree
ISLAY
Rum I.
SKYE
LITTLE MINSH
THE MINSH
LEWIS
Harris
Bara
Rona
ISLANDS
SCOTLAND
40 fms.
20 fms.
30 fms.


1
0
1
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3
4
8
IX
IX
9
X
X
10
50
XI
XI
XII
11
XII
O
I
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1
VI
II
II
2
III
Line of 50 Fathoms
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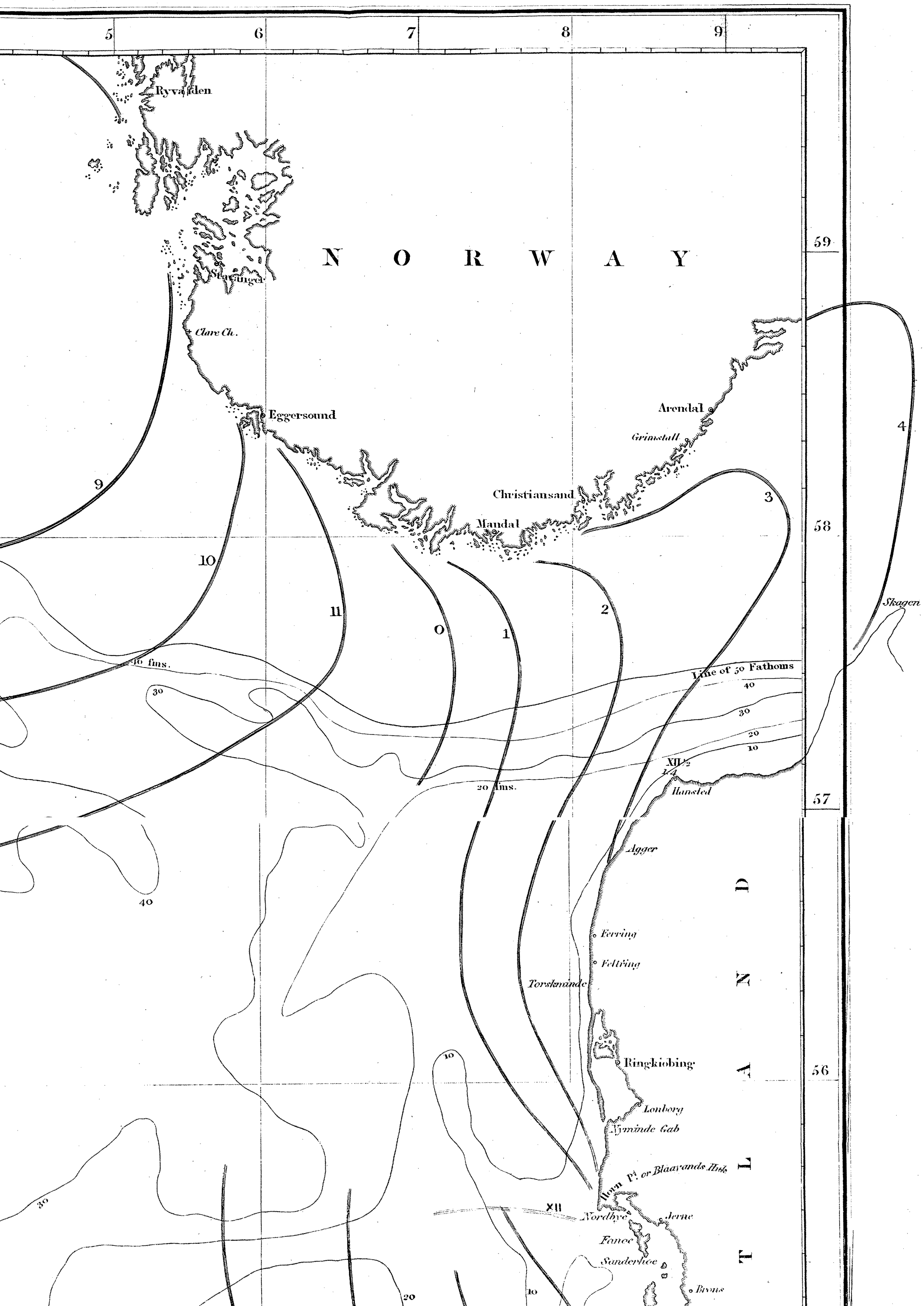
30
30



5
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7
8
9
59
58
57
56
N O R W A Y
Clare Ch.
Eggersound
Arendal
Grimstall
Christiansand
Mandal
Skagen
Line of 50 Fathoms
40
30
20
10
40 fms.
20 fms.
XII½
Hansted
Agger
Ferring
Feltring
Torskmunde
Ringkiobing
Lonborg
Nymindc Gab
Horn Pt. or Blaavands Huk
XII
Nordbye
Jerne
Fanoe
Sanderhoe
Brons
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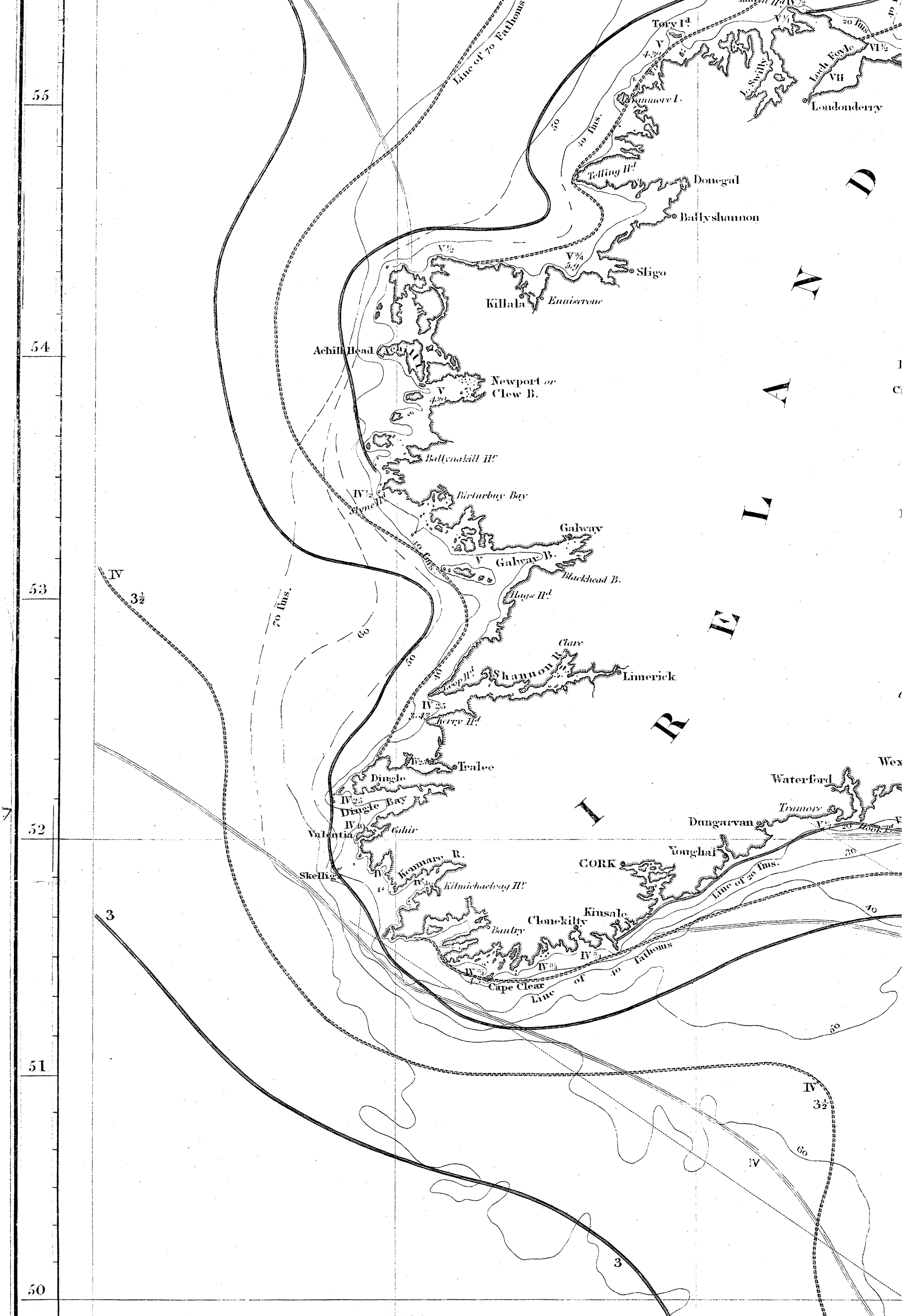
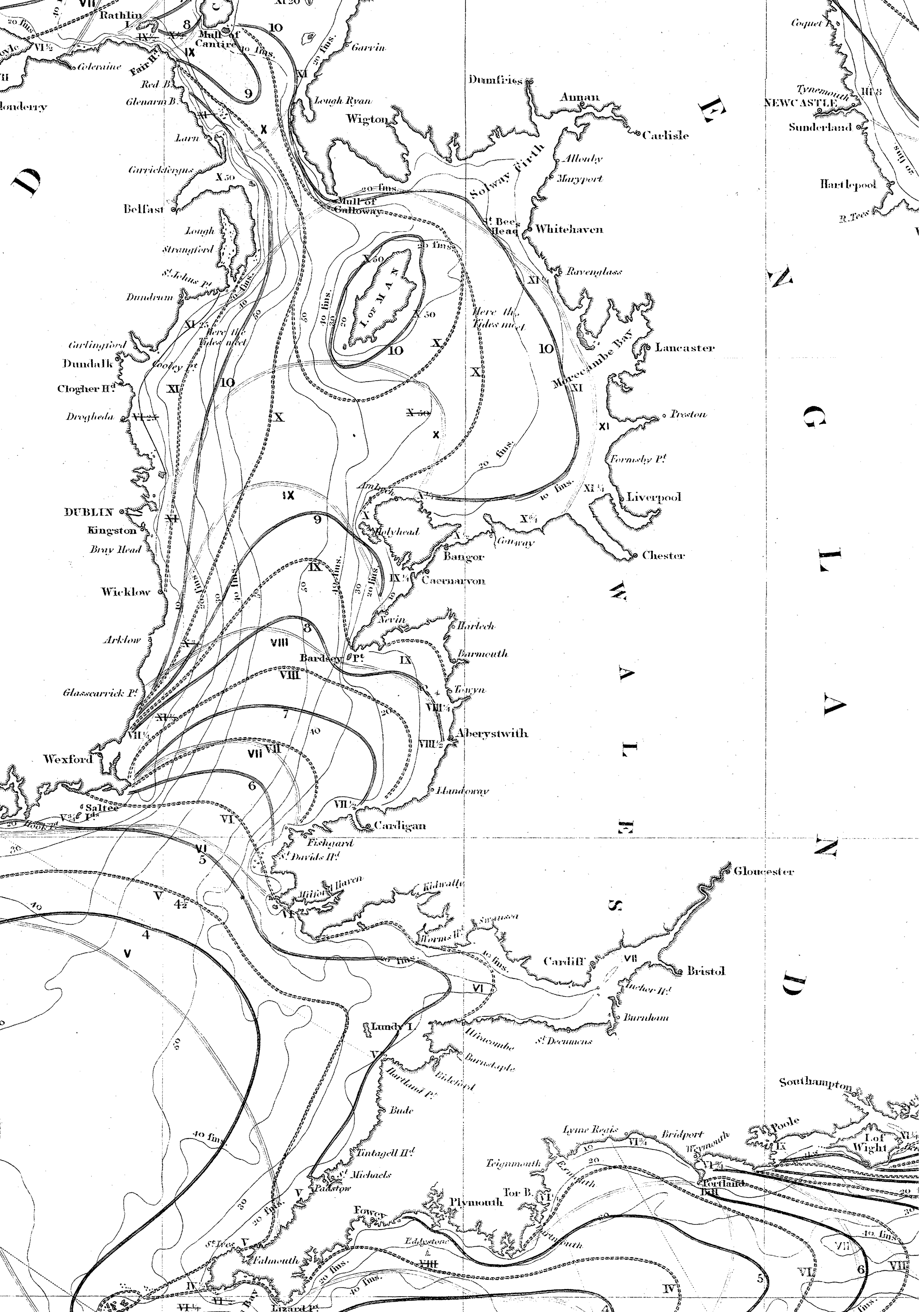
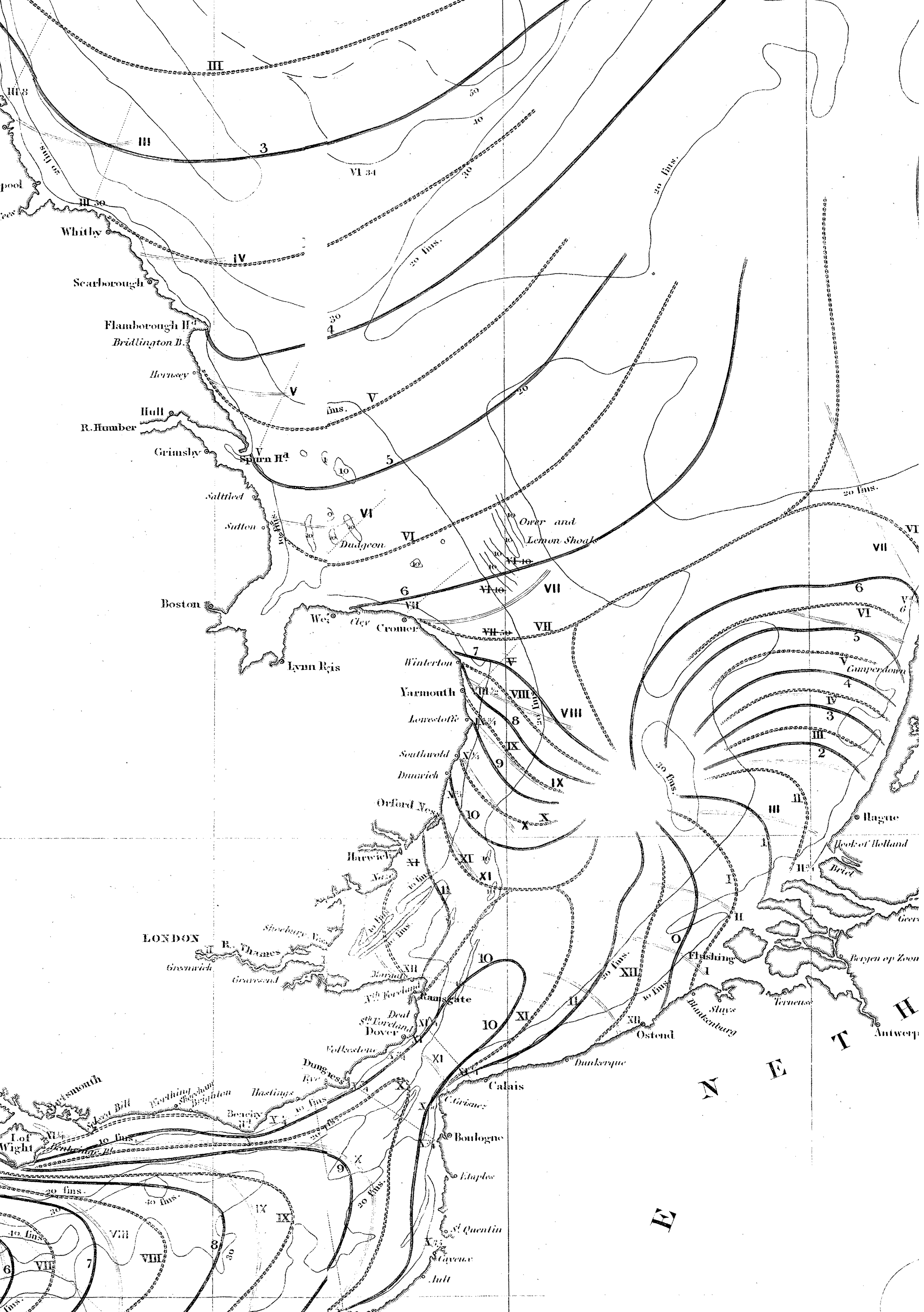
4



55
54
53
52
51
50
Line of 70 Fathoms
Tory Id.
Londonderry
L. Swilly
Loch Foyle
Donegal
Ballyshannon
Sligo
Killala
Enniscrone
Telling Hd.
Achill Head
Achill
Newport or Clew B.
Ballynakill Hr.
Slyne Hd.
Birturbuy Bay
Galway
Galway B.
Blackhead B.
Hags Hd.
Clare
Shannon R.
Limerick
Kerry Hd.
Tralee
Dingle
Dingle Bay
Valentia
Cahir
Skelligs
Kenmare R.
Kilmichaelcag Hr.
Bantry
Clonekilty
Kinsale
Cape Clear
CORK
Youghal
Dungarvan
Waterford
Tramore
Line of 20 fms.
Line of 40 Fathoms
70 fms.
40 fms.
I R E L A N D



Rathlin
Mull of Cantire
Coleraine
Fair Hd
Red B.
Glenarm B.
Garvin
Lough Ryan
Wigton
Dumfries
Annan
Carlisle
Solway Firth
Allonby
Maryport
Larn
Carrickfergus
Belfast
Lough Strangford
St. Johns Pt.
Dundrum
Mull of Galloway
St. Bees Head
Whitehaven
Ravenglass
I. of MAN
Here the Tides meet
Carlingford
Dundalk
Clogher Hd.
Drogheda
Cooley Pt.
Lancaster
Morecambe Bay
Preston
Formsby Pt.
Liverpool
Chester
Amlwch
Holyhead
Conway
Bangor
Caernarvon
DUBLIN
Kingston
Bray Head
Wicklow
Arklow
Nevin
Harlech
Barmouth
Bardsey Pt.
Towyn
Glasscarrick Pt.
Aberystwith
Wexford
Llandoway
Saltee Ids.
Hook Pt.
Cardigan
Fishguard
St. Davids Hd.
Milford Haven
Kidwelly
Swansea
Worms Hd.
Cardiff
Gloucester
Bristol
Uphill Hd.
Burnham
Lundy I.
Ilfracombe
St. Decumens
Barnstaple
Bideford
Hartland Pt.
Bude
Tintagell Hd.
St. Michaels
Padstow
St. Ives
Falmouth
Lizard Pt.
Fowey
Plymouth
Eddystone
Tor B.
Teignmouth
Exmouth
Dartmouth
Lyme Regis
Bridport
Weymouth
Portland Bill
Poole
I. of Wight
Southampton
Coquet I.
Tynemouth
NEWCASTLE
Sunderland
Hartlepool
R. Tees
Londonderry
E N G L A N D
W A L E S



Whitby
Scarborough
Flamborough Hd
Bridlington B.
Hornsey
Hull
R. Humber
Grimsby
Spurn Hd
Saltfleet
Sutton
Dudgeon
Ower and
Lemon Shoal
Boston
Cley
Cromer
Lynn Regis
Winterton
Yarmouth
Lowestoft
Southwold
Dunwich
Orford Ness
Harwich
LONDON
R. Thames
Greenwich
Gravesend
Shoebury Ness
Margate
Nth Foreland
Ramsgate
Deal
Sth Foreland
Dover
Folkestone
Dungeness
Rye
Hastings
Brighton
Worthing
Beachy Hd
Portsmouth
I. of Wight
Calais
C. Grisnez
Boulogne
Etaples
St Quentin
Cayeux
Ault
Ostend
Dunkerque
Blankenburg
Sluys
Flushing
Terneuse
Bergen op Zoom
Antwerp
Hague
Hook of Holland
Briel
Camperdown
20 fms.
10 fms.
30 fms.
40 fms.
N E T H
E

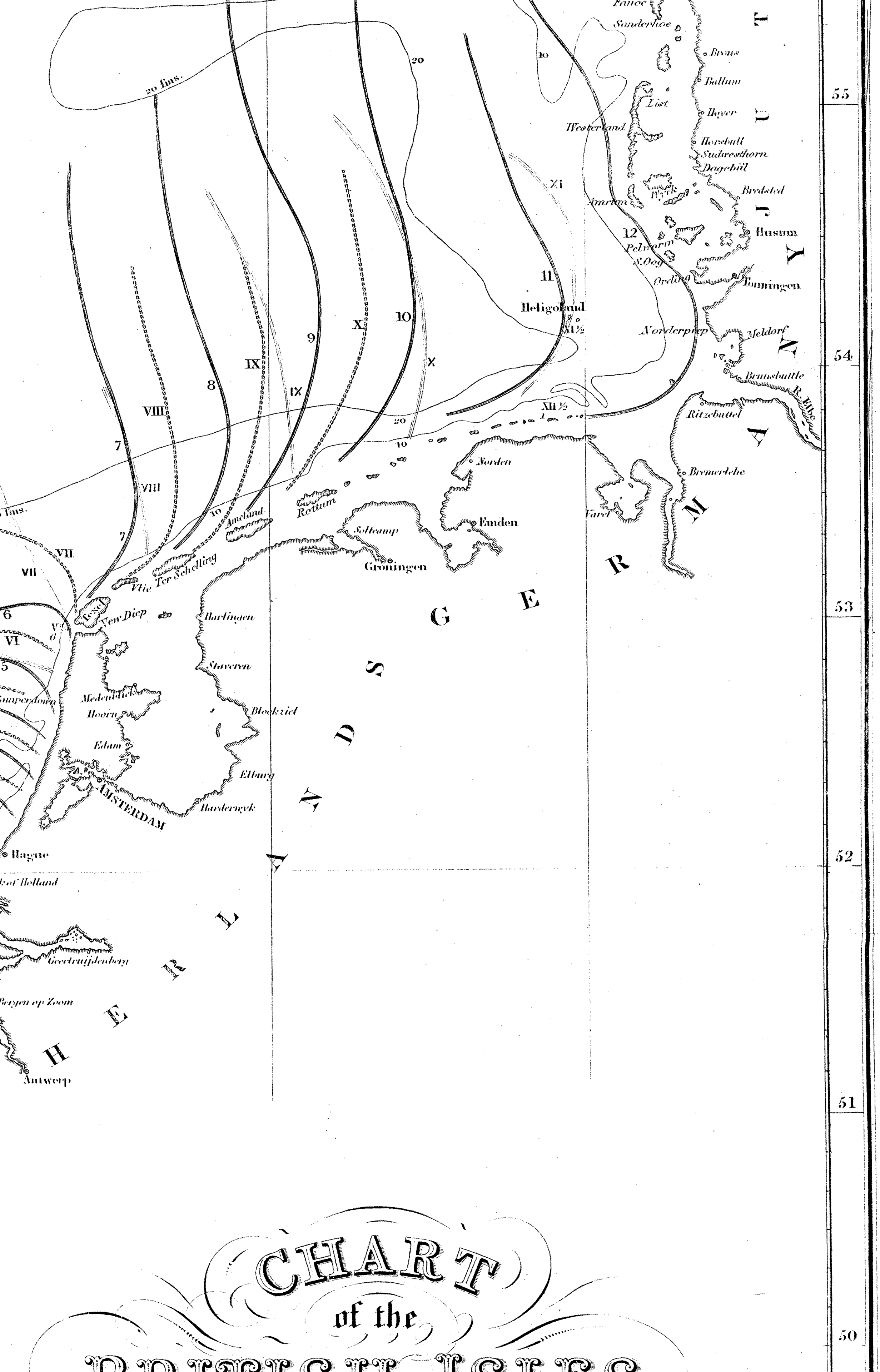
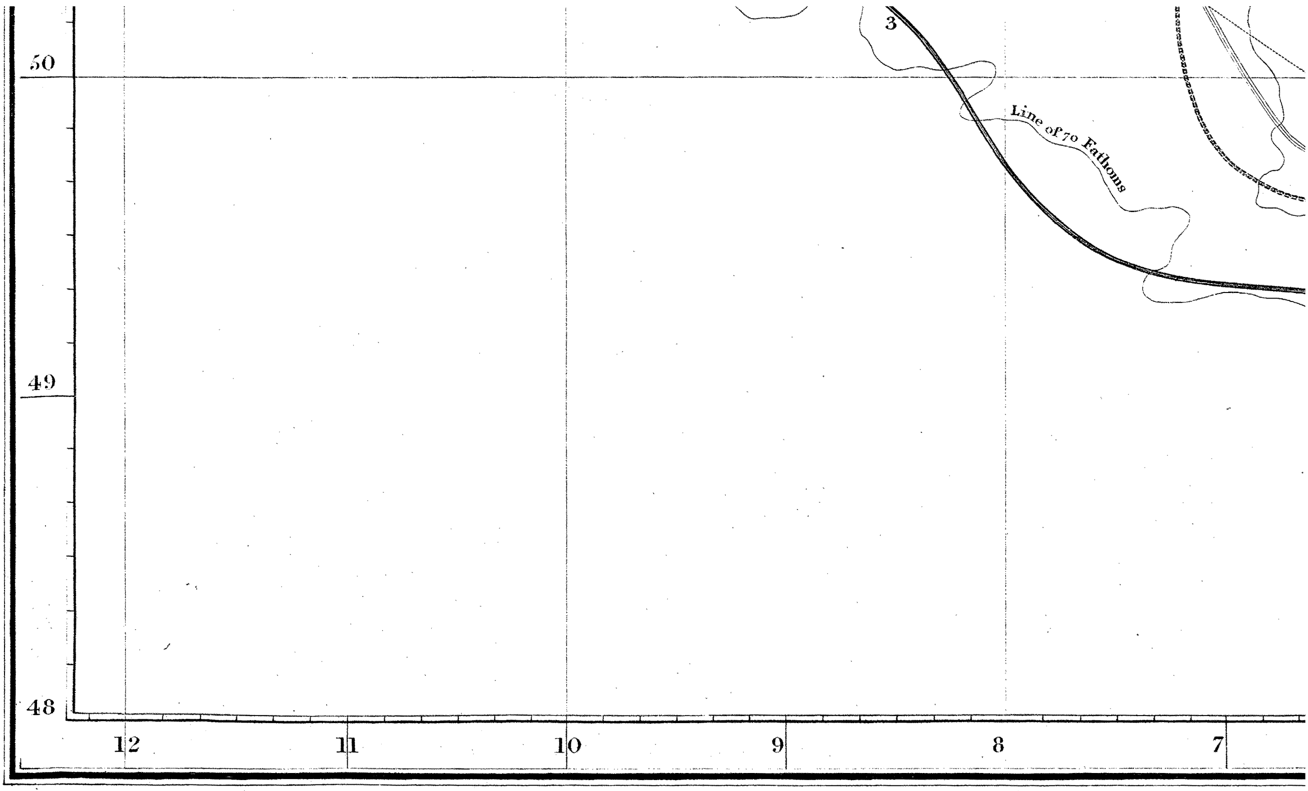
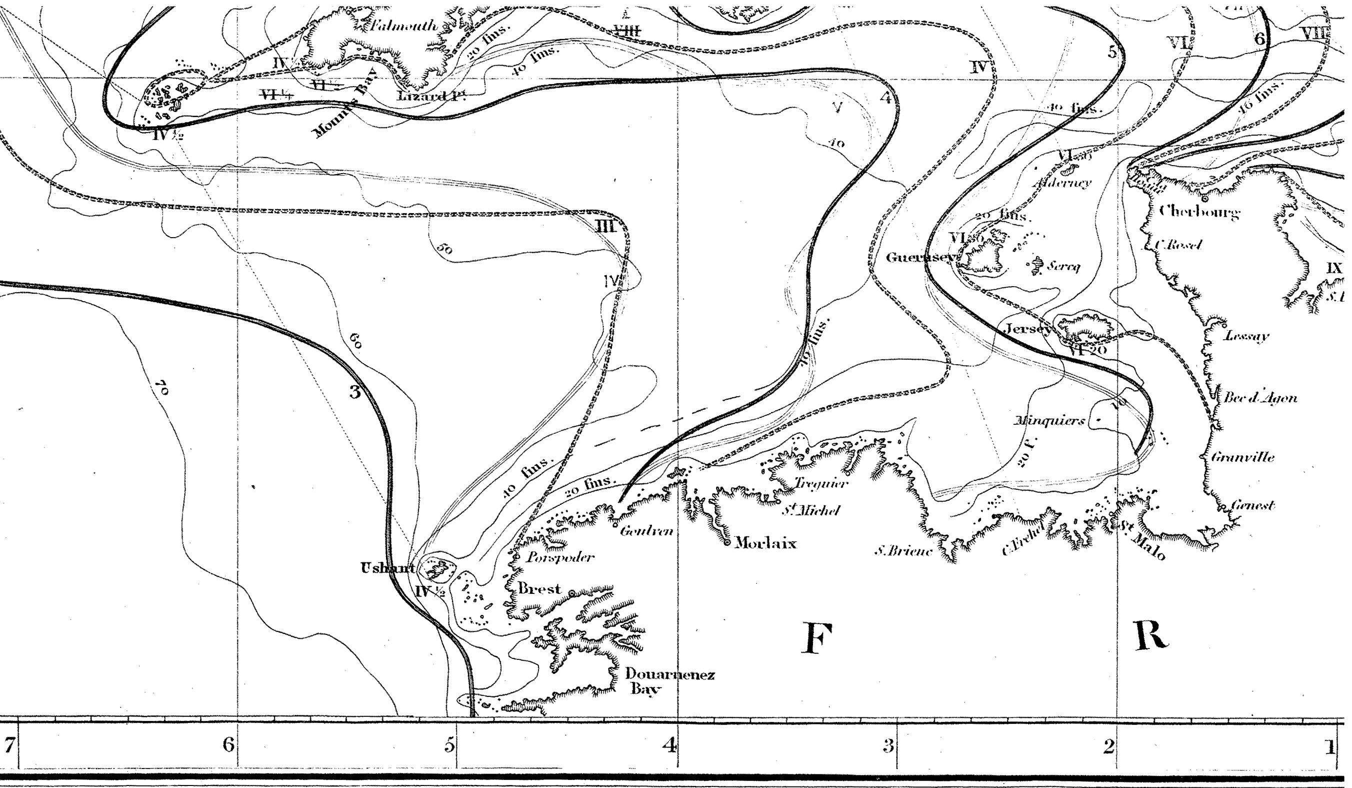


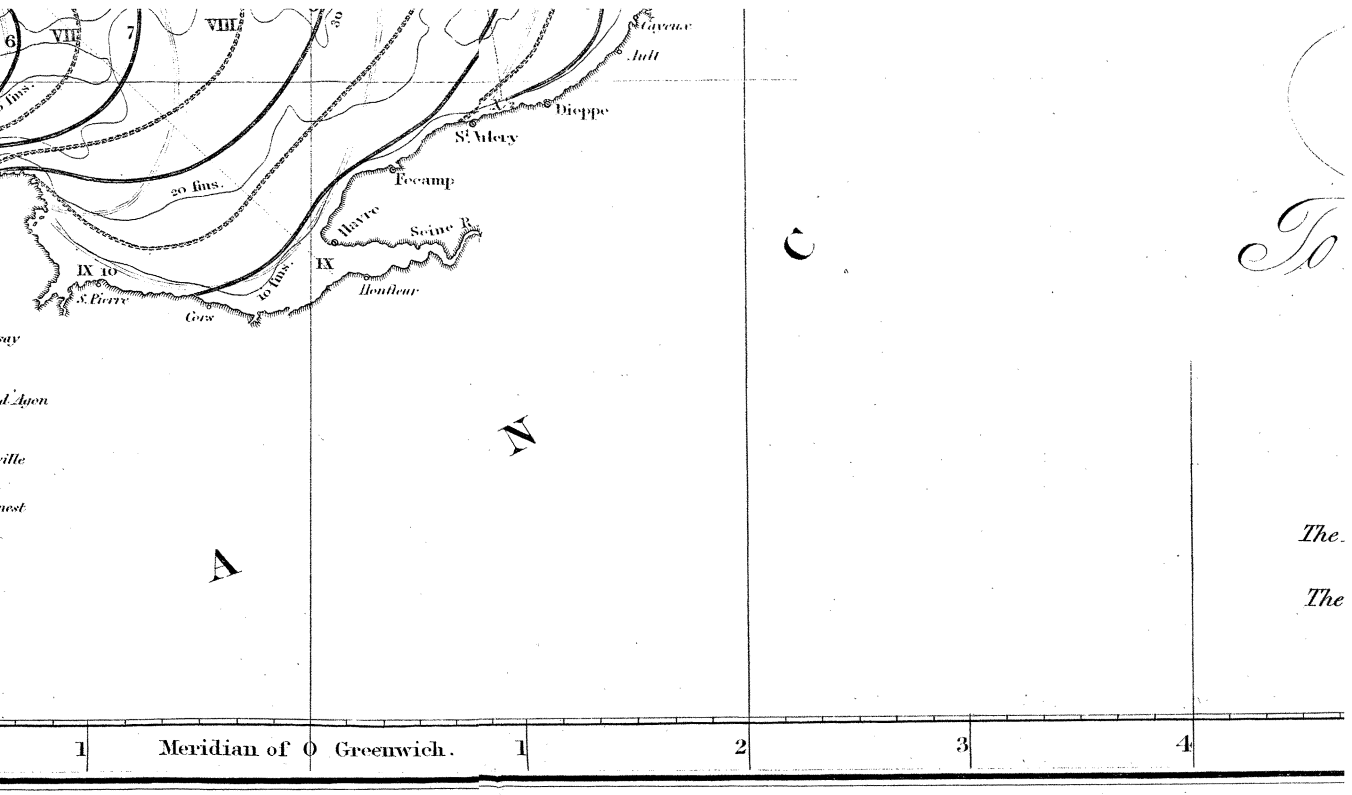
CHART
of the
Fanoe
Sanderhoe
Brons
Ballum
List
Hoyer
Westerland
Horsbull
Sudwesthorn
Dagebül
Bredsted
Amrum
Husum
Pelworm
S.Oog
Ording
Tonningen
Heligoland
Norderpiep
Meldorf
Brunsbuttle
R. Elbe
Ritzebuttel
Bremerlehe
Norden
Emden
Rotum
Ameland
Ter Schelling
Vlie
Texel
New Diep
Solteamp
Groningen
Harlingen
Staveren
Blockziel
Elburg
Harderwyk
Medenblick
Hoorn
Edam
AMSTERDAM
Hague
Geertruijdenberg
Bergen op Zoom
Antwerp
JUTLAND
GERMANY
NETHERLANDS
20 fms.
55
54
53
52
51
50



50
49
48
12
11
10
9
8
7
3
Line of 70 Fathoms



Falmouth
VIII
20 fms.
40 fms.
IV
VI ¼
VI
Mounts Bay
Lizard Pt.
IV ½
III
IV
50
60
70
3
V
4
40
IV
5
VI
6
VII
40 fms.
40 fms.
VI
Alderney
Cherbourg
20 fms.
Guernsey
Sercq
C. Rosel
IX
Jersey
VI 20
Lessay
Bec d'Agon
Minquiers
20 f.
Granville
Genest
40 fms.
40 fms.
20 fms.
Ushant
IV ½
Porspoder
Brest
Goulven
Morlaix
Treguier
St. Michel
S. Brieuc
C. Erchel
St. Malo
Douarnenez Bay
F
R
7
6
5
4
3
2
1



6
VII
7
VIII
30
20 fms.
10 fms.
IX
IX 10
S. Pierre
Cors
Honfleur
Havre
Seine R.
Fecamp
St. Valery
Dieppe
Ault
Caveux
C
N
A
The
The
Meridian of 0 Greenwich.
1
1
2
3
4

of the

BRITISH ISLES,

To accompany M.r Whewell's Paper

ON THE TIDES,

Exhibiting the Cotidal Lines.

First approximation, Phil. Trans. 1833.

The Lines drawn thus ⸻ *mark the Vulgar Establishment or Hour of High Water at Syzygy* III. IV. V. &c.

Second approximation, Sixth series of Researches. Phil. Trans. 1836.

The Lines thus ⸻ *mark the Correct Establishment or Mean Lunitidal Interval* 1. 2. 3. &c.

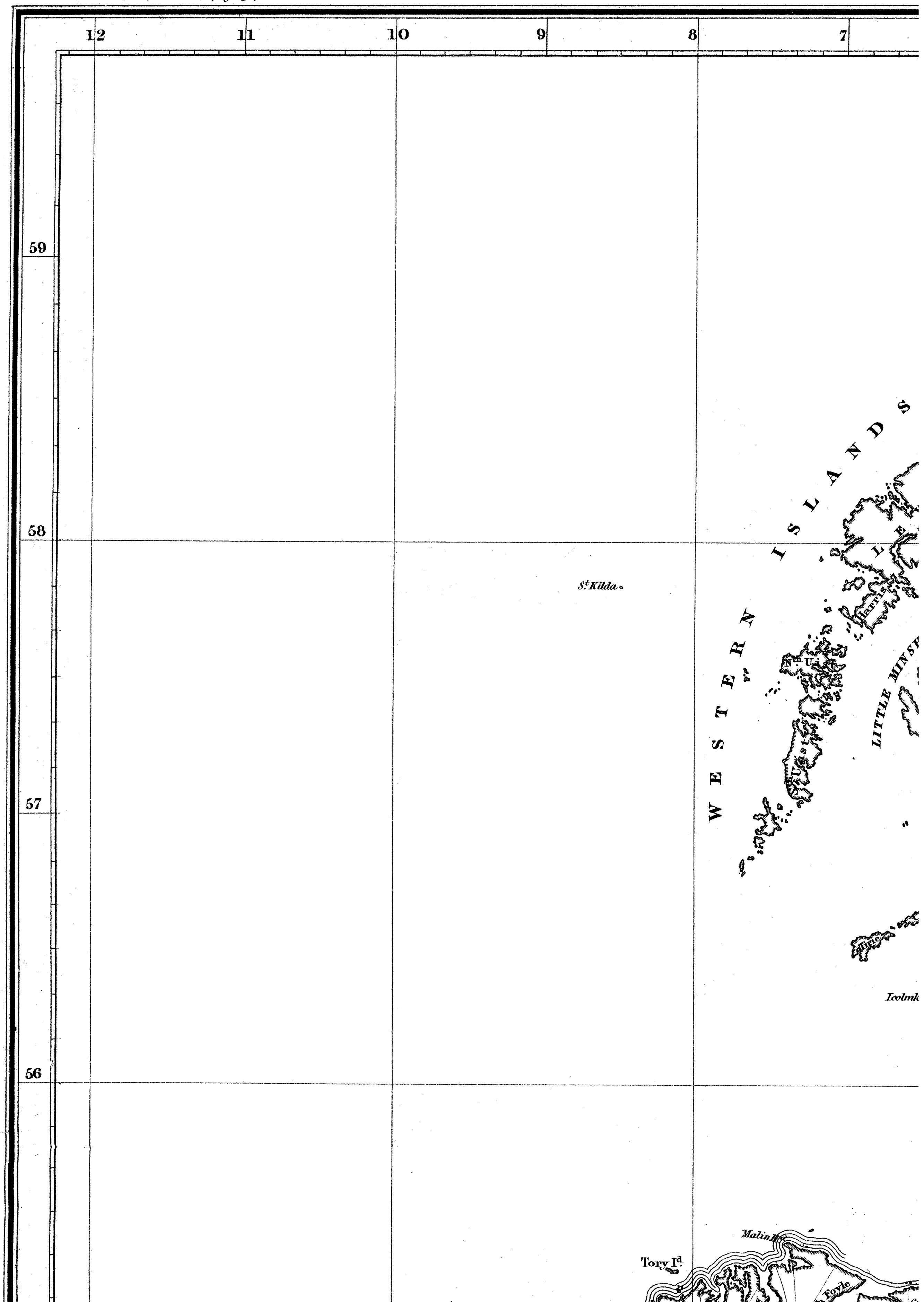
thus .... *Vulgar Establishment or Hour of High Water at Syzygy* I. II. III. &c.

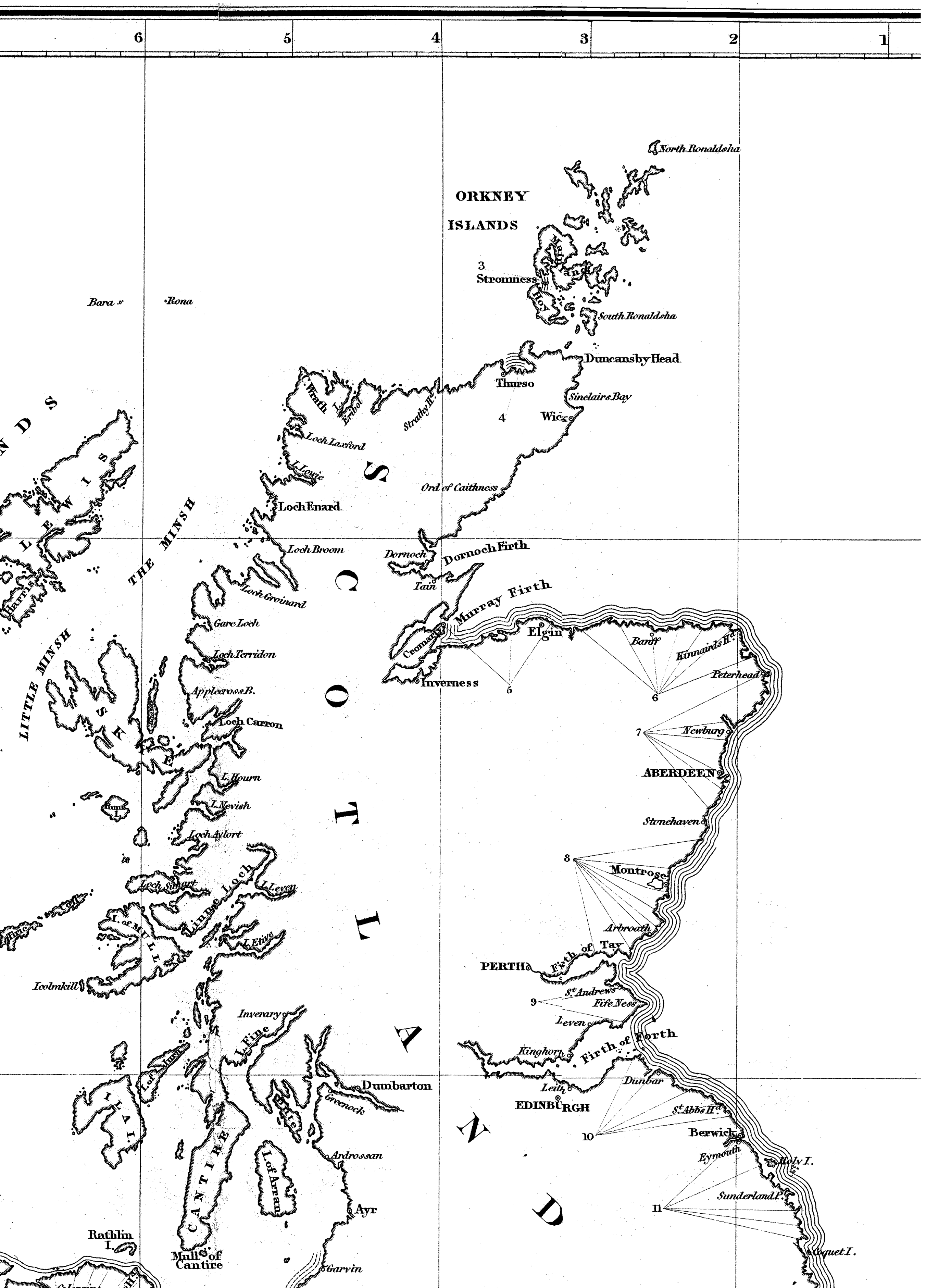
The Hours noted on the coast (as IV½ &c.) *refer to M.r Lubbocks Paper, Phil. Trans. 1831.*

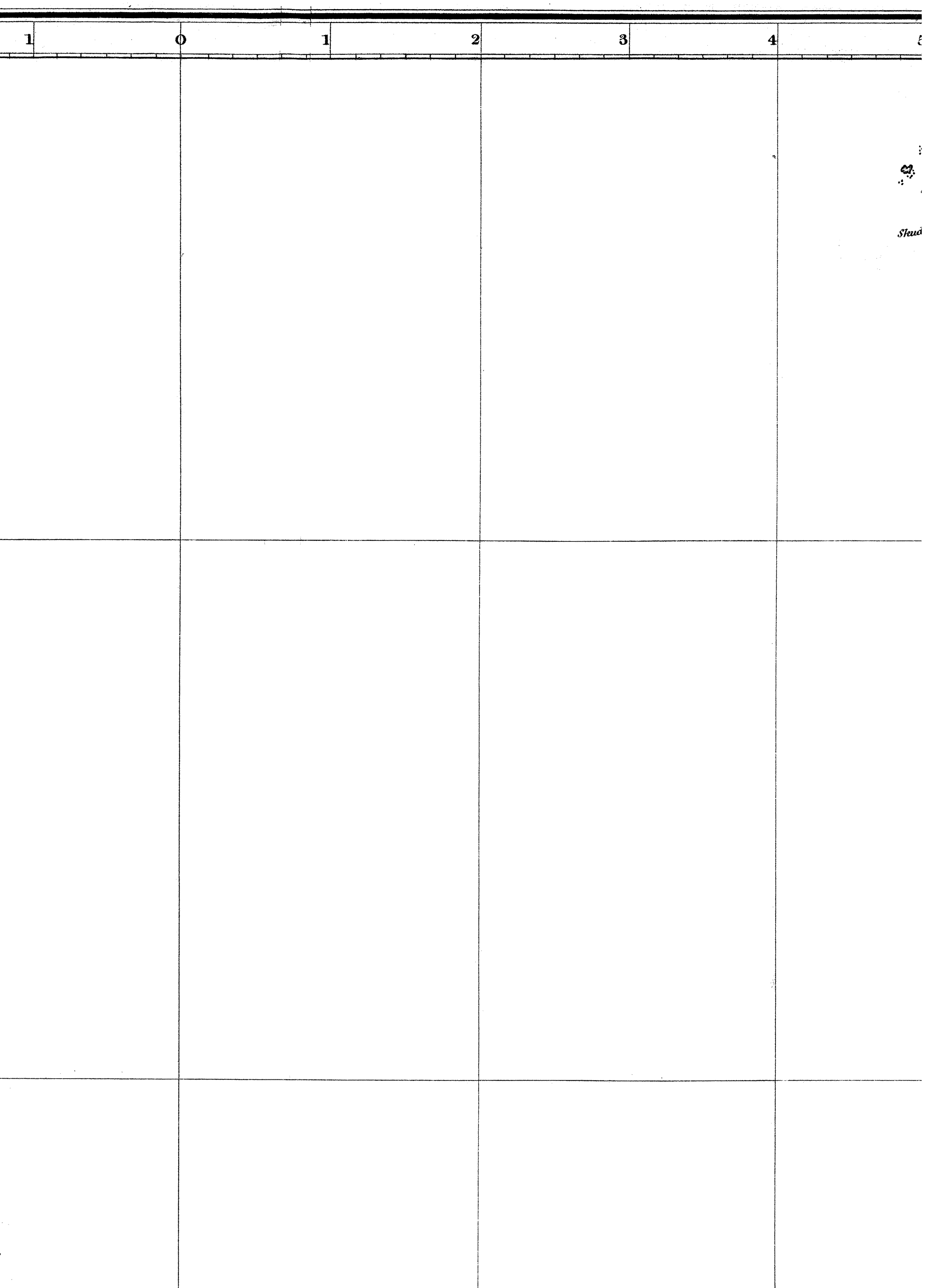
50 49 48

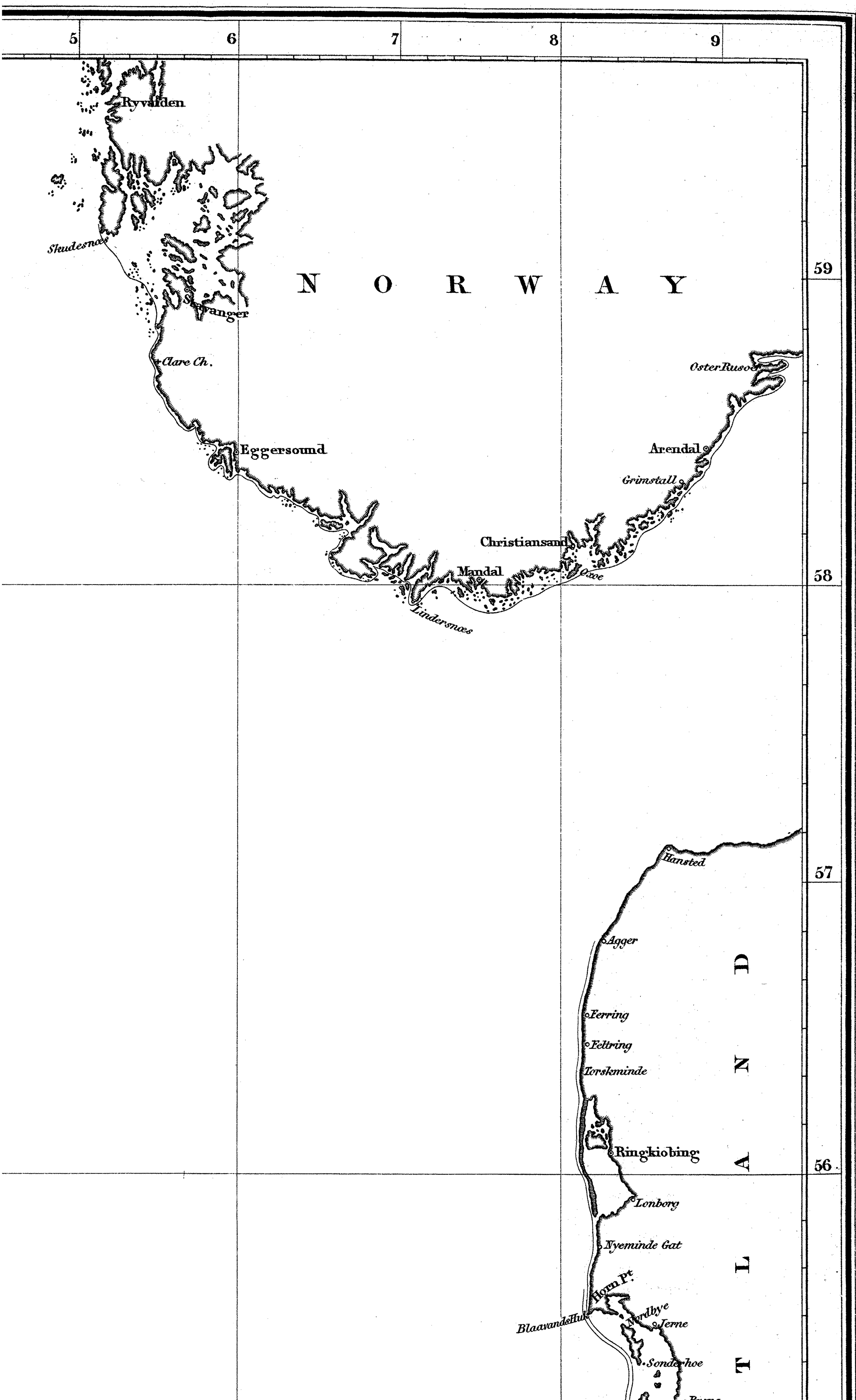
5 6 7 8 9

J. & C. Walker Sculp.t

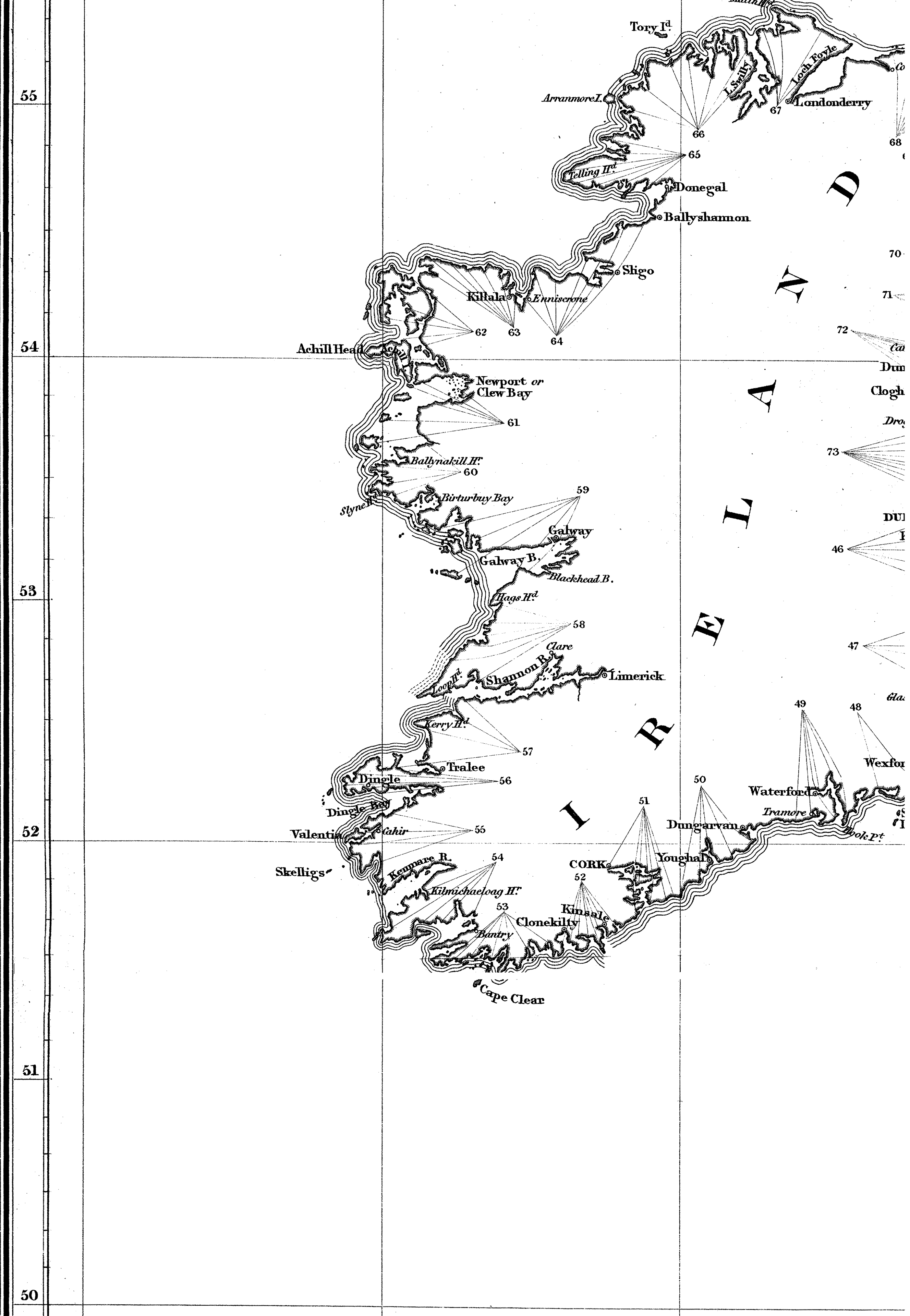

12
11
10
9
8
7
59
58
57
56
St. Kilda
WESTERN ISLANDS
Harris
N. Uist
Tory Id.

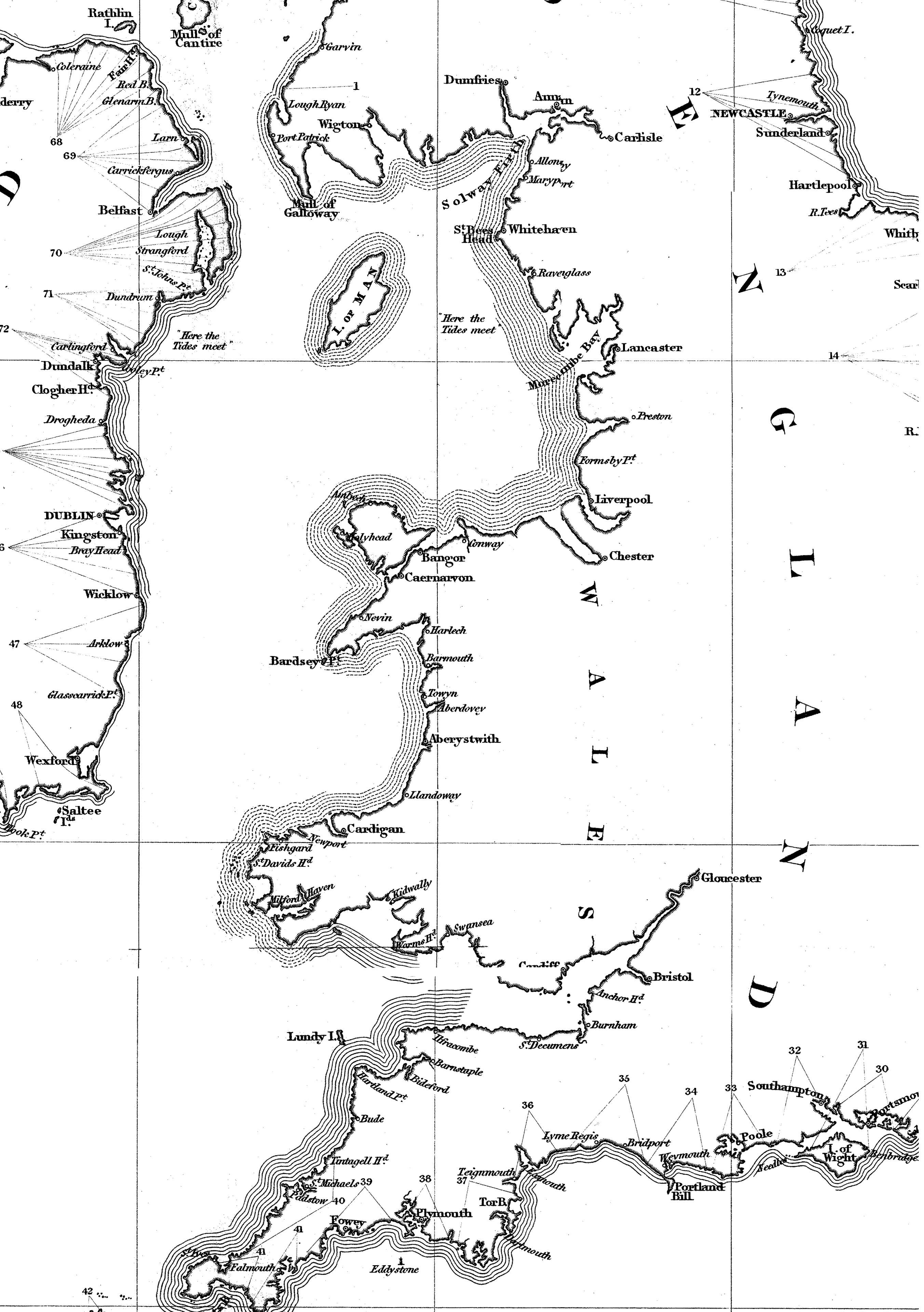

6
5
4
3
2
1
North Ronaldsha
ORKNEY
ISLANDS
Stromness
Hoy
South Ronaldsha
Bara
Rona
Duncansby Head
Thurso
Sinclairs Bay
Wick
C. Wrath
L. Erbol
Strathy H.
Loch Laxford
L. Lowie
Ord of Caithness
Loch Enard
LEWIS
THE MINSH
Loch Broom
Dornoch
Dornoch Firth
Tain
Harris
Loch Groinard
Murray Firth
Gare Loch
Cromarty
Elgin
Banff
Kinnairds Hd.
LITTLE MINSH
Loch Terridon
Peterhead
Inverness
Applecross B.
SKYE
Loch Carron
Newburg
ABERDEEN
L. Hourn
L. Nevish
Stonehaven
Loch Aylort
Montrose
Loch Sunart
Linnhe Loch
L. Leven
I. of MULL
L. Etive
Arbroath
Firth of Tay
PERTH
St. Andrews
Fife Ness
Icolmkill
Inverary
Leven
L. Fine
Firth of Forth
Kinghorn
Dunbar
Dumbarton
Leith
EDINBURGH
Greenock
Bute
St. Abbs Hd.
Berwick
ISLAY
CANTIRE
Ardrossan
L. of Arran
Eymouth
Holy I.
Sunderland P.
Ayr
Rathlin I.
Mull of Cantire
Coquet I.
Garvin
SCOTLAND


1
0
1
2
3
4



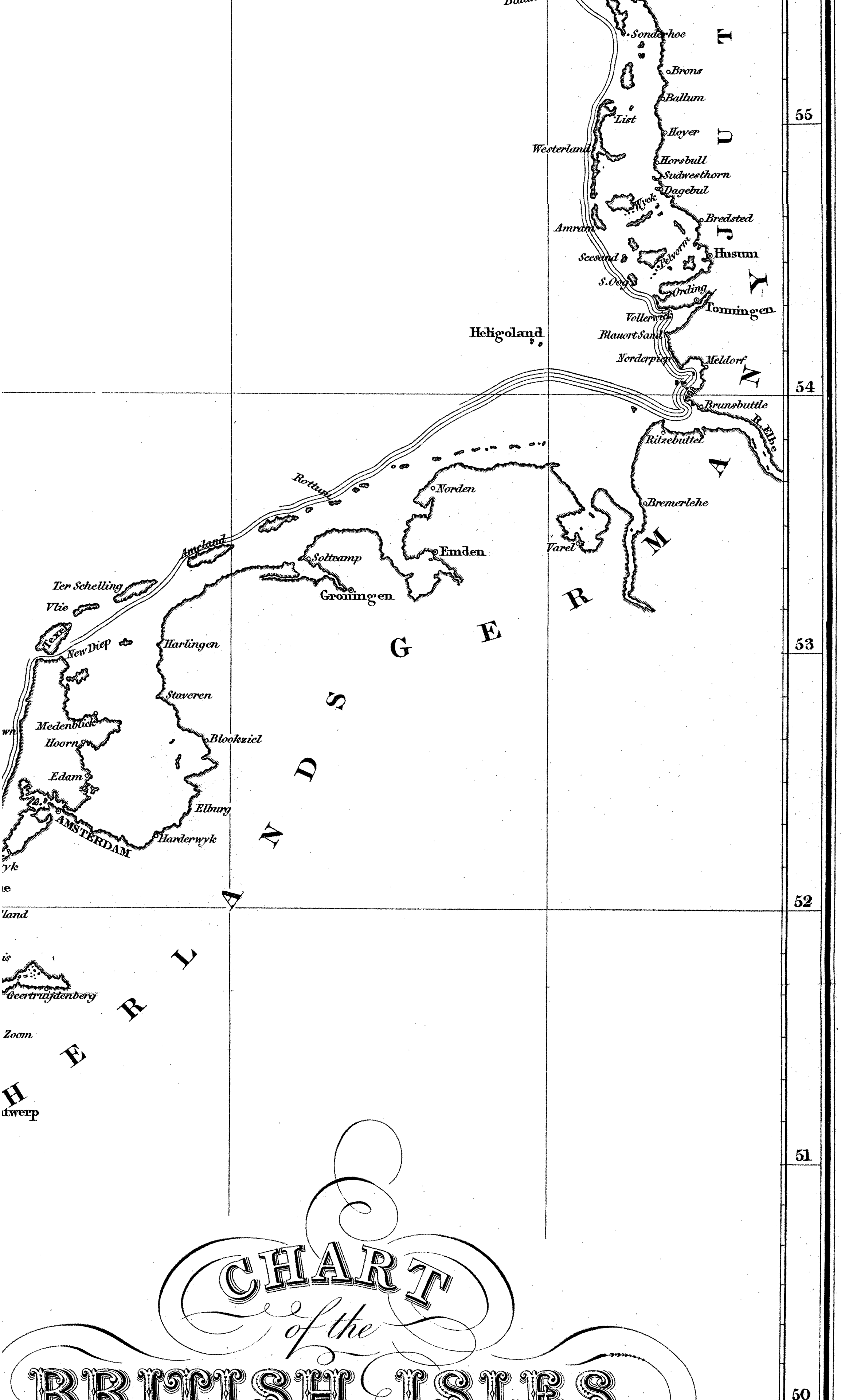
5
6
7
8
9
59
58
57
56
Ryvalden
Skudesnæs
Stavanger
NORWAY
Clare Ch.
Eggersound
Oster Rusoe
Arendal
Grimstall
Christiansand
Mandal
Oxoe
Lindersnæs
Hansted
Agger
Ferring
Feltring
Torskminde
Ringkiobing
Lonborg
Nyeminde Gat
Horn Pt.
Blaavands Huk
Nordbye
Jerne
Sonderhoe
T L A N D


55
54
53
52
51
50
Tory Id.
Arranmore I.
L. Swilly
Loch Foyle
Londonderry
66
67
68
65
Telling Hd.
Donegal
Ballyshannon
D
70
Sligo
N
71
Killala
Enniscrone
62
63
64
72
Achill Head
Achill
Dun
Newport or
Clew Bay
A
Clogh
61
73
Ballynakill Hr.
60
59
Birturbuy Bay
Slyne Hd.
L
Galway
DU
46
Galway B.
Blackhead B.
Hags Hd.
58
E
47
Clare
Shannon R.
Loop Hd.
Limerick
49
48
Kerry Hd.
R
57
Wexfor
Tralee
Dingle
56
50
Waterford
51
Dingle Bay
Tramore
I
Valentia
Cahir
55
Dungarvan
Hook Pt.
Youghal
Skelligs
Kenmare R.
54
CORK
52
Kilmichaeloag Hr.
Kinsale
53
Clonekilty
Bantry
Cape Clear

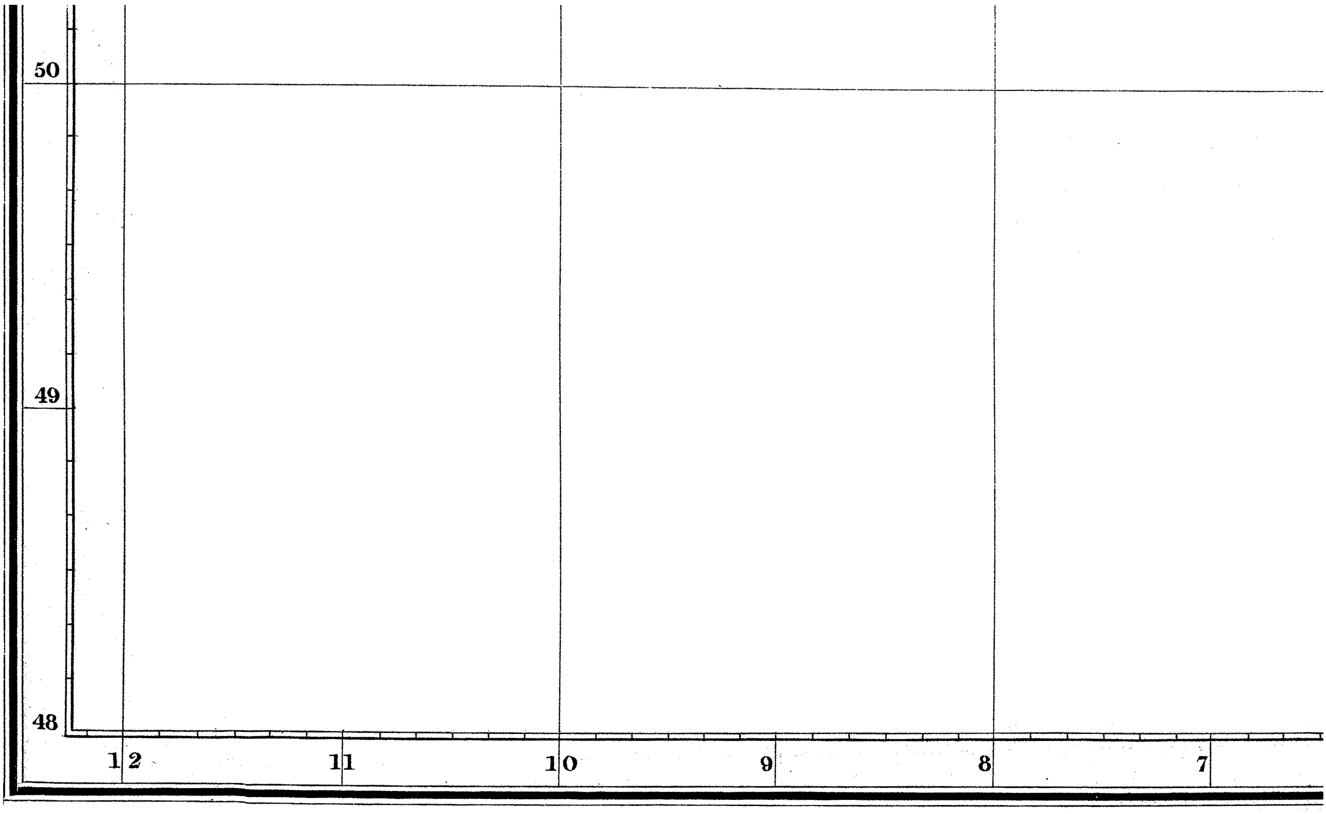


Rathlin I.
Mull of Cantire
Garvin
Coleraine
Fair H.
Red B.
Glenarm B.
derry
68
69
Larn
Carrickfergus
Belfast
Lough Strangford
70
St. Johns Pt.
71
Dundrum
72
"Here the Tides meet"
Carlingford
Dundalk
Cooley Pt.
Clogher Hd.
Drogheda
DUBLIN
Kingston
Bray Head
Wicklow
47
Arklow
Glasscarrick Pt.
48
Wexford
Saltee Ids.
Hook Pt.
1
Lough Ryan
Wigton
Port Patrick
Mull of Galloway
Dumfries
Carlisle
Solway Firth
Allonby
Maryport
St. Bees Head
Whitehaven
Ravenglass
I. of MAN
"Here the Tides meet"
Lancaster
Morecambe Bay
Preston
Formsby Pt.
Liverpool
Chester
Amlwch
Holyhead
Bangor
Conway
Caernarvon
Nevin
Harlech
Bardsey Pt.
Barmouth
Towyn
Aberdovey
Aberystwith
Llandoway
Cardigan
Newport
Fishgard
St. Davids Hd.
Milford Haven
Kidwally
Worms Hd.
Swansea
Cardiff
Gloucester
Bristol
Anchor Hd.
Burnham
W A L E S
E N G L A N D
Coquet I.
12
Tynemouth
NEWCASTLE
Sunderland
Hartlepool
R. Tees
Whitby
13
Scarb
14
Lundy I.
Ilfracombe
St. Decumens
Barnstaple
Bideford
Hartland Pt.
Bude
Tintagell Hd.
St. Michaels
39
Padstow
40
41
St. Ives
Falmouth
Fowey
38
Plymouth
37
Teignmouth
Tor B.
Exmouth
Dartmouth
1
Eddystone
36
Lyme Regis
35
Bridport
34
Weymouth
Portland Bill
33
Poole
Needles
I. of Wight
32
Southampton
31
30
Portsmouth
Bembridge
42


Whitby
Scarborough
Flamborough Hd.
Bridlington B.
Hornsey
Hull
R. Humber
Grimsby
Spurn Hd.
Saltfleet
Sutton
15
Dudgeon
Ower and
Lemon Shoals
Boston
Wells
Cley
Cromer
Lynn Regis
16
17
Winterton
Yarmouth
18
Lowestoffe
Southwold
19
Dunwich
Orford Ness
20
Harwich
21
Naze
Shoebury Ness
LONDON
R. Thames
Greenwich
Gravesend
22
23
24
25
Nth Foreland
Margate
Ramsgate
Deal
Sth Foreland
Dover
26
Folkstone
27
Dungeness
Rye
Hastings
28
Shoreham
Brighton
Worthing
Beachy Hd.
29
Portsmouth
Selsea Bill
30
31
Benbridge Pt.
Calais
C. Grisnez
Boulogne
Etaples
St. Quentin
Cayeux
Ault
Dunkerque
Nieuport
Ostend
Blankenburg
Sluys
Terneuse
Antwerp
Flushing
W. Kapple
Bergen op Zoom
Geertruijden
Brouwers Hav.
Brie
Hellevoetsluis
Goedereede
Hook of Holland
Hague
Katwyk
Camperdown
Texel
Vlie
E N E T H



Sonderhoe
Brons
Ballum
List
Hoyer
Westerland
Horsbull
Sudwesthorn
Dagebul
Wyck
Bredsted
Amram
Pelworm
Husum
Seesand
S. Oog
Ording
Tonningen
Vollerwick
Blauort Sand
Heligoland
Norderpiep
Meldorf
Brunsbuttle
R. Elbe
Ritzebuttel
Bremerlehe
Rottum
Norden
Emden
Varel
Ameland
Soltcamp
Groningen
Ter Schelling
Vlie
Texel
New Diep
Harlingen
Staveren
Medenblick
Hoorn
Blookziel
Edam
Elburg
AMSTERDAM
Harderwyk
Geertruijdenberg
Zoom
JUTLAND
GERMANY
NETHERLANDS
55
54
53
52
51
50
CHART
of the
BRITISH ISLES


50
49
48
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11
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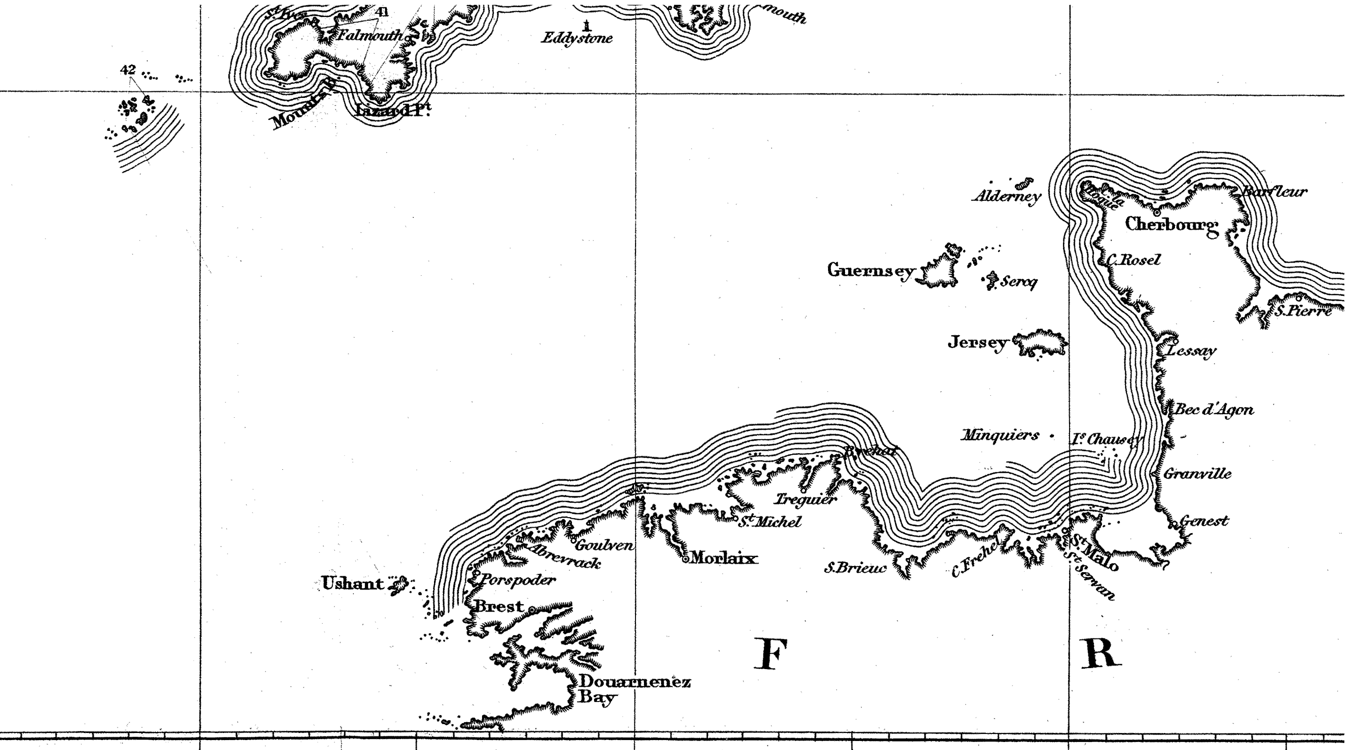
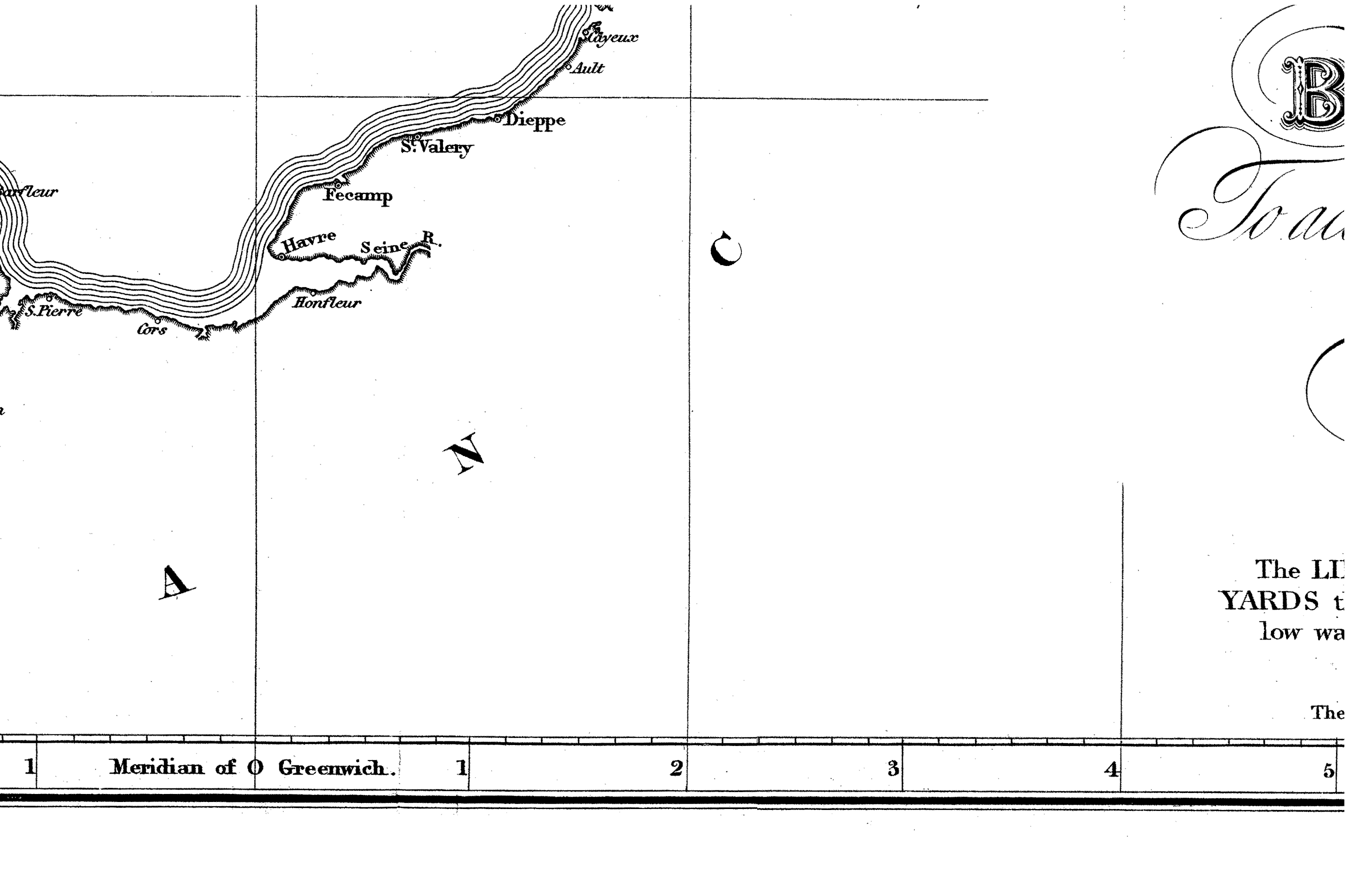
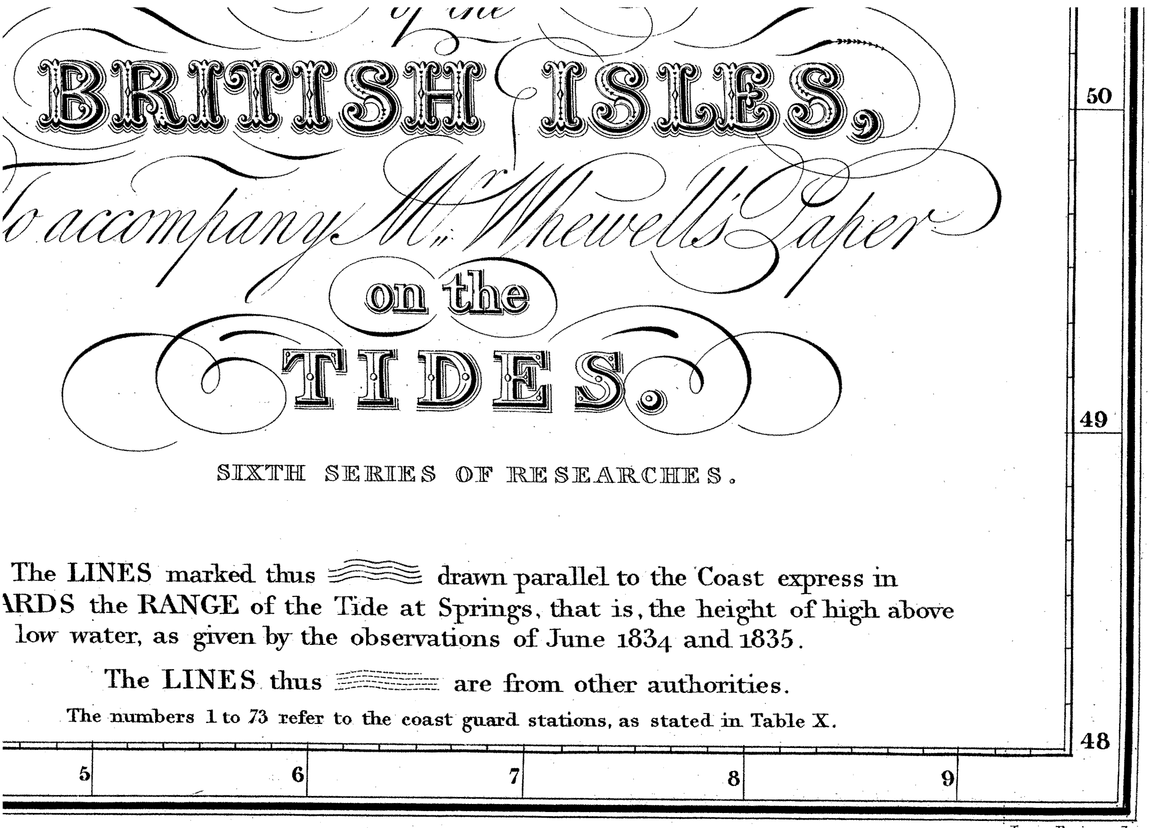
9
8
7



41
Falmouth
1
Eddystone
42
Alderney
Barfleur
Cherbourg
C. Rosel
Guernsey
Serq
S. Pierre
Jersey
Lessay
Bec d'Agon
Minquiers
Is. Chausey
Granville
Treguier
St. Michel
Genest
Goulven
Abrevrack
Morlaix
S. Brieuc
C. Frehel
St. Malo
St. Servan
Ushant
Porspoder
Brest
F
R
Douarnenez
Bay
6
5
4
3
2
1



Ault
Dieppe
St. Valery
Fecamp
Havre
Seine R.
Honfleur
S.Pierre
Cors
C
N
A
Meridian of 0 Greenwich.
1
1
2
3
4
5



James Basire sculp.

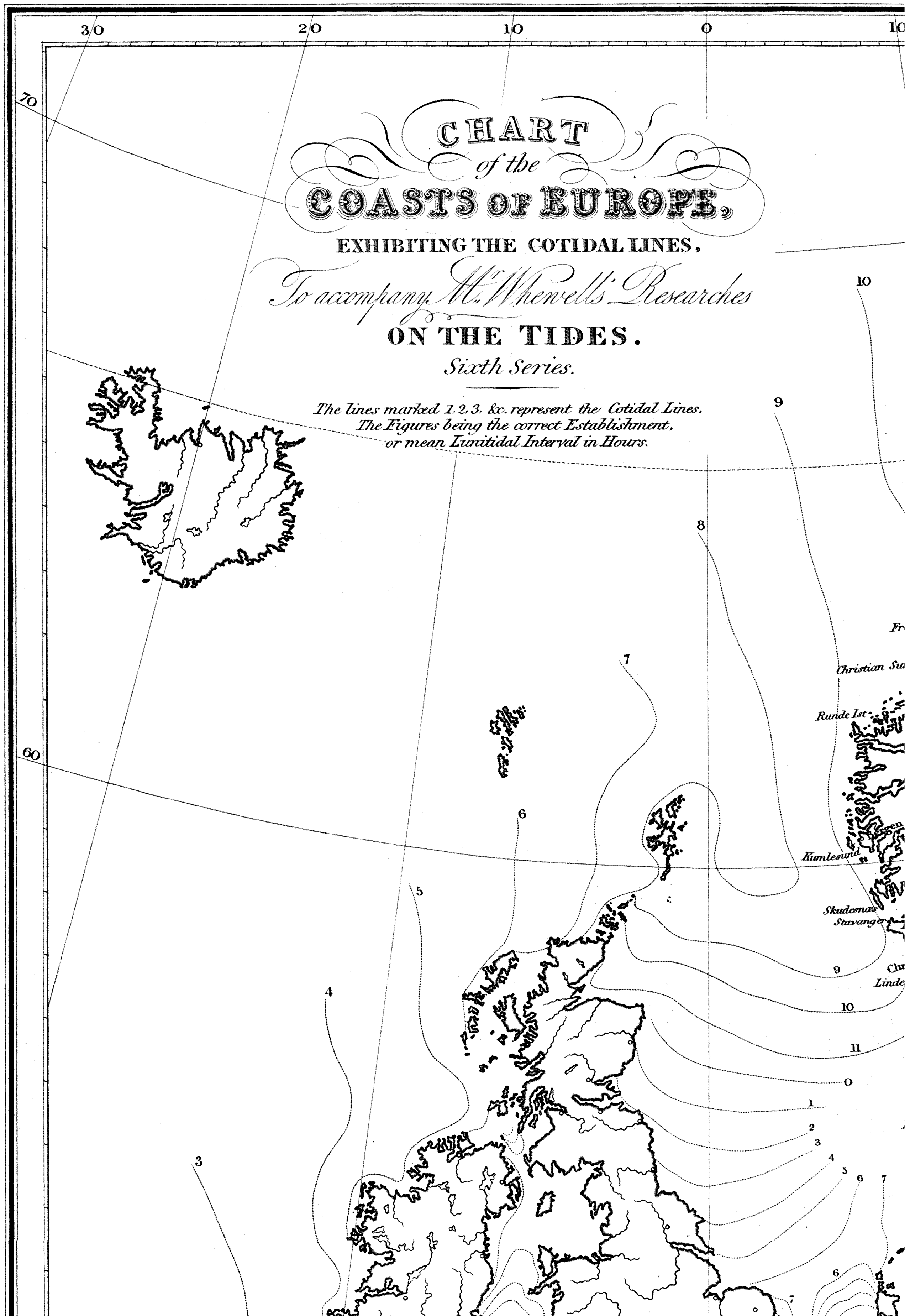
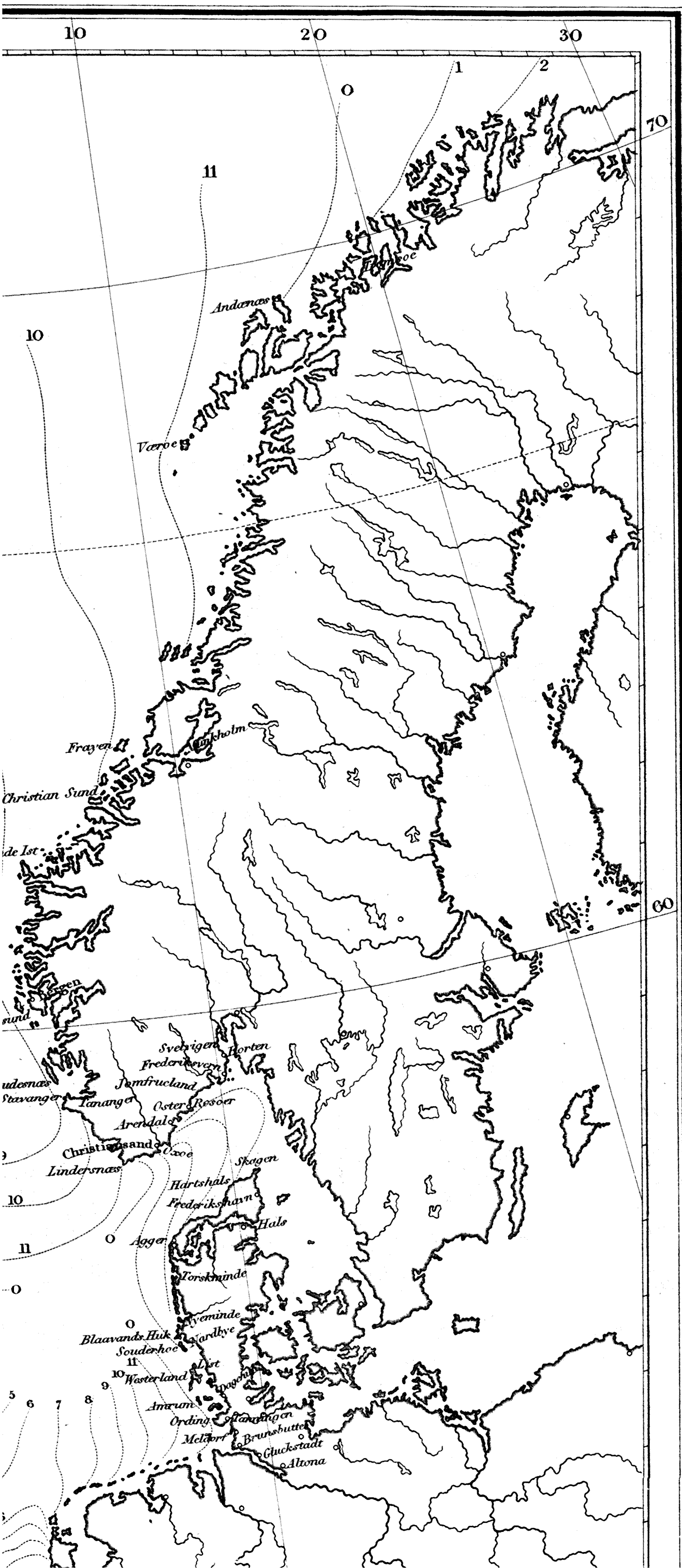
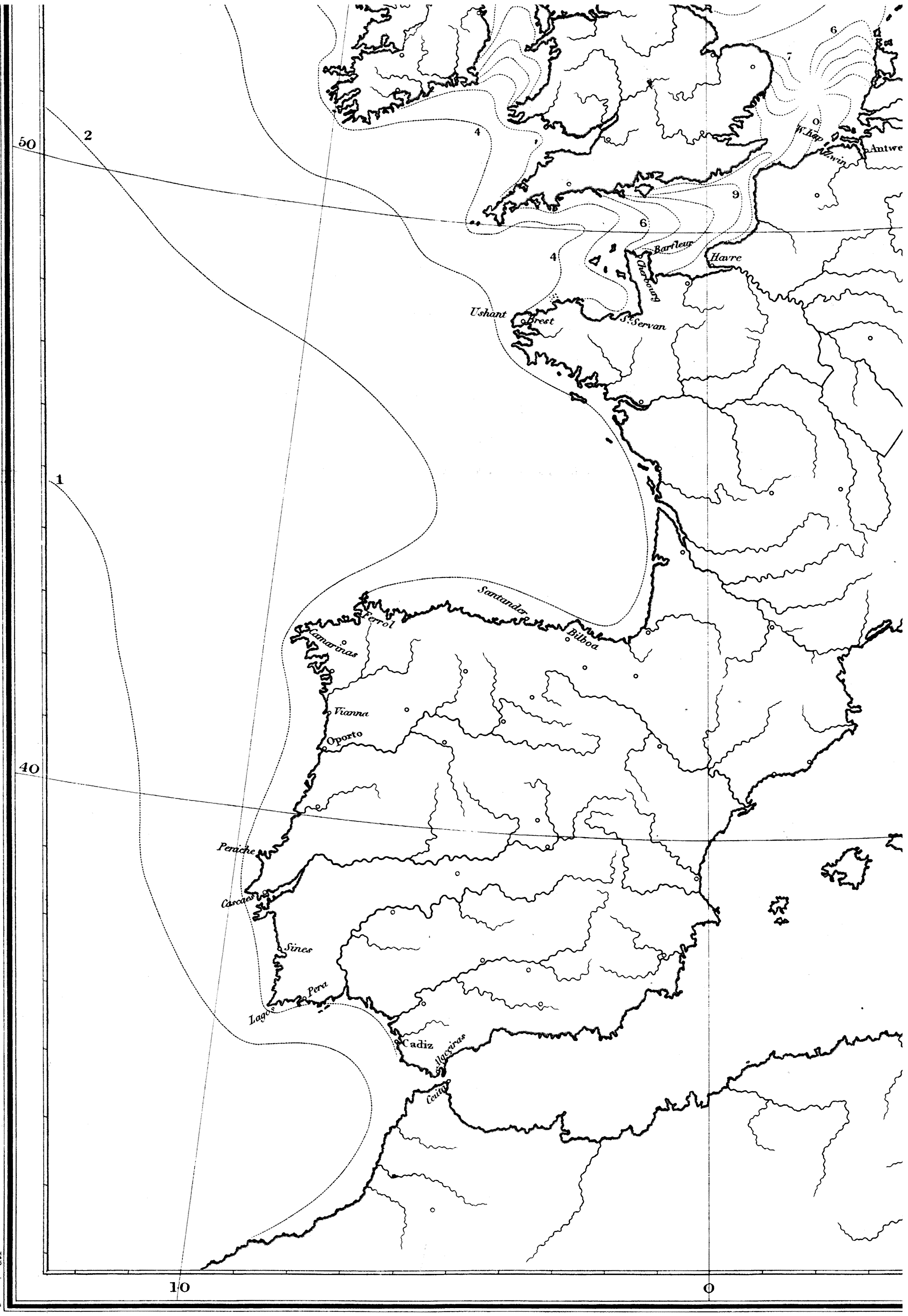


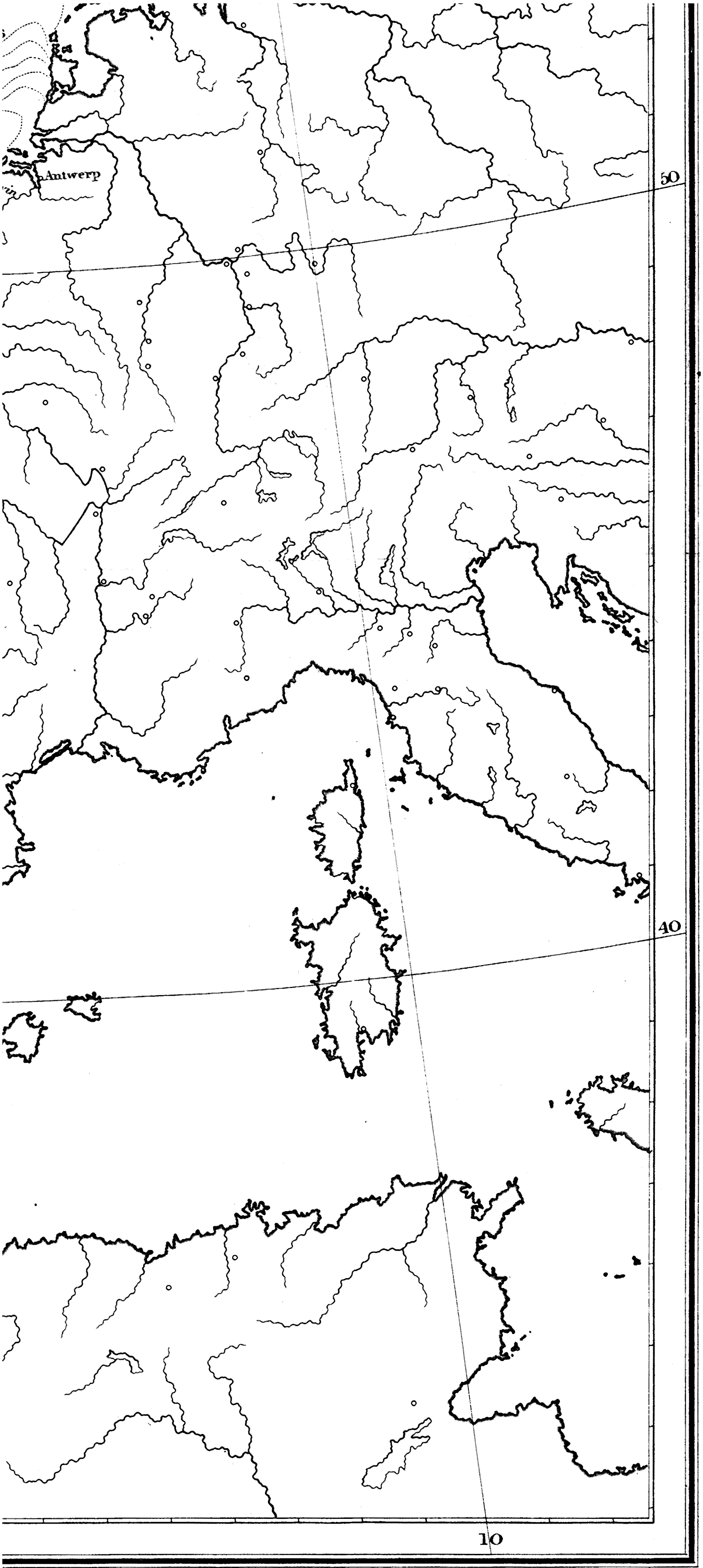
CHART
of the
COASTS OF EUROPE,
EXHIBITING THE COTIDAL LINES,
To accompany Mr. Whewell's Researches
ON THE TIDES.
Sixth Series.
The lines marked 1, 2, 3, &c. represent the Cotidal Lines,
The Figures being the correct Establishment,
or mean Lunitidal Interval in Hours.
30
20
10
0
70
60
Christian Sund
Runde Isl.
Kumlesund
Skudesnæs
Stavanger



Phil. Trans. MDCCCXXXVI. *Plate* XXVI. *p.* 307.



J. Basire sculp.

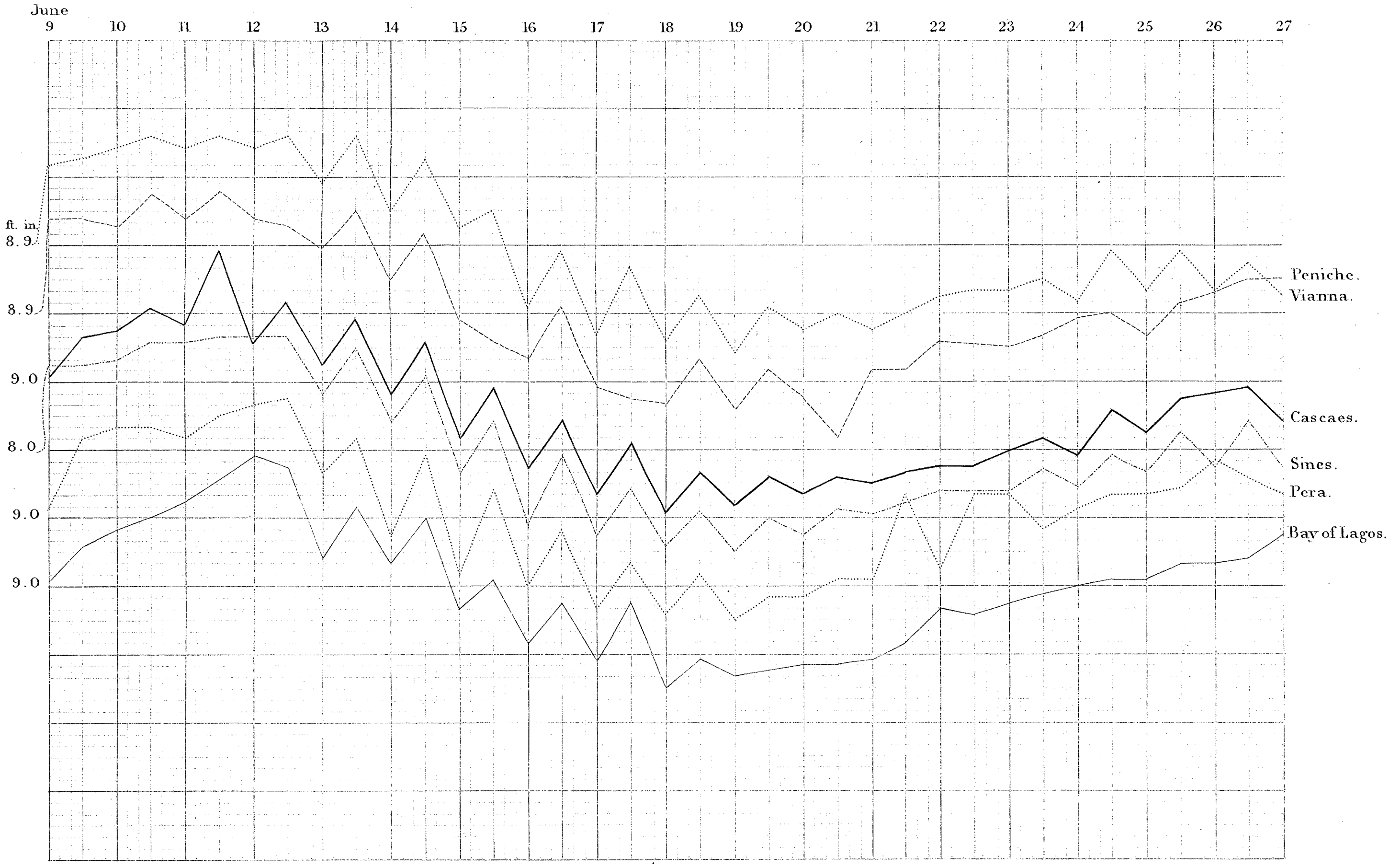


Antwerp
50
40
10

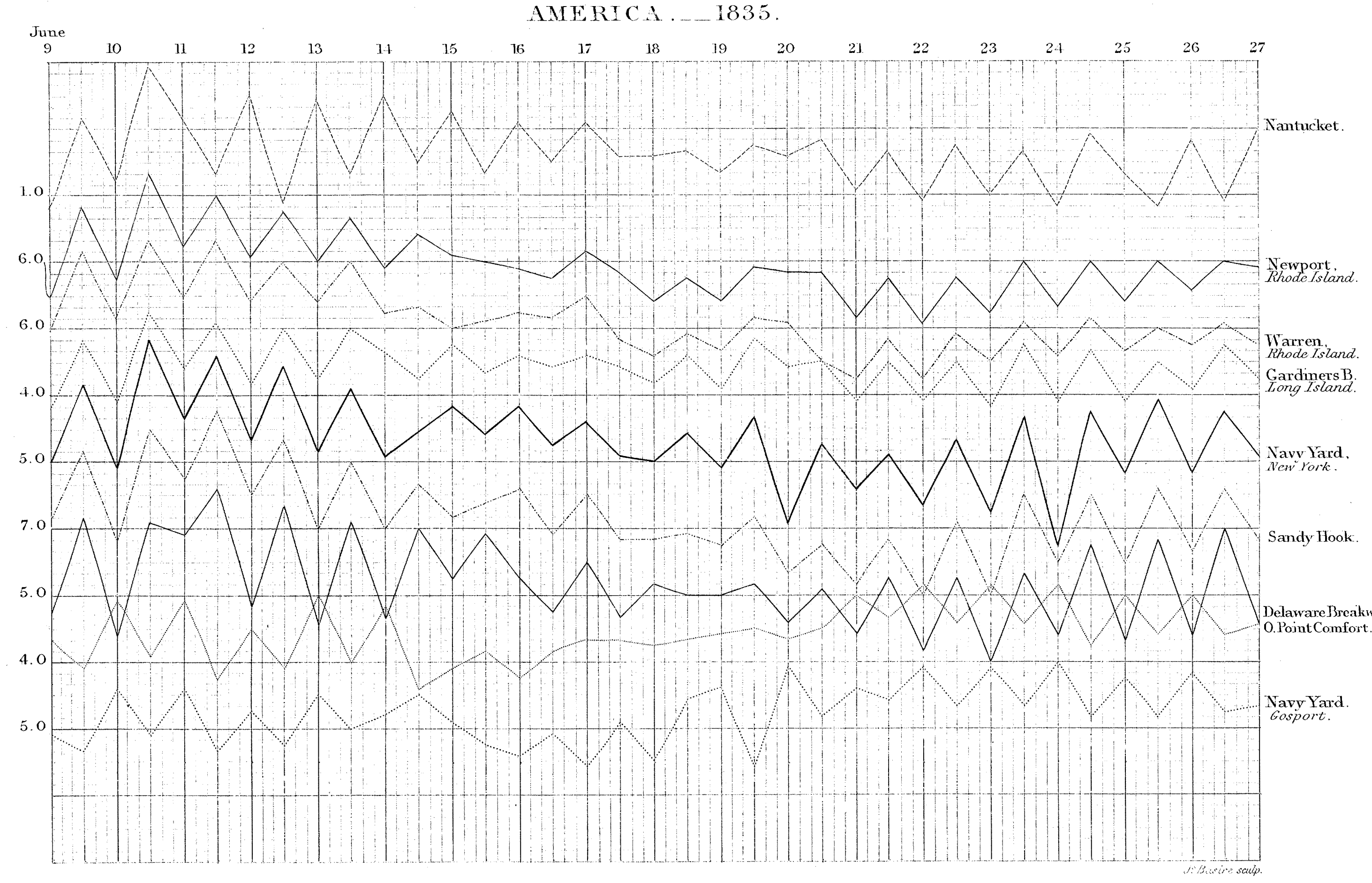
Phil. Trans. MDCCCXXXVI. *Plate* XXVII. *p.* 307.

HEIGHTS OF HIGH WATER,

PORTUGAL. —— 1835.



AMERICA. —— 1835.



J. Basire sculp.

Table X. The Greatest and Least Ranges of the Tide at the places of observation selected as above.

In this Table I have inserted, for the foreign stations, the names of the directors of the observations, and of the observers; also the latitudes and longitudes of the places when those have been given along with the observations. For the British stations, I have given the range from the observations of June 1834 as well as 1835; and the names of the Inspecting Commanders of the districts of the Coast Guard, under whose direction the observations were made in 1835.

Table XI. Semimenstrual and Diurnal Inequalities of the Height of High Water at several places of observation.

In this list, those places are taken at which the diurnal inequality is most distinct and regular.

Plate XXIV. Map of the British Isles and coasts of the German Ocean, showing the *cotidal lines* (according to the correct establishment).

Plate XXV. The same Map, showing the *range of the high tides* at each point of the shore (in yards).

Plate XXVI. Map of the *coasts of Europe*, showing the *cotidal lines* according to the correct establishment.

Plate XXVII. Diagram exhibiting examples of the curve of the heights of high water, affected by the diurnal inequality, which has different epochs at different places.

The materials upon which the above Tables and Maps are founded are deposited in the Hydrographer's Office in the Admiralty; and I will give a list of them, since they may be of use in future investigations on the subject. They are,

The original Registers of the Coast Guard Observations in June 1834.

The original Registers of the Coast Guard Observations in June 1835.

The Registers of the Observations made in June 1835, transmitted to the Admiralty from North America, Portugal, Spain, France, Belgium, the Netherlands, Denmark, and Norway.

Founded upon these there are Tables containing

The Times of High Water arranged in order for each place;

The Lunitidal Intervals calculated from the Times;

The curves of Lunitidal Intervals for most of the places of observation, and for several groups of places, in order to obtain Tables I. to IX. by graphical interpolation;

The Heights of High Water arranged in order for each place;

The Curves of High Water for most of the places of observation, in order to obtain Table XI. by graphical interpolation.

The *mean* Lunitidal Intervals have also been calculated by addition for most of the places; but as I have not used these, I have not given them.

London, June 11, 1836.

LUNITIDAL INTERVALS. JUNE 1835.

Table I.

Coast of North America.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected establishment.	Long. W.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	h m	h m	h m
c b Thomson's Island. Key West Florida	9 15	10 45	90	38	9 53	5 57	3 50	3 30
b St. Augustine	7 35	8 45	70	29	8 4	5 26	1 30	1 14
a Savannah	7 38	8 53	75	31	8 9	5 24	1 33	1 17
b Charlestown	6 57	7 57	60	24	7 21	5 20	0 41	0 26
a Cape Fear River	6 47	7 54	67	27	7 14	5 12	0 26	0 12
c Cape Hatteras	4 55	6 45	110	48	5 43	5 4	10 47	10 36
c c Gosport. Virginia Navy Yard	8 15	10 0	105	45	9 0	5 8	2 8	1 50
b Delaware Breakwater	7 7	8 15	68	28	7 35	5 0	0 35	0 20
b Sandy Hook	7 5	8 18	73	30	7 35	5 0	0 35	0 20
c b Old Point Comfort	7 50	9 19	89	37	8 27	5 0	1 27	1 10
a New York	8 8	9 18	70	29	8 37	4 56	1 33	1 16
b Newport	7 17	8 13	56	22	7 39	4 45	0 24	0 9
b Warren	7 35	8 48	73	30	8 5	4 36	0 41	0 25
c b Gardiner's Bay	9 17	10 48	91	38	9 55	4 37?	2 32	2 12
c a Cape Cod	10 50	12 15	85	35	11 25	4 38	4 3	3 40
a Province Town	10 55	12 12	77	32	11 27	....	......	......
a Boston	11 0	12 15	75	31	11 31	4 43	4 14	3 51
c a Portland	10 35	12 0	85	35	11 10	4 40	3 50	3 28
c a Mount Desert Island	10 35	12 0	85	35	11 10	4 32	3 42	3 20
a Portsmouth	11 0	12 13	73	30	11 30	4 44	4 14	3 51
a Gloucester	11 35	12 35	60	24	11 59	....	......	......
a E. Port Maine	10 40	12 0	180	33	11 13	....	......	......
b Nantucket	12 8	13 26	78	33	12 31	4 40	5 11	4 46

At the places marked *a* the curves are regular but very flat. At those marked *b* the curves are more broken from tide to tide, but the general course tolerably regular. At Cape Hatteras a sudden increase of the interval after June 18. At Newport, Warren, Gardiner's Bay, Gosport, an increase of the interval June 21 P.M.

The reduction made by subtracting 6^m from the mean, except at the places marked *c*, where 7^m is subtracted.

Key West, Florida has a diurnal inequality, which at its maximum (June 9 and 24) amounts to $2\frac{1}{2}^h$.

Nantucket has a tide-hour much later than the surrounding seas.

I add here the following observations which I have received from Sir John Herschel, made by him and Mr. Maclear.

Cape of Good Hope.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected establishment.	Long. E.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	h m	h m	h m
Simon's Bay	1 50	4 0	130	58	2 48	1 20	1 28	1 22
Table Bay	1 25	3 48	143	64	2 29	1 20	1 9	1 6

Table II.

Coast of Spain, Portugal, France, Belgium.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected establishment.	Long. W.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	m	h m	h m
Ceuta	1 4	2 55	111	48	1 55	21	2 16	2 12
Algesiras	0 45	2 38	113	49	1 34	21	1 55	1 52
Cadiz	1 2	2 32	90	38	1 40	25	2 5	2 2
Pera Algarve	1 13	1 55	42	21	1 34	33	2 7	2 4
Lagos Bay	1 55	2 19	24	12	2 7	35	2 42	2 38
Sines	1 25	2 51	86	36	2 1	35	2 36	2 32
Cascaes	0 50	2 22	92	39	1 29	35	2 4	2 1
Peniche	0 56	3 6	130	58	1 54	37	2 31	2 27
Bar of Oporto	1 50	3 25	95	40	2 30	35	3 5	3 2
Vianna	1 28	2 38	70	28	1 56	35	2 31	2 27
Camarinas	1 40	3 18	98	42	2 22	36	2 58	2 55
Ferrol	1 45	3 28	103	44	2 29	32	3 1	2 58
Santander	2 40	4 35	115	50	3 30	16	3 46	3 43
Bilboa	2 25	3 35	70	28	2 53	12	3 5	3 2
Ushant	0 48	2 25	97	41	1 29	20	1 49	1 46
Brest	2 48	4 17	89	37	3 25	18	3 43	3 36
Abrevrak	6 30	8 35	125	55	7 25	..	....	....
Lambrille (L'Isle de Sein)	3 3	4 30	87	36	3 39	..	....	....
Brehat (Isle)	4 53	6 15	82	34	5 27	12	5 39	5 28
St. Servan, Chaussey (Isle), Granville	5 7	6 55	108	47	5 54	6	6 0	5 48
Cherbourg	6 55	8 25	90	38	7 33	6	7 39	7 24
Barfleur	8 10	9 35	85	35	8 45	5	8 50	8 32
Havre	8 50	10 37	107	46	9 36	0	9 36	9 17
Dieppe	10 5	11 35	90	38	10 43	4E.	10 39	10 16
Cayeux	10 15	11 45	90	38	10 53	6	10 47	10 25
Boulogne	10 15	12 2	107	46	11 1	6	10 55	10 33
Calais	10 50	12 28	98	42	11 32	7	11 25	11 2
Dunkirk	11 15	12 50	95	40	11 55	12	11 43	11 19
Chenal de Port de Nieuport	11 20	12 55	95	40	12 0	11	11 49	11 25
Fort d'Ostend	11 35	13 22	107	46	12 21	12	12 9	11 44
Blankenberg	11 50	13 47	117	51	12 41	13	12 28	10 3
Rade de Ste Marie	14 55	16 35	100	43	15 38	16	15 54	13 23
Antwerp	15 18	17 57	99	42	16 0	18	16 48	14 26

Table III.

West and North Coast of Ireland.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected establishment.	Long. W.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	m	h m	h m
56 *d*. . 56 *e* Sibyl Head	2 52	4 22	90	38	3 30	41	4 11	4 4
56 *f*. . 58 *a* Shannon Mouth	3 35	5 3	88	37	4 12	39	4 51	4 43
58 *c*. . 58 *g* Clare Coast	3 48	5 27	89	37	4 25	38	5 3	4 54
59 *b*. . 59 *g* Galway Coast	3 37	5 19	102	47	4 24	40	5 0	4 51
60 *a*. . 60 *c* Slyne Head, &c.	3 38	5 40	122	54	4 32	41	5 13	5 4
61 *a*. . 61 *e* Mishen, &c.	4 6	5 56	110	48	4 54	..	....	....
61 *c* Inisbofin	4 9	5 31	82	34	4 43	42	5 25	5 16
61 *e* Achilbeg	4 15	5 55	100	43	4 58	41	5 39	5 29
61 *f* Keel, Achil	4 0	6 7	127	56	4 56	42	5 38	5 28
62 *a* Elly Beg	3 55	6 1	126	56	4 51	..	....	....
62 *d* Blacksod Bay	4 0	6 35	155	70	5 10	41	5 51	5 41
62 *e* Ballygloss	4 2	6 6	124	55	4 57	38	5 35	5 25
63 *a*. . 63 *c* Killala Bay	4 20	6 4	104	45	5 5	37	5 42	5 32
64 *c*. . 64 *dd* Sligo Bay	4 40	6 25	105	45	5 25	36	6 1	5 50
64 *e*. . 65 *c* Donegal Bay	4 25	6 5	100	43	5 8	35	5 43	5 33
65 *d*. . 66 *c* Teelin Head, &c.	4 30	6 12	102	44	5 14	35	5 49	5 39
66 *f*. . 67 *b* Dunaff Head, &c.	5 2	6 28	86	36	5 38	30	6 8	5 57
67 *c* Malin Head	4 45	6 29	104	45	5 30	30	6 0	5 49
68 *h* Port Balinkae	5 13	7 5	112	49	6 2	..	....	....
68 *a* Port Rush	5 4	7 20	136	61	6 5	27	6 32	6 20
68 *e* Rachlin	6 0	10 0	240	113	7 53	25	8 18	8 2
68 *f* Torr Head	8 44	11 10	146	66	9 50	24	10 14	9 54
68 *c* Glenarm	9 55	11 15	80	33	10 28	23	10 51	10 30
68 *g*. . 69 *h* Larne, &c.	....	....	....	..	....	..	....	10 32

N.B. In the British observations the numbers refer to the districts of the coast-guard, and the letters *a*, *b*, *c*, &c. to the stations of each district; according to the list given in Table X.

61 *a*. Mishen or Mishoe (qu. same place?) differs 1^h in 1834 and 1835.
62. Dulaugh differs 48^m mean of 1834 and 1835.
62 *d*. Blacksod Bay irregular: differs in 1834 and 1835.
63 *e*. Lachen anomalous (flat).
63 *f* 64 *a*. Anomalous (flat).
64 *b*. Pulogherry anomalous.
64 *a*. Inniscrone very flat.
67 *d* 67 *e*. In Loch Foyle.
68 *b* 68 *c* 68 *d*. Extremely irregular.

Table IV.

South and East Coast of Ireland.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected establishment.	Long. W.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	m	h m	h m
56 *d*. . 56 *e* Sibyl Head	2 52	4 22	90	38	3 30	41	4 11	4 4
55 *c*. . 56 *c* Dingle Bay, &c.	3 0	4 35	95	40	3 40	40	4 20	4 13
55 *b* Ballinskillings Bay . .	3 4	4 42	98	42	3 46	41	4 27	4 20
53 *h*. . 54 *b* Bantry Bay	3 14	5 5	111	48	4 2	39	4 41	4 33
52 *g*. . 53 *g'* Cape Clear, &c.	3 35	5 17	102	44	4 19	37	4 56	4 47
52 *a*. . 52 *f* Kinsale	......	......	....	....	4 29	34	5 3	4 54
51 *a*. . 51 *h* Cork, &c.	3 57	5 32	95	40	4 37	33	5 10	5 1
49 *f*. . 50 *e* Youghal, &c.	......	......	....	....	4 38	31	5 9	5 0
48 *e*. . 49 *e* Waterford, &c.	4 12	5 38	86	36	4 48	28	5 16	5 6
48 *a*. . 48 *d* Carnsore, &c.	4 40	6 15	95	40	5 20	25	5 45	5 34
47 *b*. . 47 *f* Cahore, &c.	6 35	8 0	85	35	7 10	25	7 35	7 24
47 *a* Arklow	9 15	11 30	135	60	10 15	24	10 39	10 19
46 *b*. . 46 *e* Bray..............	10 30	12 30	120	53	11 23	24	11 47	11 24
46 *a*. . 46 *a'* Dublin............	10 30	12 7	97	41	11 11	25	11 36	11 14
73 *b*. . 73 *m* Lambay Island, &c...	10 20	12 3	103	44	11 4	24	11 28	11 6
73 *a* Boyne Mouth	11 0	12 50	110	48	11 48	25	12 13	11 49
72 *f* Clogher Head	10 25	11 55	90	38	11 3	25	11 28	11 6
70 *k* Portaferry	11 32	13 12	100	43	12 15	23	12 38	0 14
71 *a*. . 72 *e* Carlingford Station, &c.	10 12	11 49	97	41	10 53	23	11 16	10 54
70 *a*. . 70 *i* Donaghadee, &c.....	10 10	11 43	93	39	10 49	22	11 11	10 49
68 *g*. . 69 *h* Larne, &c.	9 47	11 28	101	43	10 30	23	10 53	10 32

Table V.

West Coast of England.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected establishment.	Long. W.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	m	h m	h m
42 *a*. . 42 *d* Scilly Isles	3 30	5 6	96	41	4 11	25	4 36	4 28
43 *a* Portreath	3 50	5 17	87	36	4 26	21	4 47	4 38
43 *c* Padstow	4 17	5 50	93	39	4 56	20	5 16	5 6
44 *a* Clovelly	4 27	6 0	93	39	5 5	17	5 22	5 12
44 *b* Barnstaple	......	......	....	....	......	16		
44 *c* Ilfracombe	4 38	6 22	104	45	5 23	16	5 39	5 28
45 *a* Portheinion	4 45	6 30	105	45	5 30	15	5 45	5 34
44 *d* Lynmouth	4 53	6 33	100	43	5 36	15	5 51	5 40
45 *b*. . 45 *c* Tenby	6 40	8 25	105	45	6 25	19	6 44	6 31

Table VI.

North and East Coast of Britain.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected establishment.	Long.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	m	h m	h m
1 *a* Isle of Witham......	10 83	11 23	110	48	11 21	18 W.	11 39	11 17
1 *b* Cairn Ryan	10 28	11 24	116	51	11 19	19	11 38	11 16
1 *c* Port Logan, C. G. S.	10 22	11 5	103	44	11 6	19	11 25	11 3
2 *a* Lerwick	10 7	12 5	118	52	10 59	3	9 9	8 51
3 *a* Stromness..........	8 5	10 21	136	61	9 6	14	9 20	9 2
4 *a* Scrabsters (Thurso)..	7 45	9 9	84	35	8 20	14	8 22	8 6
5 *a* Cromarty	11 9	12 31	82	34	11 43	16	11 59	11 36
5 *b*. . 6 *c′* Elgin, &c...........	11 18	13 0	102	44	12 2	12	12 14	11 50
6 *c* Fraserburgh	11 10	12 46	96	41	11 51	8	11 59	11 35
6 *f* Rattry Head........	......	......	....	....	......	....	......	......
7 *a* Peterhead	12 10	13 40	90	38	12 48	8	12 56	31
7 *b*. . 8 *a* Aberdeen	12 25	14 15	110	48	13 13	8	13 21	55
8 *b* Johnshaven	12 38	14 27	109	47	13 25	9	13 34	1 7
8 *c*. . 8 *g* Montrose, &c.	1 0	2 35	95	40	1 40	10	1 50	1 47
8 *h* Broughty Ferry	1 38	3 23	105	45	2 23	11	2 34	2 29
9 *a* St. Andrews........	1 3	2 38	95	40	1 43	11	1 54	1 51
9 *h* Elie (Fife)	0 47	2 25	98	42	1 29	11	1 40	1 37
10 Newhaven	1 24	2 48	84	34	1 58	11	2 9	2 5
10 *a*. . 10 *c* Dunbar, &c.........	1 16	2 58	102	44	2 0	10	2 10	2 6
10 *d*. . 10 *e* Berwick, &c.	1 30	3 15	105	45	2 15	8	2 23	2 19
11 *b*. . 11 *c* Holy Island, &c.	1 49	3 43	114	50	2 39	7	2 46	2 41
11 *d* Craster............	......	......	....	....	......	....	......	......
11 *e* Alnmouth..........	......	......	....	....	......	....	......	......
12 *a* Blyth	2 14	3 55	101	43	2 57	5	3 2	2 56
12 *b*. . 12 *e* Sunderland, &c.	2 32	4 22	110	48	3 20	5	3 25	3 18
13 *a* Coatham	......	......	....	....	......	....	......	......
13 *b* Redcar	......	......	....	....	......	4	......	......
13 *c*. . 14 *a* Whitby, &c.........	3 2	4 40	98	42	3 44	2	3 46	3 39
14 *b* Filey..............	......	......	....	....	......	....	......	......
14 *c* Flamborough	3 5	4 22	77	31	3 36	0	3 36	3 29
14 *c′*. . 14 *f* Bridlington, &c.	3 46	5 32	106	46	4 32	0	4 32	4 23
16 *b*. . 16 *d* Wells, &c.	5 25	7 1	96	41	6 6	4 E.	6 2	5 50
17 *c*. . 18 *a* Cromer, &c.........	6 6	7 35	89	37	6 43	6	6 37	6 24
18 *b* Caistor	......	......	....	....	......	....	......	......
18 *b′* Yarmouth..........	8 26	9 51	85	35	9 1	8	8 53	8 35
18 *c* Gorlestone	......	......	....	....	......	....	......	......
18 *d* Corton	8 15	10 11	116	51	9 6	8	8 58	8 40
18 *e* Lowestoft..........	......	......	....	....	......	8	......	......
18 *f* Kessingham........	8 57	10 27	90	38	9 35	8	9 27	9 8
18 *g* Southwold	9 18	10 58	100	43	10 1	7	9 54	9 34
19 *d* Orfordness	10 28	11 58	90	38	11 6	7	10 59	10 37
19 *f*. . 21 *c* Harwich, &c.	11 15	12 43	88	37	11 52	5	11 47	11 24

Table VII.

South Coast of England.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected Establishment.	Long. W.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	m	h m	h m
42 *d*. . 42 *a* Scilly Isles	3 30	5 6	96	41	4 11	25	4 36	4 28
41 *b*′. . 40 *f* Mount's Bay	3 29	5 23	114	50	4 19	22	4 41	4 32
40 *e*. . 39 *h* Fowey, &c.	4 3	5 35	92	39	4 42	19	5 1	4 52
39 *g*. . 39 *a* East Looe, &c.......	4 14	5 58	104	45	4 59	18	5 16	5 6
38 *f*. . 37 *g*′ Plymouth Sound, &c.	4 24	5 56	92	39	5 3	17	5 20	5 10
37 *f*. . 37 *e* Prawle Head, Salcomb	4 36	6 12	96	41	5 17	15	5 32	5 21
37 *d*. . 37 *a* Torquay, &c.	5 0	6 30	90	38	5 38	14	5 52	5 41
36 *e*. . 36 *b* Teignmouth, &c.....	5 18	6 40	82	34	5 52	14	6 6	5 54
36 *a*. . 35 *c* Exmouth, &c.	5 13	6 25	72	29	5 42	14	5 56	5 45
34 *d*. . 33 *d* Weymouth Bay	6 17	7 27	70	28	6 45	10	6 55	5 42
33 *e* Kimmeridge Bay....	5 57	8 0	123	54	6 51	9	7 0	6 48
33 *d* St. Alban's Head....	6 18	7 28	70	28	6 46	8	6 54	6 40
33 *d* Swanage Bay	8 17	9 31	74	30	8 47	8	8 55	8 37
33 *c* Studland Bay	7 40	10 4	144	65	8 45	8	8 53	8 36
33 *d*. . 33 *a* Christchurch Bay....	8 5	9 53	108	47	8 52	7	8 59	8 48
32 *d* Lymington	11 14	13 0	106	46	12 0	6	12 6	11 52
30 *e*. . 29 *l* Portsmouth, &c.	10 55	12 15	80	33	11 28	5	11 33	11 10
31 *e* St. Lawrence	9 51	11 5	74	30	10 21	5	10 26	10 3
31 *c* Bembridge	10 35	12 1	86	36	11 11	5	11 16	10 54
29 *h* Selsea Bill	10 38	12 6	88	37	11 15	3	11 18	10 55
29 *h*. . 28 *m* Selsea to Brighton ..	10 18	11 31	73	29	10 47	2	10 49	10 27
28 *l*. . 28 *d* Rottingdean to Cuckmere	10 32	11 52	80	33	11 5	1	11 6	10 44
28 *c*. . 28 *a* Burling Gap to South Bourne	10 40	11 50	70	28	11 8	1 E.	11 7	10 45
27 *m*. . 27 *f* Gully Hill to Madox								
27 *i* Hastings	10 17	11 30	73	29	10 46	3 E.	10 43	10 21
27 *d*. . 26 *n*	....	....	..	..	....	4		
26 *n*. . 26 *l*′ Dungeness	10 16	11 46	90	38	10 54	4 E.	10 50	10 26
26 *k*. . 26 *a* Sutherland, Dover ..	10 22	11 53	91	38	11 0	5 E.	10 55	10 33
25 *n* Northend, Deal......	11 2	12 32	90	38	11 40	6	10 36	11 13
25 *h* Ramsgate	10 16	12 0	104	45	11 1	6	10 55	10 33
25 *g* Broadstairs	10 40	12 35	115	50	11 30	6	11 24	11 1

33 *b*, 33 *a*, 32 *f*, 32 *e*, 32 *c* rejected as imperfect or anomalous.

Table VIII.

Coasts of the Netherlands and Denmark.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected Establishment.	Long. E.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	m	h m	h m
Westkapelle	0 20	1 48	88	37	0 57	13	0 44	0 42
Zwin or Sluice Dupe	0 33	1 57	84	35	1 8	14	0 54	0 52
Flushing	0 40	2 20	100	43	1 23	14	1 9	1 6
Browershaven	1 22	2 48	86	36	1 58	15	1 43	1 39
Goederede	1 35	3 5	90	38	2 13	15	1 58	1 54
Hellvoetsluys	2 25	3 55	90	38	3 3	16	2 47	2 41
Delflandshoofden	1 5	2 20	75	30	1 35	17	1 18	1 15
Brielle	2 5	3 25	80	33	2 38	16	2 22	2 17
Katwyk	1 20	3 5	105	45	2 5	17	1 48	1 44
Newdiep	5 55	7 55	120	53	6 48	20	6 28	6 14
Tor Schelling	7 48	9 20	92	39	8 27	21	8 6	7 49
Ameland	9 15	10 30	75	30	9 45	23	9 22	9 3
Rottum	10 0	11 25	85	35	10 35	26	10 9	9 48
Denmark.								
Norderpiep	11 48	13 25	97	41	12 29	36	11 53	11 30
Meldorf	12 20	14 0	100	43	13 3	37	12 26	0 0
Tonningen	12 40	14 10	90	38	13 18	36	12 42	0 15
Pelworm	12 35	14 15	100	43	13 18	35	12 43	0 16
Suder Oog	....	....	..	..	....	34		
Volterwick	12 7	13 50	103	44	12 51	35	12 16	11 50
Ording	11 35	13 15	100	43	12 18	35	11 43	11 18
Westerland (W. side of Sylt)	11 45	13 0	75	30	12 15	35	12 40	0 15
List (E. side of Sylt)	12 55	14 32	97	41	13 36	32	13 4	0 37
Wyck	12 57	14 30	93	39	13 36	35	13 1	0 34
Dagabül	12 50	14 30	100	43	13 33	35	12 58	0 31
Bongsiel	12 40	14 15	95	40	13 20	35	12 45	0 18
Amrum	12 13	14 7	114	50	13 3	33	12 30	0 4
Hoyer Canal	14 2	15 42	100	43	14 45	34	14 11	1 41
Hoyer	13 55	15 30	95	40	14 35	34	14 1	1 32
Sudwesthorn	13 12	14 55	103	44	13 56	32	13 24	0 56

The following are taken from Mr. Tegner's "Resultat," (sent along with the observations,) subtracting 30^m from his establishment, obtained by taking the mean from the 9th to the 18th of June.

	Latitude.				Corrected establishment.	Long. E.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	° ′				h m	m	h m	h m
Helgoland	54 11½	....	..	..	11 44	31	11 13	10 50
Sönderhoe	55 20¾	....	..	..	14 21	34	13 47	1 18
Nordby	55 27	....	..	..	15 2	34	14 28	1 58
Blaavands-Huk	55 34	....	..	..	13 43	32	13 11	0 44
Nyminde Gab	55 47	....	..	..	14 40	33	14 7	1 38
Torskminde	56 20½	....	..	..	15 33	32	15 1	2 30
Agger	56 45	....	..	..	16 8	33	15 35	3 3
Hirtshals	57 35½	....	..	..	16 27	40	15 47	3 14
Skagen	57 42½	....	..	..	17 55	42	17 13	4 37

Table IX.

Coast of Norway, &c.

	Least Interval.	Greatest Interval.	Difference.	Reduction.	Corrected Establishment.	Long.	Corr. Estab. Greenwich Time.	Cotidal Hour.
	h m	h m	m	m	h m	m	h m	h m
[Scilly Isles	3 30	5 6	96	41	4 11	24 W.	4 35	4 27
Sibyl Head	2 52	4 22	90	38	3 30	40 W.	4 10	4 2
Blacksod Bay	4 0	6 35	94	40	4 40	41 W.	5 21	5 11
Donegal Bay	4 25	6 5	100	43	5 8	35 W.	5 43	5 33
Malin Head	4 45	6 29	104	45	5 30	30 W.	6 0	5 48
Scrabsters	7 45	9 9	84	35	8 20	14 W.		
Stromness	8 5	10 21	136	61	9 6	14 W.	9 20	9 1
Lerwick]	10 7	12 5	118	52	10 59	4 W.	11 3	10 41
Norway, going North.								
Tananger	8 45	10 13	88	37	9 22	24 E.		
Stavanger	9 8	10 55	107	46	9 54	24 E.	9 30	9 12
Skudesnæs	9 12	10 58	106	46	9 58			
Kumlesand. Kersford	9 14	10 36	82	34	9 48	22	9 26	9 8
Bergen	9 55	11 10	75	30	10 25	22 E.	10 3	9 43
Runde Ist	9 33	11 50	137	61	10 34	23 E.	10 11	9 50
Christiansund	10 0	11 42	102	44	10 44	31 E.	10 13	9 51
Froyen Ist. Point Fitteren	10 14	11 56	102	44	10 58	34 E.	10 24	10 4
Munkholm	10 30	12 13	103	44	11 14	44 E.	10 30	10 10
Vœroe	11 45	13 21	106	46	12 31	45 E.	11 36	11 12
Andænes. Lofoden	12 8	13 36	88	37	12 45	60 E.	11 45	11 22
Tromsoe	0 32	2 10	98	42	1 14	75 E.	2 29	2 27
Going South.								
Stavanger	......	......	....	....	9 54	....	......	9 12
Tananger	......	......	....	....	9 22			
Lindesnæs	1 36	3 50	134	60	2 36	28 E.	2 8	2 3
Christiansund	3 0	5 16	136	61	4 1	34 E.	3 27	3 19
Oxsoe	2 55	5 5	130	58	3 53			
Arendal	3 9	5 9	120	53	4 2	37 E.	3 25	3 17
Ostre Rusoer	2 48	5 12	144	65	3 53			
Jomfruhland	3 30	5 40	130	58	4 28			
Frederikswærn	3 15	5 37	142	64	4 19	41 E.	3 38	3 29
Langesund	3 30	5 20	110	48	4 18			
Talöern	3 30	5 56	146	66	4 36			
Frederikstadt	3 48	6 0	132	59	4 47			
Swelwigen	4 0	6 24	144	65	5 5			
Christiania	4 44	6 34	114	50	5 34	44 E.	4 50	4 39

In Greenland the high water at full and change is from 12 to 2. (Purdy, Memoir to accompany a Chart of the Northern Ocean, p. 24.)

Table X.

Greatest and Least Range of the Tide in June 1834 and 1835.

Scotland to the Thames.									
Station.	Inspecting Commander.	1834.				1835.			
		Date.	Greatest Range.	Date.	Least Range.	Date.	Greatest Range.	Date.	Least Range.
			ft. in.		ft. in.		ft. in.		ft. in.
1 *a* Isle of Whithorn (Wigtonshire)....	Comm^r J. C. Bennet.	20 P	19 11	15 A	9 5	11 A	20 7	20 A	6 4
1 *b* Cairn Ryan..........	———	21 A	8 11	16 A	6 0	13 P	9 5	21 A	4 8
1 *c* Port Logan..........	———	....	12 5	15 A	8 8	12 A	13 3	20 A	7 4
2 *a* Lerwick (Shetland)....	Lieut. W. H. Brand,	....	6 0	....	3 3	13 P	6 5	17 P	2 4
3 *a* Stromness (Orkney) ..	Lieut. Ch. Jobson.	21 P	9 10	14 A	4 4	10 P	10 7	19 P	3 6
4 *a* Scrabsters (Thurso)....	Mr. G. Culmer.	....	....	....	....	11 P	15 3	20 A	5 8
5 *a* Cromarty..........	Mr. J. Prosser.	22 A	12 6	14 A	7 0	12 P	13 2	....	4 11
5 *b* Burghead..........	———	....	11 0	....	6 8	12 P	12 5	19 A	5 3
5 *c* Lossiemouth	———	....	10 10	....	6 5	12 P	12 0	....	5 5
6 *a* Buckie..........	Mr. T. Blake.	21 P	10 8	....	5 10	12 A	11 3	....	4 6
6 *a'* Cullen..........	———	....	....	....	....	10 P	11 3	20 P	3 5
6 *b* Portsoy	———	....	....	....	....	12 P	11 2	18 P	4 0
6 *b* Sandend	———	22 A	10 7	16 A	6 2				
6 *c* Banff	———	21 P	10 10	14 A	6 1	....	11 0	19 A	4 9
6 *c* Gardenstone	———	....	....	....	....	....	11 0	....	4 8
6 *d* Pennan	———	21 P	10 6	15 A	6 2				
6 *e* Fraserburgh..........	———	22 A	10 6	14 A	6 1	....	11 1	....	4 8
6 *f* Rattray Head	———								
7 Aberdeen..........	Mr. T. Richmond.	22 P	11 3	16 A	7 4				
7 *a* Peterhead..........	———	21 A	10 4	....	5 8	....	12 0	20 A	5 4
7 *b* Colliestown..........	———	....	11 9	14 A	7 0	....	12 10	19 P	4 11
7 *c* Bethelvie..........	———	8 P	11 1	17 A	8 0	13 A	12 10	18 A	5 0
7 *d* The Don (near Aberdeen)	———	22 A	11 10	14 A	8 0	12 P	12 10	20 A	5 11
7 *e* Cove Bay..........	———	....	12 4	16 A	7 5	11 P	12 7	19 A	5 7
7 *f* Muchals	———	21 A	12 3	....	5 7	11 A	13 4	21 A	6 2
8 *a* Katerline..........	Mr. D. F. Wilson.	22 A	13 0	14 A	7 10	12 P	13 10	19 A	6 0
8 *b* Johnshaven..........	———	....	13 4	....	7 10	....	14 3	....	6 1
8 *c* Uzon	———	....	13 9	....	8 6	11 P	14 2	....	6 3
8 *d* Red Castle	———	....	14 5	....	8 10	12 P	14 8	....	6 8
8 *e* Auckmithie..........	———	22 P	15 1	13 A	9 8	11 P	15 2	....	6 10
8 *f* Arbroath..........	———	22 A	14 3	16 A	8 11	12 P	15 1	....	6 7
8 *g* Westhaven	———	....	14 6	....	9 0	....	15 6	....	6 10
8 *h* Broughty Ferry	———	....	14 6	....	9 6	....	15 0	....	7 3
9 *a* St. Andrews	Lieut. H. Randall.	....	14 9	14 A	9 0	12 P	15 6	21 A	7 7
9 *b* Elie Fife..........	———	....	16 1	14 P	10 7	....	16 3	19 P	9 0
10 Newhaven	Comm^r J. J. Arrow.	....	16 4	14 A	10 1	....	17 10	20 P	8 7
10 *a* North Berwick	———	....	15 2	16 A	9 6	....	16 1	19 A	7 0
10 *b* Dunbar	———	....	14 4	15 A	8 8	11 P	15 9	19 P	7 9
10 *c* Redheugh	———	....	11 8	14 A	6 0				
10 *d* Burnmouth..........	———	....	14 2	....	8 10	12 P	15 0	19 A	6 11
11 *a* Berwick upon Tweed ..	Comm^r J. C. Hudson.	....	14 0	16 A	8 8	12 P	15 0	....	6 8
11 *b* Holy Island..........									
11 *c* Newton	———	....	14 6	14 A	8 9	....	14 6	....	6 4
11 *d* Craster Haven..........	———	....	14 5	....	8 9	10 P	10 5	19 P	6 3
11 *e* Alnmouth	———	22 P	11 7	....	7 8				
12 *a* Blyth Haven	Mr. J. W. Cuff.	22 A	14 9	....	8 11	12 P	15 3	19 A	6 10
12 *b* North Shields........	———	....	13 11	....	8 9				
12 *c* Sunderland..........	———	....	14 4	16 A	8 10				
12 *d* Hawthorn Hive	———	....	14 3	14 A	8 11	....	15 8	21 P	7 3
12 *e* Black Hales..........	———	....	15 2	15 P	8 5	....	15 10	....	7 6
13 *a* Coatham..........	Comm^r J. Kains.	....	15 6	16 A	9 8				

Table X. (Continued.)

Station.	Inspecting Commander.	1834. Date.	1834. Greatest Range.	1834. Date.	1834. Least Range.	1835. Date.	1835. Greatest Range.	1835. Date.	1835. Least Range.
			ft. in.		ft. in.		ft. in.		ft. in.
13 *a* Redcar	Comm^r J. Kains.	....	15 6	....	9 7				
13 *c* Staithes	————	22 P	17 0	16 P	11 3				
13 *d* Whitby	————	22 A	15 10	14 A	9 8	11 A	16 6	19 A	7 6
13 *e* Robin Hood's Bay	————	....	14 11	....	9 3	12 P	15 11	....	6 11
14 Bridlington	Mr. W. Dean.	....	16 5	....	10 6	11 P	17 0	17 P	7 11
14 *a* Scarborough	————	....	15 5	....	9 9	12 P	16 11	19 A	7 1
14 *b* Filey	————	....	14 1	15 P	9 6	11 A	16 0	22 P	7 5
14 *c* Flamborough Head	————	....	16 0	15 A	10 0	11 P	17 11	22 A	7 0
14 *d* Ulrome	————	....	16 9	14 A	9 10	....	17 4	19 A	7 5
14 *e* Hornsey	————	....	16 6	....	10 7	12 P	18 0	....	7 9
14 *f* Sandlemere	————	....	16 10	....	10 8	10 A	18 6	....	8 4
14 *g* Grimsby	Comm^r P. Christie.								
14 *h* Clay Hole	————								
15 *a* Sutton	————								
15 *b* Hob Hole	————								
16 *a* Hunstanton	————	....	....	....	....	12 A	21 10	19 P	10 2
16 *b* Burnham	Comm^r R. C. Curry.	....	....	....	....	12 A	11 5	17 P	3 8
16 *c* Wells	————	22 A	16 8	14 A	8 6	11 P	18 4	20 P	7 0
16 *d* Morston	————	....	16 7	15 P	10 9				
16 *e* Brancaster	————	....	....	....	....	12 P	19 8	20 A	13 10
17 *a* Weybourne	Comm^r J. B. M'Hardy.	....	....	....	....	13 P	15 11	19 P	8 2
17 *b* Sherringham	————	....	17 0	14 A	11 0				
17 *c* Cromer	————	....	14 9	14 P	8 5	....	14 11	22 P	6 10
17 *d* Sydestrand	————								
17 *e* Mundesley	————								
17 *f* Bacton	————								
17 *g* Happisburgh	————	....	12 9	13 A	7 4				
17 *g* Hasbrough	————								
17 *h* Palling	————	....	9 11	14 P	6 1				
18 Yarmouth	Comm^r Spencer Smyth.	....	....	....	....	13 A	6 11	20 P	2 0
18 *a* Winterton	————	....	....	....	....	....	8 6	19 P	2 10
18 *b* Caister	————								
18 *c* Gorleston Pier	————								
18 *d* Corton	————	20 P	6 2	16 P	4 0	11 P	6 11	....	3 1
18 *e* Lowestoft	————	21 A	6 11	14 P	3 10	12 P	6 10	20 A	2 6
18 *f* Kessingland	————	21 P	5 11	13 A	4 3	13 A	6 10	17 A	2 6
18 *g* Southwold	————	22 A	7 2	14 P	4 6	11 A	6 5	19 P	2 10
19 *a* Mismere Haven	Comm^r Charles Moore.								
19 *b* Sizewell Gap	————								
19 *c* Aldborough	————								
19 *d* Orfordness	————	....	9 0	15 A	6 0	13 A	9 3	....	5 3
19 *e* Orford Haven	————	....	9 9	16 A	6 5	13 P	9 10	....	6 0
19 *f* Woodbridge	————	9 A	9 10	17 A	6 2	....	10 10	....	5 4
20 *a* Watton Gap	Comm^r G. S. Dyer.	22 A	12 2	14 P	8 5				
20 *b* Harwich Harbour	————	....	11 6	15 P	7 10	10 A	12 0	....	6 0
20 *c* Clacton	————	....	13 9	....	7 9				
20 *d* St. Osyth Tower	————	22 P	15 1	14 P	9 9	....	14 7	....	7 10
20 *e* St. Osyth Stone Point	————	....	....	....	....	13 A	15 7	....	8 4
20 *e'* Brightlingsea Creek	————								
20 *f* Richmond West Mersea	————								
21 *a* Bradwell (Essex)	Comm^r G. A. Halsted.	22 P	15 5	16 P	11 0	13 A	15 4	19 P	8 6
21 *b* Tillingham	————								
21 *c* Crouch River	————								
21 *c* Burnham	————								
21 *d* Kennett Head	————								
21 *e* Shoebury Ness	————								
21 *f* Southend	————								

Table X. (Continued.)

Thames to Scilly Islands.

Station.	Inspecting Commander.	1834. Date.	1834. Greatest Range.	1834. Date.	1834. Least Range.	1835. Date.	1835. Greatest Range.	1835. Date.	1835. Least Range.
			ft. in.		ft. in.		ft. in.		ft. in.
22 *a* Bugsby's Hole	Comm^r Thomas Bushby.	22 P	19 11	16 P	15 5				
22 *b* Woolwich	————	....	20 3	....	15 7	13 A	20 11	19 P	13 3
22 *c* Erith	————	....	18 11	....	14 7	....	19 6	21 P	11 6
22 *d* Greenhithe	————	....	19 1	15 P	14 7	....	20 4	19 P	12 2
22 *e* Gravesend	————	....	18 5	....	13 8	....	19 5	....	12 5
22 *f* Cliff Creek	————	....	18 6	....	13 2	....	19 0	....	12 3
22 *g* Yantlett Creek	————	....	16 10	16 P	12 2	....	16 10	....	10 4
22 *h* Colemouth Creek	————	22 A	17 11	14 P	11 0				
22 *i* Rainham	————	....	17 8	16 P	12 5				
22 *k* Haven Hole	————	....	....	....	....	11 P	18 5	....	10 10
23 *a* The Bathurst, Queensb.	Comm^r W. Kelly.	....	17 0	....	12 2	....	17 5	....	10 1
23 *b* Sheerness	————	22 P	16 10	....	12 3				
23 *c* Eastend Lane	————								
23 *d* Hensbrook	————	....	....	....	....	....	17 4	....	9 4
23 *e* Warden Point	————								
23 *f* Leysdown	————	....	15 10	....	11 2	15 A	17 1	....	9 6
23 *g* Shellness	————	....	....	....	....	13 A	16 8	20 A	8 5
24 *a* Fountain Hard, up Stangate Creek	Comm^r R. Barton.	....	15 0	15 A	10 3				
24 *b* Milton	————								
24 *c* Elmley Ferry	————								
24 *d* Conyer Creek	————								
24 *e* The Forester, E. Swale	————	22 A	19 0	....	11 9	12 A	17 8	20 P	9 7
24 *f* The Beresford, Faversham Creek	————								
24 *g* Sandgate	————	22 A	20 8	15 A	14 10				
24 *h'* Seasalter Cliff	————								
24 *h* Seasalter, C. G. S.	————								
24 *k* Whitstable Harbour	————								
24 *k'* Tankerton	————	22 P	16 0	17 A	11 3				
24 *l* Swale Cliff	————	....	16 0	16 P	11 0				
24 *m* Herne Bay	————	....	16 0	....	9 10				
24 *n* Bishopstone	————	22 A	16 6	....	9 9	13 A	17 6	21 A	8 0
24 *o* Reculver	————	....	15 8	....	9 8	....	16 5	....	8 0
25 *a* St. Nicholas, C. G. S.	Comm^r S. Helland.	....	13 0	14 P	11 0	14 A	14 0	18 P	8 4
25 *b* Epple Bay	————	....	13 9	....	9 6	12 A	14 4	19 P	7 8
25 *c* Westgate	————	....	13 9	....	9 8	....	14 4	....	7 9
25 *d* Margate	————	22 P	13 7	16 P	10 0				
25 *e* Newgate	————	....	....	....	....	13 A	13 11	....	7 8
25 *f* Kingsgate	————	....	13 8	....	9 7	12 P	13 10	....	8 6
25 *g* Broadstairs	————	....	14 2	15 A	11 8	27 A	13 11	20 A	10 2
25 *h* Ramsgate	————	....	15 8	....	11 0	11 P	15 7	22 P	10 3
25 *i* Pegwell Bay	————	....	14 6	....	10 10	....	14 5	19 P	9 1
25 *k* North Shore	————	....	....	....	....	....	11 6	20 A	7 6
25 *l* Shingle End	————	....	....	....	....	12 P	17 1	19 P	8 8
25 *l'* Westbrook	————	....	....	....	....	11 P	14 1	....	8 0
25 *m* No. 2 Battery, Southdown	————	21 P	16 2	14 P	11 8	....	16 6	....	9 4
25 *n* No. 1 Battery, near Deal	————	22 A	16 10	....	11 11	11 A	17 5	....	9 7
25 *o* Northend, Deal	————	....	16 8	15 A	12 0	13 A	17 7	....	9 9
25 *p* Walmer	————	21 P	17 10	14 P	12 4	12 P	18 1	20 A	9 11
25 *q* Kingsdown	————	22 A	17 2	15 A	12 6				
25 *r* St. Margaret's Bay	————	....	17 10	....	12 11				

Table X. (Continued.)

Station.	Inspecting Commander.	1834. Date.	1834. Greatest Range.	1834. Date.	1834. Least Range.	1835. Date.	1835. Greatest Range.	1835. Date.	1835. Least Range.
			ft. in.		ft. in.		ft. in.		ft. in.
25 *s* Cornhill Station	Comm^r S. Helland.								
26 *a* Casemates, Dover	Comm^r J. Sherer.	8 A	18 6	16 A	12 0				
26 *b* Townshend Battery	———	22 P	17 11	15 A	14 2				
26 *c* Lydden Point	———	22 A	20 0	....	14 3				
26 *d* Eastware Bay, Pelter Brig	———								
26 *e* No. 3 Tower	———								
26 *f* Folkstone	———								
26 *g* Sluice	———								
26 *g'* Sandgate	———	....	....	....	....	11 A	22 9	19 A	12 3
26 *h* Shore Cliff	———	22 A	21 6	15 A	14 0	....	22 2	20 A	11 6
26 *i* Fort Twiss	———	10 P	22 0	....	14 3	....	22 3	....	12 10
26 *k* Fort Sutherland	———	22 A	20 0	16 A	14 6	13 A	22 0	....	12 2
26 *l* Fort Moncrieff	———	22 P	19 9	....	13 11				
26 *m* No. 23 Tower, Dymchurch	———	21 P	22 8	15 A	15 0	14 A	20 0	....	12 6
26 *n* No. 24 Tower	———	22 P	21 3	15 P	14 10	10 P	22 4	....	11 8
26 *o* No. 27 Tower	———	21 P	22 6	15 A	14 0	12 A	22 5	....	11 10
26 *p* Littlestone	———	22 A	24 4	14 P	16 0	13 A	21 7	....	10 3
26 *q* Romney	———	....	....	....	....	....	21 10	....	7 7
26 *r* No. 2 Battery	———	....	....	....	....	12 A	23 4	19 P	12 6
26 *s* No. 1 Battery, Dunge-	———	....	....	....	....	....	23 6	20 A	12 8
ness						13 P	23 6	....	13 0
26 *t* Redoubt, Dungeness	———	....	....	....	....				
26 *u* No. 3, Dungeness	———	....	....	....	....	11 P	21 6	....	5 0
26 *u'* Lydd Station	———								
26 *w* Jury's Gap	———								
26 *x* Camber	———	22 A	22 5	16 A	12 8				
27 *a* Enchantress, C. G. S.	Comm^r Dawson Mayne.	....	....	....	....	....	24 7	20 A	13 6
27 *c* Rye Bay, 31 Tower	———	....	23 4	15 A	15 5				
27 *d* Winchelsea	———	....	....	....	....	12 P	23 0	....	11 9
27 *f* Maddocks, C. G. S.	———	....	....	....	....	12 A	23 5	....	7 6
27 *g* Farlight	———								
27 *h* Ecclesbourne	———								
27 *i* Hastings	———								
27 *k* Priory Station	———	....	....	....	....	11 P	22 11	....	12 3
27 *m* Gulley Hill	———	22 A	22 10	15 A	16 6	....	23 5	21 A	12 10
28 *a* Eastbourne	Comm^r James Morgan.	....	....	....	....	9 P	22 8	20 A	11 2
28 *b* Hollywell	———	....	....	....	....	11 A	21 9	....	11 6
28 *c* Berling Gap	———	....	20 3	....	14 0	12 A	21 2	....	11 0
28 *d* Crow Link Gap	———	....	19 7	....	13 11	10 P	20 4	....	11 6
28 *e* Cuckmere	———	....	....	....	....	....	20 0	20 P	10 0
28 *f* Blatchington	———								
28 *g* Newhaven	———								
28 *i* Rottingdean	———								
28 *k* Blackrock	———	22 A	18 0	15 A	14 6				
28 *l* Brighton	———	....	18 8	....	13 6	12 A	19 4	18 P	9 2
28 *m* Hove	———								
28 *o* Shoreham, C. G. S.	———								
28 *o'* Entrance to Shoreham Harbour	———	21 P	14 6	14 A	11 8	11 P	14 11	19 A	9 6
29 *a* Lancing	Comm^r John F. Appleby.	22 A	18 0	16 A	11 10	11 A	18 9	20 A	9 0
29 *b* Worthing	———	....	17 10	15 A	12 5				
29 *c* Kingstown	———	....	17 4	....	11 9				
29 *d* Littlehampton	———	20 P	17 0	....	11 5	13 P	18 4	18 P	9 8
29 *e* Elmer	———	22 P	16 5	....	10 11				

Table X. (Continued.)

Station.	Inspecting Commander.	1834. Date.	1834. Greatest Range.	1834. Date.	1834. Least Range.	1835. Date.	1835. Greatest Range.	1835. Date.	1835. Least Range.
			ft. in.		ft. in.		ft. in.		ft. in.
29 *f* Bognor	Comm^r John F. Appleby.	22 A	16 8	16 A	11 2				
29 *g* Pagham	———	....	16 3	15 A	10 8				
29 *h* Selsey	———	....	14 10	16 A	10 1	12 P	15 8	20 A	8 1
29 *i* Thorney, C. G. S.	———								
29 *l* Chichester Harbour	———	22 P	12 11	15 A	8 2	13 A	13 6	19 A	7 5
29 *l* Near Chichester Harbour	———	....	13 2	....	8 4				
30 *a* Hayling Island	Comm^r G. C. Blake.	....	13 3	....	8 10	12 P	13 10	20 A	6 8
30 *b* Langstone Harbour	———	20 P	13 1	....	8 0	13 P	13 7	....	7 0
30 *c* Southsea Castle	———								
30 *d* Portsmouth Dockyard	———	22 P	13 0	....	7 11	....	13 8	....	6 6
30 *f* Hill Head	———	....	12 0	....	7 0	12 P	12 10	....	5 8
30 *f* Stokes Bay	———	....	....	....	....	10 A	11 0	....	6 2
30 *g* Hamble Station	———	....	12 4	14 P	6 3	13 P	12 10	....	5 8
31 *a* Cowes Roads	Comm^r Charles Deare.	....	....	....	....	12 P	13 0	21 A	6 1
31 *b* Ryde	———	20 P	12 1	14 A	8 1	....	13 0	....	6 1
31 *c* Bembridge	———	22 A	11 4	15 A	7 10	11 P	11 8	20 A	6 4
31 *d* Sandown	———	22 P	10 10	15 P	7 11	10 A	12 2	19 A	6 4
31 *e* St. Lawrence	———	22 A	9 6	15 A	6 0	11 A	9 6	20 P	5 2
31 *f* Atherfield Rocks	———	....	....	....	....	10 P	7 4	....	2 6
31 *g* Freshwater	———	....	7 3	....	3 2	....	7 6	21 A	2 4
31 *h* South Yarmouth	———	....	7 6	....	4 1				
31 *i* Newton Harbour	———	....	....	....	....	12 A	8 3	....	3 0
32 *a* Southampton	Comm^r Geo. Bissett.	....	....	....	....	....	11 9	18 A	1 2
32 *b* Lepe	———	22 P	10 10	15 A	6 4	13 P	11 9	20 A	5 1
32 *c* Pitts Deep	———	....	8 9	....	6 4	12 P	8 5	21 A	5 6
32 *d* Lymington	———	....	....	....	....	27 A	9 0	19 A	5 1
32 *e* Hurst Castle	———								
32 *f* Barton Cliff	———	22 A	5 8	14 A	2 6	11 P	7 0	21 P	3 6
33 *a* Bourne Bottom	Comm^r Samuel Meredith.	22 P	5 4	15 A	3 9				
33 *b* Poole Harbour	———	22 A	5 2	....	1 9				
33 *c* Flag Head	———	....	....	....	....	....	6 5	21 A	1 2
33 *c* Studland Bay	———								
33 *d* Swanage Bay	———	22 P	3 10	14 P	2 0	10 P	6 4	21 P	1 9
33 *d'* St. Alban's Head	———	....	....	....	....	....	7 0	19 P	1 4
33 *e* Kimmeridge Bay	———	21 P	6 8	15 P	2 4	....	7 3	19 A	1 6
34 *a* Lulworth Cove	Comm^r Ch. Knight.	....	6 6	16 A	2 3	11 P	7 2	20 A	1 3
34 *b* Osmington Mills	———	22 P	6 10	....	3 3	....	7 3	18 P	3 2
34 *c* Weymouth	———	....	6 8	17 A	2 8	9 P	7 0	20 A	2 4
34 *d* Portland Castle	———	....	5 11	16 P	2 4	12 P	7 4	....	2 1
34 *e* Fleet	———								
34 *f* Langton, C. G. S.	———								
35 *a* Abbotsbury	Comm^r Henry Boteler.								
35 *b* Burton	———	7 P	12 2	14 A	5 7		12 7	21 A	1 3
35 *c* Bridport Harbour	———	21 P	13 0	15 A	6 4	10 P	13 6	20 P	3 8
35 *d* Chidcock	———	....	....	....	....	11 P	13 4	20 A	5 0
35 *e* Lyme Cobb Station	———	....	13 2	15 P	9 8	....	13 1	19 P	5 1
35 *f* Axmouth	———	22 P	12 10	16 P	6 5	....	13 4	20 P	5 8
35 *g* Beer, C. G. S.	———	....	13 6	14 P	7 9	10 P	12 11	18 A	5 11
35 *h* Branscombe	———	21 P	12 1	16 P	7 0	11 P	13 4	20 A	5 5
36 *a* Sidmouth	Comm^r Wm. Usherwood.	....	....	....	....	....	13 6	....	5 6
36' *a* Weston	———	22 P	14 0	17 A	5 4	....	13 7	21 A	5 4
36 *b* Budleigh Sallerton	———	22 A	13 9	14 P	6 6	....	12 9	19 A	4 8
36 *c* Exmouth	———	20 P	13 8	16 P	7 6	....	11 11	21 A	5 0
36 *d* Dawlish	———	....	....	....	....	12 P	14 1	20 A	5 8
36 *e* Teignmouth Harbour	———	22 A	12 10	15 P	7 5	....	13 0	....	6 3
37 *a* Babbacombe	Comm^r J. T. Talbot.	21 P	13 1	15 A	7 9	11 P	14 4	19 A	5 7

Table X. (Continued.)

Station.	Inspecting Commander.	1834. Date.	1834. Greatest Range. ft. in.	1834. Date.	1834. Least Range. ft. in.	1835. Date.	1835. Greatest Range. ft. in.	1835. Date.	1835. Least Range. ft. in.
37 *a′* Torquay	Comm^r W. Usherwood.	21 P	14 4	16 P	8 2				
37 *b* Paignton	Comm^r J. T. Talbot.	21 P	14 4	16 P	8 1	11 P	14 6	21 A	5 7
37 *b′* Brixham Quay	——	22 P	13 4	15 A	8 0				
37 *c* Dartmouth	——	21 P	14 6	16 P	8 7				
37 *d* Torcross, Start Bay	——	....	13 10	15 P	7 9	12 P	15 0	20 A	6 4
37 *e* Prawles Head	——	....	16 2	16 P	9 2	....	15 1	....	7 1
37 *f* Salcombe	——	....	15 8	16 A	9 0	....	15 9	....	3 6
37 *g* Hope Cove	——	21 A	15 2	14 A	9 4	11 P	16 3	20 P	7 10
37 *h* Challabro	——	11 A	15 9	16 A	10 0	....	16 4	20 A	7 11
38 *a* Mothercombe	Comm^r C. Basden.	21 P	15 9	16 P	9 5	....	16 3	....	7 11
38 *b* Yealme	——	....	15 11	15 A	9 11	....	16 5	....	7 11
38 *c* Bovisand	——	22 A	15 0	14 P	9 5	12 P	16 4	....	7 10
38 *d* Stonehouse Point	——	22 P	15 7	16 A	10 2	....	16 9	20 P	8 8
38 *e* Cawsand	——	21 P	15 6	15 A	9 9	9 A	16 8	20 A	8 0
38 *f* Port Wrinkle	——	....	15 4	15 P	9 0	12 P	16 5	....	7 8
39 *a* East Looe	——	....	15 4	15 A	9 9	11 P	16 0	....	7 10
39 *b* Polperra	Comm^r George Pearce.	....	15 5	....	9 9	....	16 2	....	8 0
39 *c* Polruan	——	....	15 7	....	9 11	....	16 4	....	8 1
39 *d* Polkerris	——	....	15 9	....	9 10	....	16 3	20 P	8 1
39 *e* Porthpean	——	....	15 6	....	10 0	....	16 3	....	8 1
39 *f* Mevagissey	——	22 A	15 6	16 P	9 10	....	16 2	....	7 11
39 *g* Gorran Haven	——	....	15 5	15 A	10 3	12 P	16 5	....	8 0
39 *h* Port Lowe	——	21 P	15 2	....	9 9	11 P	16 0	....	7 11
40 *a* Gerran's Bay	Comm^r R. S. Triscott.	....	15 1	....	9 11	....	16 1	....	8 2
40 *b* St. Mawe's, C. G. S.	——	....	16 2	14 A	9 10	12 P	16 0	....	8 2
40 *c* Helford Harbour	——	....	....	....	....	....	15 10	....	8 1
40 *d* Coverack	——	....	14 6	15 A	9 5	11 P	15 9	....	8 0
40 *e* Cadgwith Cove	——	22 P	15 0	15 P	9 2	....	15 8	20 A	9 1
40 *f* Mullion Cove	——	22 A	16 3	....	9 8	....	16 1	19 P	7 7
41 *a* Prussia Cove	Comm^r Digby Marsh.	21 P	14 5	14 P	9 9	....	16 0	20 P	7 10
41 *b* Mousehole	——	....	15 0	15 A	9 0	12 P	16 11	....	8 2
41 *b′* Penzance Pier	——	....	15 4	16 A	10 3	11 P	16 6	....	8 3
41 *c* Sennen Cove	——								
42 *a* St. Mary's, Scilly	Mr. Charles Steele.	....	15 7	14 P	9 9	12 A	17 2	19 A	8 1
42 *b* St. Agnes	——	21 A	15 1	15 A	11 9	....	16 8	19 P	7 8
42 *c* Tresco, Scilly	——	21 P	15 10	14 P	10 5	10 A	17 7	20 P	8 4
42 *d* St. Martin's	——	....	16 0	....	9 11	11 P	17 6	....	8 6

North-west Coast of Cornwall and Devon.

Station.	Inspecting Commander.	1834. Date.	1834. Greatest Range. ft. in.	1834. Date.	1834. Least Range. ft. in.	1835. Date.	1835. Greatest Range. ft. in.	1835. Date.	1835. Least Range. ft. in.
41 *d* Pendeen Cove	Mr. D. Williams.	21 P	18 5	15 P	11 10	11 A	19 10	18 P	10 0
41 *e* St. Ives	——	....	19 8	15 A	11 8	11 P	22 0	20 A	9 4
43 *a′* St. Agnes	——	22 A	21 0	14 P	11 9	....	23 4	20 P	10 2
43 *a* Portreath	——	21 P	20 6	15 A	12 10	....	21 8	20 P	10 6
43 *b* Newquay	——	....	23 4	15 P	13 10				
43 *c* Padstow	——	....	20 8	14 A	13 10	....	23 3	19 P	10 9
43 *d* Boscastle	——	....	22 6	15 A	13 5				
43 *e* Port Isaac	——	22 A	21 9	....	12 11	....	24 5	20 A	12 5
44 *a* Clovelly	Mr. J. Lister.	21 P	24 0	....	14 8	....	26 4	....	12 9
44 *b* Greysand Hill, near Banstaple	——	22 P	23 9	14 P	15 5	....	24 4	20 P	12 9
44 *c* Ilfracombe	——	....	26 4	15 A	21 6	....	28 6	....	13 8
44 *d* Lymouth	——	21 A	29 4	16 P	17 8	12 P	31 10	....	15 0
45 *a* Portheinion	Comm^r J. C. Fitzgerald.	21 P	25 10	15 A	15 3	11 P	27 2	20 A	13 6
45 *b* Tenby	——	....	24 7	14 P	11 9	12 A	25 9	....	5 4
45 *c* Newquay	——	....	11 0	15 P	3 9	11 P	15 5	19 P	6 0

TABLE X. (Continued.)

Coast of Ireland.

Station.	Inspecting Commander.	1834.				1835.			
		Date.	Greatest Range.	Date.	Least Range.	Date.	Greatest Range.	Date.	Least Range.
			ft. in.		ft. in.		ft. in.		ft. in.
46 *a* Dublin	Comm^r W. Nearne.	....	....	....	....	10 P	13 11	18 P	6 3
46 *a* Kingstown Harbour	——	20 P	11 3	15 A	7 4	....	11 6	17 P	6 1
46 *a* Kingstown	——								
46 *b* Bray	——	....	10 5	14 A	7 11	....	10 5	18 P	6 5
46 *c* Greystones	——	....	9 10	15 A	6 7	....	9 8	20 A	1 3
46 *d* Five Mile Point	——	21 P	9 3	15 P	4 11	....	9 1	17 P	4 0
46 *e* Wicklow Harbour	——	20 P	7 6	15 A	5 1	....	8 0	18 P	3 7
46 *e'* Long Rock	——	....	....	....	....	....	6 7	....	2 6
47 *a* Jack's Hole Point	——	....	....	....	....	....	4 9	17 P	1 8
47 Adrigole	——	21 P	9 6	15 P	6 2				
47 *b* Arklow	Lieut. F. S. Boileau.	21 P	3 7	12 P	1 6	10 A	2 11	16 P	0 1
47 *c* Kilmichael	——	....	4 4	....	2 8	11 P	3 8	18 P	1 8
47 *d* Ballymoney	——	....	3 0	13 P	0 6	11 A	3 8	....	0 6
47 *e* Glynn	——	....	3 2	13 A	0 10	11 A	3 5	....	0 2
47 *f* Cahore	——	....	3 0	15 P	0 6	....	3 6	19 P	0 2
47 *g* Blackwater	——	21 A	6 1	17 A	1 8				
48 Wexford	Mr. Thomas Dunlop.	....	....	....	....	10 P	5 9	16 P	1 0
48 *a* Curracloe	——	....	6 4	15 A	1 5				
48 *b* Rosslare	——	8 A	5 2	16 P	2 0	13 P	5 2	20 P	1 10
48 *c* Ballyglory	——	9 P	7 9	....	3 10	11 P	6 6	18 A	4 0
48 *d* Carnsore	——	21 P	7 10	....	4 5	10 P	8 6	19 A	4 0
48 *e* Kilmore Station	——	....	10 9	17 A	5 5	12 A	11 8	....	6 7
48 *f* Lough Bar	——	7 P	8 7	16 P	4 11	10 P	7 3	18 A	4 7
49 Waterford Harbour	Lieut. Charles Bagehot.	....	....	....	....	....	12 11	19 P	7 1
49 *a* Feathard Station	——								
49 *a'* Waterford Station	——	22 P	13 4	16 A	8 8	11 P	13 8	....	7 5
49 *b* Duncannon, Lumsden's Bay	——								
49 *c* Dunmore Station	——	....	....	....	....	....	12 11	20 P	6 3
49 *d* Ballymacan	——	21 P	10 5	16 P	6 10	....	12 0	19 A	6 0
49 *e* Tramore Station	——	9 P	11 1	18 A	2 8	11 A	13 0	20 P	6 8
49 *f* Boumahon	——	....	....	....	....	12 A	12 6	19 A	6 11
50 *a* Helwick Head	Comm^r H. E. Atkinson.	21 A	12 3	16 A	8 2				
50 *b* Ardmore	——	21 P	12 0	16 P	8 2				
50 *c* Youghall	——	....	11 9	....	8 5				
50 *d* Knockadoon	——								
50 *e* Ballycotton	——								
51 *a* Ballycrooneen	Comm^r Sir R. Hagon.	22 A	10 2	14 P	6 0	11 P	12 9	20 A	6 10
51 *a* Ballyrobin Point	——	....	12 2	16 A	6 9				
51 *b* Poor Head	——	21 P	12 6	15 P	8 0	11 P	12 4	....	6 6
51 *c* Roche Lighthouse	——	....	11 11	14 A	7 11	10 P	12 3	19 A	6 9
51 *d* East Ferry Station	——	....	13 3	16 P	8 9	12 P	13 2	20 P	6 11
51 *e* Cove of Cork	——	22 P	11 7	....	8 4	11 P	12 8	....	4 4
51 *f* City of Cork	——	21 P	13 2	14 P	9 3	....	13 7	19 P	7 9
51 *g* Crosshaven	Comm^r Thomas Greene.	22 P	11 9	15 A	8 3	....	12 7	19 A	7 1
51 *h* Robert's Cove	——	21 P	11 11	15 A	8 1	10 P	11 0	19 A	6 9
52 Sandy Cove	——	....	11 4	16 A	7 10				
52 *a* Oyster Haven	——	22 P	11 9	15 A	7 9	11 P	12 0	20 P	6 6
52 *b* Upper Cove	——	21 P	11 3	14 A	7 10	11 A	12 1	19 A	6 7
52 *c* Old Head Kinsale	——	22 P	11 10	15 P	8 4	11 P	12 7	19 P	2 6
52 *d* Howe Strand	——	21 P	11 5	15 A	7 6	....	11 10	20 A	6 5
52 *e* Courtmasherry	——	....	10 9	14 A	7 9	12 P	12 5	....	6 7
52 *f* Barry's Cove	——	9 P	11 3	15 P	8 6				

Table X. (Continued.)

Station.	Inspecting Commander.	1834. Date.	1834. Greatest Range.	1834. Date.	1834. Least Range.	1835. Date.	1835. Greatest Range.	1835. Date.	1835. Least Range.
			ft. in.		ft. in.		ft. in.		ft. in.
52 Ring Bar	Comm^r Thomas Greene.	21 A	10 2	15 A	5 8				
52 *g* Dunny Cove	———	....	9 10	....	5 5	11 P	11 1	19 P	6 4
52 *h* Dirk Cove	———	20 P	10 6	....	6 5	....	11 1	20 P	5 10
53 *a* Mill Cove	Comm^r W. Finlaison.	21 A	9 8	13 A	8 8	....	10 9	19 A	5 10
53 *b* Glandore	———	21 P	10 8	15 P	7 2	12 A	11 0	19 A	6 0
53 *c* Castle Townsend	———	21 A	10 5	....	7 4	11 P	10 10	20 A	5 3
53 *d* Barlogne	———	21 P	10 0	....	6 10	11 P	11 2	19 A	5 8
53 *e* Baltimore	———	....	9 6	16 P	6 7	....	11 1	....	5 6
53 Skull	———	....	9 10	15 P	6 5				
53 *g* Long Island	———	....	....	....	....	....	10 5	20 P	5 5
53 *g* Crookhaven	———	....	9 3	....	6 6	....	10 4	....	5 4
53 *h* Dunmanus	———	....	10 1	13 P	5 0	10 P	10 5	21 A	5 2
54 Bluehill, near Bantry	Lieut. A. Evanson.								
54 Collieries, Berehaven	———	....	....	....	....	10 P	10 6	19 P	0 6
54 Whitehorse Station, Bantry Bay	———	....	....	....	....	11 P	10 6	18 P	5 1
54 *a* Castleton	———	21 A	9 8	14 P	5 11	....	10 6	....	5 0
54 *a* Black Ball Station	———	22 A	9 7	....	6 2				
54 *b* Garnish	———	....	....	....	....	10 P	10 5	19 P	5 0
54 *c* Kilmichalog	———	20 P	10 7	15 P	6 3				
54 *d* Ballychroon	———	....	10 5	14 P	6 0				
54 *e* Whiddy Island	———	22 A	10 1	....	6 1				
55 *a* Whitestrand	Comm^r John Monday.	21 P	10 11	....	4 6				
55 *b* Ballinskelligs	———	....	9 9	....	6 0	11 P	11 0	19 P	4 9
55 *c* Port Magee, W. entrance to Valentia	———	20 P	10 7	15 P	6 2	....	11 5	20 A	5 5
55 *c* East end of Valentia	———	22 A	10 7	....	6 6	10 P	11 10	20 A	4 11
55 *d* Kells	———	20 P	9 2	....	2 6	11 P	12 0	19 P	5 3
56 Dunquin	———	22 A	13 8	14 P	8 4				
56 *a* Minard	Lieut. John Bowie.	20 P	11 0	14 P	6 1	11 P	12 4	19 P	5 1
56 *b* Dingle	———	21 P	10 8	16 A	5 11	....	12 1	....	5 7
56 *c* Ventry	———	....	11 1	15 P	6 7	11 A	11 11	....	5 5
56 *d* Ferriter's Cove	———	....	12 3	14 A	6 11	11 P	13 0	19 A	5 2
56 *e* Smerwick Harbour	———	21 A	11 11	15 P	6 11				
56 *e'* Ballydavid	———	....	....	....	....	11 A	13 0	19 P	5 7
56 *f* Brandon Bay	———	20 P	12 6	....	7 4	11 P	13 5	19 A	6 11
57 *a* Castle Gregory	Comm^r W. Shepheard.	22 A	13 4	14 P	7 11	....	14 0	21 A	6 8
57 *b* Barrow, C. G. S.	———	20 P	13 6	....	7 5	....	14 11	20 A	6 1
57 *c* Ballyheize	———	....	....	....	....	....	14 0	19 A	7 0
57 *d* Cashen River	———	21 P	12 6	....	8 6	9 P	14 0	19 P	6 0
57 *e* Beal, River Shannon	———	....	13 10	....	8 7	12 P	14 11	18 P	6 9
58 *a* Dunbeg	Comm^r G. E. Marshall.	20 P	13 5	15 A	7 4				
58 *a* Kilrush	———	....	13 9	....	8 4	11 P	15 0	19 A	6 7
58 *b* Kilcradane	———	....	13 3	15 P	6 4	....	14 5	18 P	6 9
58 *c* Kilkee	———	22 A	14 2	14 P	8 7	11 A	14 8	18 P	5 6
58 *d* Killard	———	20 P	13 4	15 P	7 8	11 P	14 7	18 P	5 2
58 *e* Seafield	———	....	13 3	14 P	7 11	....	14 2	19 A	6 2
58 *f* Freagh	———	19 P	12 6	....	8 0	10 P	13 7	19 P	7 6
58 *g* Liscannor	———	21 P	12 10	15 A	8 5	11 A	13 9	19 A	6 7
59 *a* Fairhill	Lieut. W. B. White.	20 P	14 2	15 P	4 3				
59 *b* North side of Arran	———	....	13 9	15 A	8 0	11 P	14 6	19 P	6 3
59 *c* Ballyonughan	———	....	14 0	14 P	8 1	....	15 4	18 P	6 9
59 *d* Newharbour	———	....	14 3	15 P	7 8	....	15 8	20 A	6 4
59 *e* Barna	———	....	13 8	14 P	8 4	....	15 5	....	6 0
59 *f* Costello Bay	———	....	13 5	....	7 10	....	13 3	19 P	6 5
59 *g* Lettermore	———	....	13 9	....	7 11	....	15 3	....	5 7
60 *a* Innislaken Island	Mr. John Andrews.	8 P	15 0	15 A	8 0	12 A	14 8	18 P	6 9

TABLE X. (Continued.)

Station.	Inspecting Commander.	1834. Date.	1834. Greatest Range.	1834. Date.	1834. Least Range.	1835. Date.	1835. Greatest Range.	1835. Date.	1835. Least Range.
			ft. in.		ft. in.		ft. in.		ft. in.
60 *b* Mannin Bay	Mr. John Andrews.	20 P	12 2	15 P	6 11	11 P	13 3	18 P	5 7
60 *c* Cleggan	———	21 P	12 2	14 P	6 10	....	13 3	19 P	5 6
60 *d* Killery	———	20 P	12 0	....	6 8	....	13 1	18 P	5 4
61 *a* Innishen	———	21 A	12 4	17 A	7 3	10 P	13 9	....	4 8
61 *b* Old Head	Lieut. Joseph Irwin.	21 P	10 8	16 P	8 1				
61 *c* Innisbofin	———	....	12 6	14 P	7 0	11 P	13 3	20 A	5 4
61 *d* Mynish	———	20 P	12 0	14 P	6 10	11 P	13 3	20 A	5 3
61 *e* Achill Beg	———	21 A	11 7	15 A	6 8	....	13 1	19 A	5 0
61 *f* Keel	———	22 P	11 6	15 P	7 0	12 P	12 3	20 A	5 1
62 Ballycroy	Lieut. John Nugent.	20 P	11 4	14 P	6 6	....	12 5	18 P	4 8
62 Dulaugh	———	....	....	....	....	10 P	12 7	19 P	5 0
62 Elly Bay Neptune	———	22 P	11 1	16 A	6 4	....	12 6	19 A	4 5
62 Bellmullet	———	....	9 11	....	5 0				
62 *a* Bullsmouth	———	20 P	11 6	14 P	6 7	....	10 6	20 P	3 2
62 *b* Doohooma	———	22 A	11 8	17 A	6 0	11 P	12 0	....	4 6
62 *d* Blacksod Station	———	20 P	11 1	16 A	6 3	....	12 7	....	4 10
62 *e* Ballyglass	———	....	10 8	14 P	6 7	....	11 8	19 P	3 6
63 *a* Doonkeeghan	Lieut. W. Sterne.	....	10 6	....	6 0	....	11 9	18 A	4 11
63 *aa* Portaclog	———	22 P	10 4	15 A	5 8	....	11 10	19 P	4 8
63 *b* Port Terlin	———	8 P	10 11	16 P	5 1	12 P	11 6	....	4 8
63 *c* Bealderig	———	20 P	10 7	14 P	6 4	11 P	12 2	20 P	2 3
63 *d* Ballycastle	———	....	11 0	16 P	6 6				
63 *e* Lacken	———	21 A	11 2	15 A	5 6	11 P	12 4	19 A	4 9
63 *f* Kilcummin	———	20 P	11 1	16 P	6 0	....	12 5	20 A	3 11
63 *g* Ross	———	....	11 2	15 A	6 10	....	12 3	19 P	4 11
64 *a* Inniscrone	Lieut. H. J. Clifford.	22 A	10 8	14 P	6 3	....	10 11	21 A	4 6
64 *b* Pulloghery	———	....	....	....	....	....	11 9	20 A	0 7
64 *c* Pullendiva	———	20 P	11 1	....	6 1	10 P	11 11	19 P	4 11
64 *cc* Portavad	———	21 P	10 9	16 P	6 8	....	11 11	20 P	4 11
64 *d* Raughly	———	22 P	11 2	14 P	6 6	11 P	12 4	19 P	4 10
64 *dd* Sligo Harbour	———	....	11 1	13 P	5 11	....	12 6	....	5 1
64 *e* Mullaghmore	———	21 A	11 4	16 P	6 5	....	13 1	....	5 0
64 *f* Ballyshannon	———	21 P	10 11	14 P	7 1				
64 Port New	———	20 P	10 11	16 P	6 2				
65 *a* Dooran	Comm[r] H. Layton.	....	11 7	14 P	6 9	12 P	11 9	....	3 6
65 *b* Trybane	———	....	12 1	16 P	6 2	10 P	12 3	....	4 11
65 *c* Killybegs	———	21 P	11 3	14 P	6 10	12 P	12 0	....	4 11
65 *c* Teelin Harbour, East	———	22 P	10 9	....	7 1	....	12 2	....	5 2
65 *c* Teelin Harbour, West	———	21 A	11 1	....	6 8	11 P	12 4	....	4 11
65 *d* Malinbeg	———	22 P	11 2	15 A	6 1	....	12 3	21 A	4 7
65 *e* Port Nov	———	22 P	10 10	16 P	6 2	11 P	12 3	19 P	4 8
65 *g* Daurus	———	....	11 0	13 A	6 8	11 P	12 2	....	4 8
66 Curran's Point	Comm[r] W. B. Dobson.	....	11 6	16 P	6 8	10 A	12 2	20 P	5 0
66 Downing's Bay	———	....	13 2	14 P	5 8	12 A	11 6	20 A	5 9
66 *a* Rutland Island	———	21 A	10 8	14 A	4 6				
66 *b* Guidore	———	21 P	11 0	16 P	6 4	10 P	12 6	19 P	4 8
66 *c* Port Ballynash	———	....	10 7	15 P	5 5	11 P	10 8	18 A	4 10
66 *d* Sheephaven	———	22 P	11 5	....	5 7	....	12 7	20 P	3 11
66 *f* Crowris	———	21 P	13 2	....	6 11	....	12 10	19 P	4 8
66 *g* Rathmullen	Comm[r] Charles Bosden.	....	13 0	14 P	7 5	....	13 9	....	4 11
67 *a* Dunree Fort	———	22 P	12 5	15 P	7 1	....	13 3	....	4 5
67 *b* Dunaff Head	———	21 P	11 5	....	5 6	....	11 5	18 A	4 10
67 *c* Malin Head	———	....	10 3	14 P	5 9	....	11 6	19 P	3 5
67 *d* Couldaff Glebe	———								
67 *e* Moville	———	22 P	6 9	15 A	3 8	....	7 2	....	2 3
68 *a* Port Rush	Comm[r] E. W. Gilbert.	21 P	5 7	....	2 9	....	6 5	....	1 5
68 *b* Ballintrae	———	22 A	6 1	15 P	2 4	....	5 11	20 P	0 10

Table X. (Continued.)

Station.	Inspecting Commander.	1834. Date.	1834. Greatest Range.	1834. Date.	1834. Least Range.	1835. Date.	1835. Greatest Range.	1835. Date.	1835. Least Range.
			ft. in.		ft. in.		ft. in.		ft. in.
68 *b* Ballintry	Comm^r^ E. W. Gilbert.	21 A	4 6	15 A	1 7	....	4 5	18 P	0 7
68 *c* Glenarm	——	....	....	....	....	11 A	6 4	19 P	3 11
68 *d* Ballycastle	——	7 A	3 9	....	1 6	11 P	3 8	20 A	1 4
68 *d* Ballycastle, C. G. S.	——	....	....	....	....	10 P	11 8	19 P	5 4
68 *e* Rathlin Island	——	22 P	3 2	....	1 3	12 P	3 6	17 P	0 11
68 *f* Torr Head	——	17 P	5 7	11 A	2 5	10 A	4 10	19 P	1 6
68 *g* Cushendon	——	16 A	6 3	7 A	3 10	12 P	5 2	20 A	3 5
68 *h* Cushendall	——	21 A	5 9	15 A	3 5	11 A	4 1	19 A	4 0
69 *a* Garrow Point	Comm^r^ Douglas Cox.	....	6 2	16 P	4 10	9 A	6 9	18 P	3 10
69 *a* Belfast	——	8 P	9 7	17 P	7 1	11 P	10 3	20 A	6 7
69 *c* Larne	——	21 A	7 11	14 A	5 11	11 A	8 5	19 A.	5 1
69 *d* Ballygally	——	....	7 3	....	5 2	12 A	7 5	19 P	4 7
69 *e* Port Muck	——	....	8 3	15 A	6 3	11 A	8 6	19 A	5 5
69 *f* Black Head	——	8 P	9 2	14 P	5 0	13 P	8 9	20 A	1 11
69 *g* Carrickfergus	——	21 A	9 10	15 A	7 0	11 A	9 10	....	6 1
69 *h* White House	——	20 P	9 8	13 P	6 10	....	10 2	18 A.	2 10
70 Strangford	——	....	....	....	....	10 P	5 8	20 P	3 6
70 *a* Hollywood	Comm^r^ Charles Smith.	21 A	9 8	15 A	7 3				
70 *a'* Crawford's Burn	——	....	9 5	....	7 3	12 A	10 0	20 P	5 8
70 *b* Bangor	——	....	9 6	....	6 10	10 A	10 2	17 P	6 0
70 *c* Grimsport	——	19 P	9 6	....	6 10	....	10 7	18 P	5 10
70 *c'* Orlock Hill	——	21 A	10 1	....	7 3	....	10 8	21 A	4 6
70 *d* Donaghadee	——	....	11 4	....	8 0	....	11 8	19 P	7 2
70 *e* Millisle	——	....	12 0	....	8 7	....	12 10	17 P	7 4
70 *f* Ballywater	——	....	12 6	....	8 9	11 A	13 4	20 P	8 0
70 *g* Ballyhalbert	——	20 P	13 1	....	9 1	....	13 6	19 P	8 2
70 *h* Cloughy Bay	——	....	13 8	....	9 4	....	14 8	20 P	8 6
70 *i* Tarra Bay	——	21 A	14 0	....	9 10	....	15 10	19 P	8 8
70 *k* Portaferry	——	19 P	10 7	14 P	8 8	12 A	11 2	18 P	6 2
71 *a* Gun's Island	Comm^r^ Henry Ellis.	20 P	14 1	15 A	9 4	....	15 5	20 A	8 6
71 *b* Ardglass	——	....	14 6	....	10 4	10 P	15 6	....	8 7
71 *c* St. John's Point	——	22 A	14 9	....	9 6	....	16 2	19 P	7 4
71 *d* Newcastle	——	20 P	15 1	14 P	11 0	11 A	15 6	21 A	8 0
71 *e* Annalong	——	....	14 2	15 A	10 0	11 P	15 4	19 A	8 7
71 *f* Lee Stone	——	21 P	13 4	15 A	7 6	11 A	15 11	20 P	12 0
71 *g* Cranfield	——	20 P	14 0	17 A	11 0	11 P	15 5	19 A	8 1
72 *a* O'Meath	Comm^r^ Edw. Handfield.	22 P	14 10	15 A	10 8	....	15 9	19 P	9 4
72 *a* Carlingford Station	——	21 A	14 5	15 P	10 8				
72 *b* Greenore Point	——	....	14 3	15 A	10 0	10 P	15 3	....	8 11
72 *c* Cooley Point	——	21 P	15 4	....	10 3	....	15 4	20 P	8 6
72 *c* Giles Quay	——	21 A	16 1	....	9 7	11 P	15 9	20 A	8 3
72 *d* Soldier's Point	——	....	13 3	....	6 11	....	14 0	21 A	8 7
72 *e* Dunany Point	——	20 P	14 10	....	9 7	....	15 7	19 A	8 4
72 *f* Clogher Head	——	21 A	13 9	14 P	5 11	....	15 2	18 A	2 9
73 *a* Mouth of the Boyne	Comm^r^ Thomas Ross.	21 A	9 11	15 A	7 11	10 P	9 6	20 P	6 7
73 *b* Nannywater	——	20 P	13 8	....	9 0	11 P	14 4	20 A	7 3
73 *c* Balbriggan	——	....	13 6	....	8 11	....	14 4	....	7 11
73 *d* Skerries	——	....	....	....	....	11 A	13 0	18 P	9 2
73 *e* Rush	——	....	....	....	....	11 P	12 6	20 P	8 2
73 *f* Lough Shinney	——	21 P	14 0	14 A	9 11				
73 *g* Rogerstown	——								
73 *h* Portrane	——	21 P	12 4	15 A	8 6	11 A	13 11	20 A	7 3
73 *i* Lamboy Island	——	22 A	12 6	....	8 2	10 P	13 5	20 A	6 8
73 *k* Malahide	——	....	....	....	....	11 A	12 0	....	7 0
73 *l* Baldoyle Creek	——	....	....	....	....	....	10 5	18 P	7 5
73 *m* Howth Harbour	——	21 A	12 0	....	8 0	11 P	13 1	20 A	7 0

TABLE X. (Continued.)

Coast of America.

Honourable MAHLON DICKERSON, Secretary of the Navy, United States.

Station.	Observers.	Latitude N.			Longitude W.			Date.	Greatest Range.		Date.	Least Range.	
		°	′	″	°	′	″		ft.	in.		ft.	in.
Eastport (Maine)	Jery Burgin, Inspector.	44	54	0	66	56	0	11 P	22	10	21 A	14	8
Mount Desert Island..	Henry S. Jones.	44	9	0	68	31	0	....	13	4	22 P	8	1
Portland............	John Williams.	44	39	16	70	20	30	....	12	2	21 A	7	0
Portsmouth Navy Yard	Jos. R. Jarvis, Lieut. United States Navy.	43	4	44	70	45	0	10 P	10	4	20 A	6	1
Gloucester..........	John Webber.	42	36	0	70	42	0	10 P	12	8	21 P	6	9
Boston Navy Yard....	Commodore John Downes, Duncan Bradford, Professor of Mathematics, Henry French, passed Midshipman.	42	20	0	71	4	9	....	14	8	22 A	10	11
Cape Cod	Richard Ainsworth.	42	2	6	70	4	0	....	12	6	21 A	7	3
Province Town	Major James D. Graham, United States Corps of Topographical Engineers.	42	2	45	70	13	0	....	12	6	22 A	7	1
Nantucket	William Coffin.	41	16	12	70	7	42	12 A	2	6	....	0	11
Newport............	Col. J. G. Totten, Engineers, assisted by Lieut. Child, Artillery.	41	29	0	71	21	14	10 P	6	0	21 A	2	6
Warren	Lieut. Joel Abbot, United States Navy.	41	44	0	71	15	15	....	6	8	20 A	2	7
Gardiner's Bay	M'Perry, Master Commander, United States Navy.	41	4	0	72	5	0	....	3	5	21 A	1	5
New York Navy Yard..	Commodore C. G. Rigeby, Commander M. F. Mix.	40	42	40	74	1	8	....	6	6	20 A	1	6
Sandy Hook	Josiah Tattnall, Lieut. U. S. Navy.	40	28	0	74	1	0	....	7	1	....	2	7
Delaware (Breakwater)	A. R. Hetzel, 2nd Infantry.	38	57	0	75	10	0	10 P	6	4	20 P	3	0
Old Point Comfort....	C. H. Kennedy, Lieut. United States Navy.	37	0	0	76	22	10	10 P	3	9	21 A	1	10
Gosport Navy Yard ..	William P. S. Sanger, Engineer.	36	50	50	76	18	47	11 P	4	5	21 A	2	1
Cape Hatteras	Isaac S. Farrow, and Joseph C. Jennett.	35	14	0	75	30	0	9 P	5	6	19 A	2	0
Cape Fear River	J. Dimeck, Capt. Artillery.	33	48	0	78	9	0	10 P	6	11	20 A	2	7
Charleston	W. H. Pettes, Lieut. Artillery.	32	44	0	80	1	0	11 P	7	11	....	3	6
Savannah	C. S. Merchant, Capt. Artillery.	32	2	0	81	3	0	10 P	8	5	....	1	5
St. Augustine........	F. L. Dancy, Lieut. Artillery.	29	48	30	81	35	0	10 P	6	7	21 A	3	1
Key West	F. L. Dade, Brevet Major, United States Army.	24	29	0	81	55	0	13 A	2	6	21 P	1	6
Tampa Bay..........	R. A. Lantzinger, Major, United States Army.	28	5	0	83	18	0	15 P	3	3	17 P	0	8
Pensacola Navy Yard..	W. Chauncey, commanding Navy Yard, W. K. Latimer, Master Commandant, and Nahum Warren, Sailing Master.	30	32	0	87	12	0	13 A	2	3	20 A	0	10
Mobile Point	F. S. Belton.	30	13	0	88	21	0	11 A	2	1	....	0	8
Fort Wood..........	John M. Creylar, Assistant Surg., United States Army.	29	15	0	89	35	0	13 P	2	7	20 P	0	2
Fort Pike	John Mountfort, Major, Artillery.	28	0	0	89	0	0	....	1	8	21 A	0	0

TABLE X. (Continued.)

Coast of Portugal.

Baron de SA DA BANDEIRA, Minister and Secretary of State for the Marine Department. A Commission consisting of Major Gen. JOSE XAVIER BRESSAN LEITE, Col. MARINO MIGUEL FRANZINI, Capt. JOÃO DE FONTES PEREIRA DE MELLO, Capt. ANTONIO LOPEZ DA COSTA ALMEIDA, and JOZE DE MELLO DE GOVEA PREGO.

Station.	Observers.	Greatest Range.	Least Range.
		ft. in.	ft. in.
Oporto			
Vianna	—— Carvalho.	10 3	4 3
Peniche	Captain Sá.	10 5	4 6
Cascaes	Captain Leotte.	10 0	4 6
Sines	Captain Nieira.	9 0	3 10
Pera	Lieutenant Rego.	10 6	4 2
Bay of Lagos		10 9	4 0

Coast of Spain.

Count TORENO.

Station.	Observers.	Greatest Range.	Least Range.
		Spanish ft. in.	Spanish ft. in.
Bilboa	Henry Thompson, Second Master, Saracen.	13 5	4 1
Santander	Jozé M. Chrum.	14 3	6 4
Ferrol	Captain Antonio Doral.	13 5	5 8
Camariñas	Angel Valdez.	12 0	5 6
Cadiz	Captain de Puonto, Luis de Caig.	11 1	4 9
Algesiras	Andres Ortiz.	3 5	1 5
Ceuta	Gorge P. Lasso de la Vega.	3 5	1 6

Coast of France.

M. BEAUTEMPS BEAUPRÉ.

Station.	Observers.	Greatest Range.	Least Range.
		French ft. in.	French ft. in.
Dunkerque		16 5	9 5
Calais			
Boulogne			
Cayeux			
Dieppe			
Havre			
Lambrille		17 8	7 8
Barfleur	De Lamisse.	17 3	8 3
Cherbourg	D'Aboville.	17 3	7 5
Granville		37 6	16 7
Chausey		30 4	20 2
St. Servan	P. Trehouart.	34 7	14 5
Bréhat	A. D. Protet.	30 32	13 5
Abrevrack	Jaouen.	22 04	10 05
Ile d'Ouessant	Duchou.	19 0	8 7
Brest	Escande.	19 6	9 1

Coast of Belgium.

Station.	Observers.	Greatest Range.	Least Range.
		French Metres.	French Metres.
Fort d'Ostend	A. Kempynck.	4·10	2·95
Blankenberg	J. A. Claeys.	4·17	3·71
Rade St. Marie	D. T. A. Nuerveus.	2·35	1·80
Anvers	T. Sams.	4·67	2·80
Chenal du Port de Nieuport	A. Kempynck.	4·85	2·65

TABLE X. (Continued.)

Coast of the Netherlands.

Dr. G. MOLL, General Inspector.

Station.	Observers.	Greatest Range.	Least Range.
		Dutch Ells.	Dutch Ells.
Spaarndam	I. Kros.		
Zwanenbury	P. de Leeuw.		
Amsterdam	C. Aleywyn.		
Rottum	A. van Rhyn.	2·70	1·62
Ameland	Fenning.	2·30	1·40
Ter Schelling	J. H. Hofmeister.	2·10	1·30
Nieuwdiep	W. H. Sahernis.	1·34	·80
Kykduin	A. E. Thierens.	1·57	·91
Petten	G. Tabuis.	1·87	1·40
Katwyk	J. R. Cambier.	2·02	1·02
Delflandschehoofden	J. R. Loutman.	1·88	1·15
Brielle	A. A. Bouricius.	1·76	·93
Hellevoetsluis		2·34	1·11
Goederede	J. Aulladig.	2·81	2·36
Brouwershaven	V. H. Tulleken.	3·21	2·77
Westkapelle	Byl desroe.	3·97	2·18
Flushing		4·31	2·75
Zwin or Sluice deep		4·30	3·18

Coast of Denmark.

Major-Gen. CHRISTENSEN. Superintendent, Captain TEGNER.

Station.	Observers.	Latitude N.	Longitude E.	Greatest Range.	Least Range.
		° ′	° ′	Danish Feet.	Danish Feet.
Altona	Superintendent, Christensen.	53 32½	9 57	8·20	4·89
Pin Aue	Captain Christensen.	53 40½	9 32½	9·82	6·77
Gluckstadt	———	53 47	9 25	9·97	6·52
Brunsbuttel	———	53 54	9 1½	9·85	6·14
Meldorf	———	54 5½	9 1½	10·05	7·67
Tonningen	Superintendent, Major Lund.	54 18¼	8 56½	9·76	6·42
Stein Schleuse	———	54 21	9 17	7·81	5·18
Vollerwick	———	54 17	8 44½	10·58	6·76
Ording	———	54 21	8 36½	9·82	6·83
Pelvorm	Superintend., Capt. Petersen.	54 30	8 42	11·25	5·75
Seesand	———	54 31½	8 21½		
Amrum	———	54 38¼	8 23½	8·58	5·17
Wyck	———	54 42	8 35	7·83	5·08
Sonderhoe	Superintendent Tegner.	55 0	....	4·98	2·69
List	Superintendent, Nissen.	55 1	8 26	6·33	3·32
Blaavands Huk	Superintendent, Tegner.	55 34	8 5	5·63	2·48
Nyeminde Gab	Superintendent, Skibsted.	55 47	8 10¾	2·68	·96
Torskminde	———	56 20½	8 7½		
Agger	———	56 45	8 12	1·49	·50
Hals	Superintendent, Bluhme.	56 59	10 20		
Frederikshaven	Superintendent, Skibsted.	57 25¾	10 32½	1·46	·13
Skagen	———	57 42½	10 35½		
Hirtshals	———	57 35¼	9 58	1·35	·31
Helgoland		....	....	11.37	

Table X. (Continued.)

Coast of Norway.

Station.	Superintendent and Observer.	Latitude. N.	Longitude. E.	Greatest vertical rise.	Least vertical rise.
		° ′	h m	English ft. in.	English ft. in.
Tromsöe	Superintendent and Observer, Lieutenant Due.	69 30	1 15	8 8	3 11
Andænes (Lofoden)	Lieutenant Hagerup.	69 30	1 0	7 7	2 7
Væroe	Superintendent and Observer, Lieutenant Rynning.	67 44	47	8 5	3 4
Froyen Ist (Point Fitteren)	Superintendent, Commodore Ferry, Observer, Captain Sheen.	63 40	33	6 8	2 11
Munkholm	Superintendent, Commodore Terry, Observer, Captain Erbe.	63 26	42	8 11	4 2
Christiansund	Superintendent, Shive, Observer, J. H. Bryhn.	63 6½	31	6 8	2 9
Runde Ist (Skotholm)	Superintendent, Shive, Observer, W. Lorange.	62 22	23	6 0	2 2
Kumlesund (Rorsfjord)	Superintendent, Lund, Observer, A. W. Bergh.	60 10½	20	3 9	2 4
Bergen	Superintendent, Lund, Observer, G. A. Dirks.	60 24	21	4 6	1 11
Skudesnæs	Superintendent, Smith, Observer, Pedorsen.	59 8	21	2 1	10
Stavanger	Superintendent, Smith, Observers, Ctausen and Haaland.	58 58⅓	24	3 5	1 7
Tananger	Superintendent, Smith, Observer, G. Mousen.	58 56	22	1 9	5
Lindesnæs	Superintendent, Shive, Observer, Ole Gulliksen.	57 58	23		
Christiansund	Observer and Superintendent, O. W. Erichsen.	58 8	32	1 1	2
Oxsöe	Superintendent, Shive, Observer, C. Bergh.	58 3¾	32	1 1	3
Arendal	Superintendent, Shive, Observer, Astaksen.	58 27	35	1 0	3
Ostre Rusöer	Superintendent, Shive, Observer, Hauge.	58 42½	37	1 4	4
Jomfruhland	Superintendent, S. Lous, Observer, Grung.	58 51	39	1 4	4
Langesund	Superintendent, Shive, Observer, Molbach.	58 59	39	1 2	4
Fræderikswærn	Superintendent and Observer, S. Lous.	58 59	41	1 3	4
Valöerne	Superintendent, Captain S. Lous, Observer, Lieutenant Bull.	59 2	44	1 3	5
Frederikstadt	Superintendent, Shive, Observer, Kock.	59 12	44	2 1	3
Horten	Superintendent and Observer, Winge.	59 24½	42		
Svelvigen	Superintendent, Shive, Observer, Brenmehl.	59 36	42	1 2	4

Table XI.

Semimenstrual and Diurnal Inequality of High Water in June 1835.

Coast of America.

	Eastport.			Mount Desert Island.			Portsmouth.			Boston.		
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	3 11	−11	+ 9	2 2	−10	+10	2 5	−11	+ 6	1 9	− 8	+ 5
10.	4 3	−14	+13	2 3	− 8	− 8	2 6	− 8	+12	2 3	− 8	+12
11.	4 4	−11	+ 9	2 3	− 8	+12	2 7	− 9	——	2 4	− 9	——
12.	4 3	——	−11	2 3	——	−10	2 7	+ 7	−11	2 3	+ 7	−12
13.	4 0	+12	− 8	2 2	+12	− 7	2 6	+10	− 7	2 1	+ 9	− 7
14.	3 7	+ 9	− 8	2 0	− 3	− 7	2 4	+ 9	− 7	1 10	+ 9	− 5
15.	2 10	+ 7	− 7	1 9	+ 6	− 7	2 1	+ 6	− 7	1 6	+ 7	− 7
16.	2 2	+ 4	− 2	1 5	+ 4	− 5	1 10	+ 4	− 3	1 3	+ 3	− 4
17.	1 8	+ 6	− 2	1 2	+40	− 2	1 7	+ 4	− 4	1 0	+ 5	− 3
18.	1 3	+ 1	+ 1	0 11	− 1	+ 1	1 5	− 2	− 1	0 9	0	0
19.	1 0	− 2	+ 1	0 8	− 2	0	1 3	− 2	+ 4	0 7	− 1	+ 4
20.	0 10	+ 4	+ 7	0 6	+ 6	+ 6	1 1	+ 3	+ 3	0 6	− 2	+ 2
21.	0 10	− 4	+ 6	0 5	− 5	+ 8	0 11	− 5	+ 4	0 4	− 8	+ 6
22.	0 11	− 9	+ 7	0 4	− 4	− 1	1 0	− 7	+ 7	0 4	− 8	+ 7
23.	1 0	− 5	+ 8	0 4	− 3	+10	1 1	− 6	+ 6	0 4	− 6	+ 6
24.	1 2	− 8	+ 7	0 4	− 5	+10	1 1	− 7	+ 6	0 5	− 7	+ 8
25.	1 3	− 6	+10	0 4	− 3	+ 1	1 2	− 7	+ 9	0 7	− 7	+ 7
26.	1 5	− 7	+ 9	0 5	− 5	——	1 3	——	− 8	0 9	− 8	
27.	1 8	− 9	....	0 7	+11	....	1 4	+ 8	....	1 1	+ 5	
28.												

	Cape Cod.			Province Town.			Newport.			Warren.		
June 9.	1 8	−10	+ 6	2 2	− 9	+ 7	1 2	− 8	+ 6	1 5	− 5	+ 6
10.	2 3	− 9	+13	2 6	−	+16	1 6	− 9	+ 9	1 9	− 7	+ 6
11.	2 4	−11	+ 6	2 8	−10	+ 8	1 8	− 5	+ 5	1 11	− 5	+ 5
12.	2 3	−14	——	2 6	——	−11	1 7	− 6	+ 3	1 10	− 5	+ 3
13.	2 1	+11	− 9	2 4	+13	− 6	1 5	− 5	+ 4	1 8	− 4	+ 5
14.	1 10	+ 9	− 8	2 2	+12	− 6	1 3	− 4	+ 3	1 5	− 2	+ 1
15.	1 8	+ 6	−12	1 11	+ 8	− 8	1 1	0	0	1 2	− 2	——
16.	1 5	+ 6	− 2	1 8	+ 3	− 6	1 0	——	− 2	1 1	+ 2	+ 2
17.	1 1	+ 4	− 6	1 6	+ 6	− 5	0 10	+ 4	+ 1	0 11	+ 7	0
18.	0 8	+ 1	0	1 3	− 1	− 1	0 8	− 3	+ 2	0 10	− 3	+ 2
19.	0 5	− 1	0	1 2	− 2	+ 1	0 7	− 2	+ 5	0 9	− 1	+ 5
20.	0 3	+ 4	+ 5	1 0	+ 2	+ 3	0 6	+ 4	+ 4	0 8	+ 5	− 1
21.	0 3	− 6	+ 6	0 11	+ 4	+ 5	0 5	− 3	+ 4	0 7	− 4	+ 3
22.	0 3	− 7	+10	0 10	− 8	+ 8	0 5	− 4	+ 3	0 8	− 4	+ 3
23.	0 4	− 5	+ 9	0 10	− 6	+ 7	0 7	− 4	+ 5	0 9	− 3	+ 3
24.	0 4	− 7	+ 9	0 10	− 6	+ 8	0 8	− 4	+ 4	0 11	− 4	+ 3
25.	0 6	− 8	+ 8	0 11	− 7	+ 7	0 9	− 4	+ 3	0 11	− 3	+ 1
26.	0 7	− 7	....	1 1	− 6	....	0 10	− 3	+ 1	0 11	− 2	+ 2
27.	0 10	+ 6	....	1 3	+ 9	....	0 11	0	....	0 10	− 1	
28.												

Table XI. (Continued.)

	Gardiner's Bay.			New York.			Sandy Hook.			Delaware.		
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	1 2	− 4	+ 5	1 5	− 5	+ 7	1 5	− 3	+ 7	1 4	− 7	+ 9
10.	1 8	− 9	+ 6	1 9	−10	+12	1 9	− 9	+ 7	1 6	−13	+ 7
11.	1 10	− 5	+ 3	2 0	− 4	+ 7	2 0	− 3	+ 9	1 7	+ 4	+12
12.	1 10	− 8	+ 2	1 11	− 7	+ 7	1 11	− 5	+ 6	1 7	− 9	+ 9
13.	1 9	− 6	+ 4	1 9	− 7	+ 5	1 8	− 8	+ 6	1 8	−13	+ 5
14.	1 8	——	− 4	1 8	− 7	——	1 5	− 5	+ 3	1 8	−12	+ 4
15.	1 7	+ 2	− 2	1 7	+ 3	− 2	1 4	− 2	——	1 7	− 4	+ 5
16.	1 6	+ 1	− 1	1 6	+ 4	− 2	1 3	+ 4	− 3	1 5	——	− 6
17.	1 5	+ 2	0	1 4	+ 3	− 3	1 1	+ 5	− 2	1 2	+ 4	− 5
18.	1 4	− 2	+ 3	1 3	− 3	+ 3	0 11	− 1	+ 1	1 1	+ 1	− 1
19.	1 3	− 2	+ 7	1 1	− 2	+ 8	0 9	− 1	+ 5	1 0	0	+ 3
20.	1 2	+ 2	+ 4	0 11	−10	+ 5	0 7	− 4	+ 3	0 11	− 4	+ 3
21.	1 2	− 3	+ 5	0 10	− 3	+ 4	0 6	− 4	+ 5	0 10	− 5	+ 6
22.	1 1	− 3	+ 4	0 9	− 5	+ 7	0 5	− 5	+ 6	0 9	− 7	+ 6
23.	1 2	− 4	+ 6	0 9	− 6	+10	0 8	− 8	+ 8	0 10	−10	+ 6
24.	1 3	− 4	+ 5	0 11	−14	+ 9	0 11	− 5	+ 6	0 11	− 6	+ 9
25.	1 3	− 4	+ 3	1 2	− 4	+ 8	1 1	− 7	+ 6	1 1	− 9	+ 8
26.	1 4	− 3	+ 5	1 4	− 6	+ 4	1 1	− 5	+ 5	1 2	− 9	+10
27.	1 5	− 2	....	1 6	− 5	....	1 2	− 4	....	1 2	− 7	
28.												

	Old Point Comfort.			Gosport.			Cape Hatteras.			Cape Fear River. (Fort Johnston.)		
June 9.	0 5	+ 3	+ 7	0 7	+ 6	+ 8	2 4	+21	+14	1 9	− 5	+ 9
10.	0 6	− 5	+ 4	0 9	− 4	+ 3	2 3	− 5	+ 6	1 8	− 9	+11
11.	0 8	− 7	+ 6	0 11	− 6	+ 5	2 2	−20	+10	1 5	−17	+ 8
12.	0 9	− 3	+ 4	1 0	− 3	+ 3	2 1	−10	+16	1 2	− 9	+ 9
13.	0 9	− 9	+ 3	1 0	− 6	0	1 11	−15	+ 9	0 11	− 9	+ 7
14.	0 9	− 7	+ 7	1 0	——	− 7	1 9	−15	+20	0 7	− 8	+ 4
15.	0 11	——	− 1	1 1	− 2	+ 1	1 6	− 4	+ 4	0 5	− 6	+12
16.	0 11	+ 4	− 1	1 3	+ 2	− 2	1 3	− 5	+ 3	0 5	+ 3	——
17.	0 11	− 3	− 2	1 4	+ 3	− 4	1 0	− 4	+ 7	0 4	+ 9	0
18.	0 9	0	0	1 3	+ 3	− 7	0 10	− 2	——	0 3	+ 7	+ 3
19.	0 7	0	0	1 0	− 7	+ 8	0 9	− 9	+ 1	0 2	+ 3	+ 7
20.	0 5	+ 3	+ 3	0 9	− 9	+ 2	0 8	+10	+ 3	0 1	− 5	+ 2
21.	0 2	− 2	+ 3	0 7	− 2	+ 2	0 7	+ 5	+ 5	0 2	− 3	+ 9
22.	0 1	− 3	+ 4	0 5	− 4	+ 4	0 7	− 1	+ 6	0 3	− 6	+ 8
23.	0 1	− 3	+ 4	0 4	− 3	+ 4	0 8	− 8	+ 6	0 4	− 7	+ 8
24.	0 2	− 4	+ 6	0 5	− 4	+ 5	0 8	− 9	+ 6	0 5	− 6	+ 6
25.	0 3	− 3	+ 3	0 6	− 2	+ 4	0 9	− 7	+ 6	0 6	− 6	+ 6
26.	0 4	− 4	+ 2	0 7	− 5	+ 1	0 10	−10	+ 9	0 7	− 8	+ 7
27.	0 6	− 1	....	0 9	− 1	....	0 10	− 4	....	0 7	− 7	
28.												

Table XI. (Continued.)

	Charleston. (Fort Moultrie.)			Savannah.			St. Augustine. (Fort Marian.)					
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	1 10	−13	+11	2 7	− 7	+ 7	1 6	− 8	+ 9			
10.	2 0	−11	+11	2 6	− 7	+ 9	1 7	− 7	+ 9			
11.	1 11	−11	+10	2 5	− 7	+ 8	1 5	− 6	+ 8			
12.	1 6	−11	+ 9	2 3	− 9	+ 9	1 4	−12	+ 8			
13.	1 2	− 9	+10	2 0	− 9	+ 7	1 2	−11	+ 6			
14.	0 10	− 7	+ 4	1 7	− 7	+ 4	0 11	− 6	+ 3			
15.	0 9	− 7	——	1 5	− 6	——	0 9	− 7	——			
16.	0 9	+ 9	+ 5	1 3	+ 5	+ 2	0 8	+ 3	− 3			
17.	0 8	+ 9	+ 1	1 1	+ 7	+ 2	0 7	+ 5	0			
18.	0 7	+16	+ 4	0 11	+ 2	+ 6	0 6	+ 1	+ 1			
19.	0 7	+ 2	+ 3	0 9	+ 3	+ 7	0 5	+ 1	+ 1			
20.	0 6	− 8	+ 2	0 8	− 9	+ 4	0 6	− 2	− 2			
21.	0 7	− 3	+ 9	0 11	− 8	+ 6	0 8	+ 1	+ 7			
22.	0 8	− 2	+10	1 4	− 5	+ 7	0 9	+ 1	+ 6			
23.	0 10	− 5	+ 7	1 5	− 8	+ 6	0 10	− 5	+ 6			
24.	0 10	− 5	+ 9	1 4	− 6	+ 8	0 11	− 7	+ 6			
25.	0 11	− 8	+ 6	1 3	− 8	+ 6	0 10	− 5	+ 2			
26.	1 0	− 9	+ 7	1 2	− 8	+ 9	0 8	− 7	+ 7			
27.	1 0	−11	....	0 10	− 7	....	0 5	− 2				
28.												

Portugal.

	Peniche.			Vianna.			Cascaes.			Sines.		
June 9.	3 2	+ 2	+ 1	3 2	+ 1	0	3 3	——	+ 1	3 2	+ 1	0
10.	3 5	− 2	+ 3	3 5	0	+ 1	3 9	− 1	+ 1	3 4	− 1	+ 1
11.	3 6	− 2	+ 3	3 6	− 1	+ 1	4 1	− 4	+ 9	3 7	0	0
12.	3 6	− 1	− 1	3 6	− 1	+ 2	4 0	− 6	+ 3	3 7	+ 1	+ 3
13.	3 3	− 4	+ 5	3 4	− 5	+ 4	3 8	− 5	+ 5	3 3	− 5	+ 6
14.	2 11	− 5	+ 6	3 1	− 7	+ 5	3 2	− 5	+ 7	2 9	− 4	+ 7
15.	2 5	− 6	− 6	2 6	− 3	+ 4	2 8	− 6	+ 6	2 3	− 7	+ 6
16.	1 10	− 6	+ 7	1 10	− 9	+ 5	2 2	− 5	+ 5	1 7	− 8	+ 7
17.	1 3	− 4	− 4	1 4	− 8	+ 6	1 10	− 6	+ 5	1 2	− 5	+ 5
18.	1 0	− 4	+ 5	1 0	− 5	+ 4	1 6	− 5	+ 3	0 11	− 4	+ 4
19.	0 10	− 3	+ 5	0 10	− 5	+ 3	1 5	− 3	+ 2	0 10	− 4	+ 2
20.	0 10	− 1	− 9	0 10	− 2	+ 2	1 6	− 2	+ 1	0 11	− 2	+ 1
21.	1 0	+ 2	− 1	0 11	− 2	0	1 7	− 1	0	1 1	− 1	+ 1
22.	1 4	+ 3	——	1 2	+ 2	——	1 9	0	− 1	1 4	+ 1	——
23.	1 6	− 1	0	1 5	− 1	0	1 11	——	+ 2	1 6	− 1	+ 1
24.	1 9	+ 2	+ 2	1 6	− 5	+ 4	2 2	3	+ 3	1 8	− 3	+ 2
25.	1 11	− 3	+ 2	1 8	− 4	+ 3	2 5	− 2	+ 2	1 11	− 3	+ 3
26.	2 1	+ 3	+ 6	1 7	− 3	+ 3	2 9	+ 2	+ 3	2 0	− 3	+ 5
27.	2 0	+ 6	....	1 4	− 1	....	2 7	− 2	....	2 0	− 3	

Table XI. (Continued.)

	Pera.			Bay of Lagos.								
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	3 0	——	0	2 6	− 5	− 1						
10.	3 4	0	− 1	2 10	0	0						
11.	3 6	− 4	0	3 0	+ 3	+ 7						
12.	3 5	+ 3	+ 5	3 0	+11	+ 9						
13.	3 1	− 5	+ 5	2 11	− 6	+ 4						
14.	2 6	−10	+ 8	2 8	− 4	+ 7						
15.	2 0	−10	+ 8	2 2	− 6	+ 3						
16.	1 6	− 6	+ 6	1 8	− 6	+ 4						
17.	1 1	− 5	+ 5	1 3	− 4	+ 8						
18.	0 10	− 3	+ 4	0 11	− 5	+ 1						
19.	0 9	− 3	0	0 9	1	0						
20.	1 0	− 1	0	0 9	+ 1	0						
21.	1 3	− 2	+11	1 0	− 1	0						
22.	1 7	− 4	+ 7	1 5	+ 3	0						
23.	1 11	+ 5	− 3	1 9	0	——						
24.	2 2	——	+ 1	2 0	0	0						
25.	2 5	− 1	− 1	2 2	− 1	+ 1						
26.	2 6	+ 3	0	2 4	0	0						
27.	2 7	− 3	....	2 6	+ 3							

Spain.

	Santander.			Ferrol.			Camarinas.			Cadiz.		
June 9.	4 0	——	+ 2	4 0	− 3	− 1	3 4	0	+ 1	1 11	0	− 8
10.	4 2	− 1	+ 2	4 5	+ 3	0	3 9	− 3	+ 2	3 2	+ 4	− 2
11.	4 7	− 2	+ 2	4 6	− 3	+ 2	3 11	− 3	+ 2	3 4	+ 3	− 5
12.	4 5	− 3	+ 3	4 5	− 5	+ 4	3 10	− 4	+ 6	3 2	+ 3	− 6
13.	4 3	− 5	+ 3	4 1	− 5	+ 6	3 6	− 5	+ 7	2 11	+ 2	+ 5
14.	3 9	− 2	+ 7	3 5	− 6	+ 7	3 2	− 6	+ 9	2 6	− 4	+ 7
15.	3 1	− 7	+ 4	2 10	− 7	+ 8	2 7	− 7	+ 8	2 0	− 6	+ 6
16.	2 4	− 4	+ 7	2 2	− 7	+ 9	2 0	−10	+ 8	1 3	− 6	+ 3
17.	1 5	− 8	+ 6	1 6	− 7	+ 8	1 5	− 8	+ 7	0 9	− 5	+ 5
18.	1 2	− 6	+ 4	1 1	− 6	+ 6	1 0	− 7	+ 6	0 5	− 4	+ 4
19.	0 10	− 5	+ 7	0 11	− 4	+ 4	0 8	− 5	+ 4	0 3	− 3	+ 3
20.	0 9	+ 1	+ 1	1 1	− 3	+ 4	0 6	− 2	+ 5	0 5	− 3	+ 2
21.	1 1	0	——	1 2	0	——	0 7	0	——	0 8	0	+ 1
22.	1 6	0	+ 1	1 4	− 1	+ 1	0 10	0	+ 1	0 10	+ 1	− 1
23.	1 10	0	− 1	1 9	− 1	+ 2	1 3	− 1	+ 2	1 1	——	− 1
24.	2 4	− 1	+ 2	2 3	− 5	+ 2	1 7	− 2	+ 2	1 5	+ 3	− 1
25.	2 10	0	+ 1	2 6	0	+ 2	1 10	− 3	+ 3	1 8	− 2	+ 2
26.	2 11	− 1	+ 1	2 5	− 6	+ 5	1 10	− 6	+ 3	1 11	− 2	+ 3
27.	2 9	− 2	+ 3	2 2	− 4	....	1 9	− 3	....	1 10	− 5	

Table XI. (Continued.)

France.

	Lambrielle, Ile de Sein. Mean.	A.M.	P.M.	Barfleur. Mean.	A.M.	P.M.	Cherbourg. Mean.	A.M.	P.M.	Granville. Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	4 7	− 1	+ 1	4 0	+ 1	+ 1	4 3	− 1	+ 1	8 1	− 1	+ 1
10.	5 2	− 2	+ 1	4 4	− 2	+ 2	4 10	− 1	+ 2	9 7	− 2	+ 3
11.	5 8	+ 3	0	4 7	− 2	+ 2	5 2	− 1	+ 2	10 6	− 1	+ 5
12.	5 9	0	+ 1	4 6	− 3	+ 2	5 1	− 4	+ 8	10 6	− 4	+ 3
13.	5 2	− 5	+ 4	4 4	− 2	+ 3	4 10	− 3	+ 3	9 10	− 4	+ 3
14.	4 4	− 7	+ 3	3 9	− 4	+ 2	4 3	− 5	+ 4	8 9	− 7	+ 3
15.	3 3	− 6	+ 5	3 3	——	− 3	3 5	− 5	+ 3	7 0	− 4	+ 3
16.	2 5	− 4	+ 9	2 7	+ 2	− 6	2 6	− 6	——	4 9	− 4	+ 6
17.	1 7	− 6	− 5	1 10	+ 2	− 1	1 11	+ 5	− 3	2 9	− 4	+ 5
18.	0 11	− 4	− 3	1 1	+ 2	− 2	1 4	+ 4	− 3	1 3	− 4	——
19.	0 8	− 3	+ 2	0 9	+ 1	+ 2	0 10	+ 1	0	0 6	+ 4	− 4
20.	0 10	− 1	+ 1	0 8	− 2	+ 1	0 8	− 1	0	0 5	0	− 3
21.	1 1	——	− 1	0 11	0	+ 1	1 0	0	0	0 11	+ 3	− 2
22.	1 6	+ 1	0	1 4	− 1	+ 2	1 6	0	+ 2	2 0	0	− 1
23.	2 2	0	0	2 1	0	+ 1	2 4	− 1	0	3 4	+ 1	+ 2
24.	2 11	0	+ 2	2 8	− 2	+ 2	3 0	− 2	+ 4	4 7	− 2	+ 6
25.	3 2	− 3	− 3	3 0	− 3	+ 1	3 4	− 2	+ 2	5 9	− 3	+ 6
26.	3 3	− 12	+ 6	3 2	− 3	+ 9	3 6	− 4	+ 13	6 6	− 9	+ 12
27.	3 3	0	....	3 2	− 3	....	3 6	− 1	....	6 10	− 5	....
28.												

	Chausey. Mean.	A.M.	P.M.	St. Servan. Mean.	A.M.	P.M.	Brehat. Mean.	A.M.	P.M.	Abervrack. Mean.	A.M.	P.M.
June 9.	8 2	− 1	+ 2	10 4	− 1	+ 3	7 4	− 2	+ 2	4 8	− 1	+ 1
10.	10 1	− 1	+ 4	10 6	+ 1	− 1	8 3	− 1	+ 4	5 4	− 2	+ 2
11.	10 9	− 5	+ 4	10 7	− 1	− 1	8 11	− 2	+ 3	5 9	− 2	+ 3
12.	10 11	− 4	+ 3	10 5	+ 1	+ 7	8 11	− 3	+ 3	5 8	− 3	+ 4
13.	10 4	− 4	+ 3	9 10	0	− 3	8 5	− 3	+ 9	5 3	− 3	+ 5
14.	9 3	− 5	+ 3	8 9	− 3	+ 6	7 6	− 5	+ 5	4 6	− 4	+ 5
15.	7 7	− 6	+ 5	7 2	− 6	+ 3	6 0	− 5	+ 5	3 9	− 7	+ 4
16.	5 6	− 6	+ 5	5 0	− 5	+ 8	4 6	− 9	+ 5	2 7	− 14	——
17.	3 8	− 5	+ 5	2 6	− 7	+ 2	2 11	− 6	+ 4	1 7	− 7	+ 6
18.	2 3	− 6	——	1 7	− 1	——	1 7	− 5	+ 2	0 10	− 4	+ 3
19.	1 7	+ 2	− 3	1 1	+ 2	− 3	1 1	——	− 2	0 4	− 4	+ 1
20.	1 4	+ 1	− 3	1 0	− 11	− 2	1 0	+ 1	− 1	0 5	− 2	+ 1
21.	1 9	+ 3	− 1	1 4	+ 3	− 1	1 5	+ 3	− 1	0 9	0	0
22.	2 10	0	0	2 6	0	+ 7	2 3	0	+ 1	1 6	0	0
23.	4 2	0	0	4 0	− 2	+ 1	3 5	+ 1	+ 1	2 5	0	− 1
24.	5 5	− 3	+ 5	5 2	− 2	+ 9	4 5	− 2	+ 4	3 0	+ 5	− 5
25.	6 4	− 4	+ 3	6 0	− 3	+ 1	5 1	− 2	+ 1	3 3	+ 3	− 7
26.	7 0	− 6	+ 11	6 9	0	+ 6	5 6	− 7	+ 11	3 5	+ 7	− 2
27.	7 6	− 5	....	7 1	− 5	....	5 10	+ 8	....	3 5	+ 2	
28.												

TABLE XI. (Continued.)

Netherlands.

	Sluischegat of Zwin.			Ulissengen.			Westkappel.			Goede Reede.		
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	1 0	0	0	1 6	+ 1	——	1 2	0	0	——	——	− 1
10.	1 1	0	+ 1	1 8	− 2	+ 1	1 4	——	+ 1	1 7	− 3	+ 1
11.	1 2	+ 1	0	1 9	+ 1	0	1 5	0	0	1 5	0	0
12.	1 2	+ 1	0	1 10	+ 1	0	1 5	+ 1	− 1	1 6	+ 1	− 1
13.	1 3	+ 1	− 1	1 10	+ 1	− 1	1 5	+ 1	− 2	1 7	+ 2	− 2
14.	1 2	+ 2	− 2	1 9	0	− 2	1 4	+ 3	− 3	1 7	+ 2	− 1
15.	1 0	+ 1	− 2	1 7	+ 1	− 1	1 2	+ 1	− 2	1 6	+ 1	− 2
16.	0 8	+ 1	− 2	1 4	+ 1	− 4	0 11	+ 1	− 3	1 4	+ 2	− 3
17.	0 6	+ 2	0	1 1	+ 2	0	0 8	+ 3	0	1 3	+ 3	− 1
18.	0 3	0	− 4	0 11	− 0	− 3	0 6	0	− 4	1 2	+ 2	− 4
19.	0 1	+ 6	− 3	0 10	+ 6	− 2	0 3	+ 7	− 2	1 2	+ 8	− 2
20.	0 0	− 2	− 1	0 9	− 2	+ 1	0 2	− 2	− 1	1 1	0	− 1
21.	0 0	+ 2	− 2	0 10	+ 1	− 3	0 4	0	− 1	1 2	0	− 3
22.	0 3	+ 3	− 2	1 1	+ 4	− 2	0 8	+ 3	+ 3	1 4	+ 4	− 1
23.	0 5	+ 5	+ 1	1 4	+ 3	− 1	0 10	+ 3	0	1 5	——	+ 3
24.	0 7	——	− 3	1 5	——	− 3	0 11	− 2	——	1 7	− 2	− 4
25.	0 10	0	+ 1	1 8	0	0	1 2	− 1	0	1 10	− 2	+ 1
26.	1 2	+12	− 3	2 0	+14	− 2	1 6	+ 9	− 4	2 1	+12	− 3
27.	1 5	− 1	....	2 3	− 4	....	1 10	− 4	....	2 5	− 5	
28.												

	Hellevoetsluis.			Brielle.			Delflandsche Hoofden.			Katwijkaan Zee.		
June 9.	1 3	− 3	+ 1	1 5	− 4	− 1	1 4	− 2	0	1 5	0	0
10.	1 3	− 1	0	1 4	+ 4	− 1	1 4	− 1	0	1 4	− 1	+ 1
11.	1 3	0	0	1 3	− 1	− 1	1 4	− 1	+ 1	1 4	− 1	+ 1
12.	1 3	+ 1	− 1	1 3	+ 1	+ 1	1 5	+ 1	0	1 5	+ 1	+ 2
13.	1 4	+ 2	− 1	1 3	+ 2	− 1	1 7	+ 3	+ 1	1 5	+ 2	+ 2
14.	1 4	+ 4	− 3	1 4	+ 2	− 3	1 7	0	0	1 5	+ 4	− 2
15.	1 3	+ 2	− 2	1 2	+ 3	− 2	1 7	− 1	− 1	1 4	+ 3	− 3
16.	1 2	+ 2	− 2	1 2	+ 2	− 2	1 7	+ 5	− 3	1 3	+ 4	− 3
17.	1 2	+ 3	0	1 2	+ 3	+ 7	1 6	+ 3	− 2	1 3	+ 4	− 2
18.	1 1	0	− 3	1 2	− 0	− 4	1 6	− 1	− 1	1 3	+ 2	− 3
19.	1 1	+ 7	− 4	1 1	+ 7	− 2	1 5	+ 8	− 2	1 3	+ 5	− 3
20.	1 0	+ 1	+ 1	1 1	− 1	0	1 3	+ 1	− 3	1 2	0	0
21.	1 0	——	+ 2	1 1	+ 1	——	1 2	+ 2	+ 2	1 3	+ 1	− 2
22.	1 2	− 4	+ 5	1 2	− 3	+ 4	1 3	+ 4	+ 3	1 5	——	+ 4
23.	1 3	0	+ 4	1 4	+ 2	+ 4	1 4	+ 2	+ 5	1 7	− 1	+ 2
24.	1 6	− 4	− 7	1 6	− 2	− 5	1 6	+ 2	− 2	1 9	− 2	− 4
25.	1 11	− 3	− 2	1 10	− 1	+ 2	1 9	+ 2	+ 2	1 10	+ 1	+ 1
26.	2 7	+ 8	− 1	2 2	+12	− 6	2 2	+12	− 7	2 2	+11	− 8
27.	3 3	− 9	....	2 8	−10	....	2 6	− 8	....	2 6	−10	
28.												

TABLE XI. (Continued.)

	Hondsbosschen.											
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	1 6	− 3	0									
10.	1 6	0	0									
11.	1 6	− 1	0									
12.	1 6	0	0									
13.	1 5	+ 2	0									
14.	1 5	+ 4	− 2									
15.	1 4	+ 2	− 2									
16.	1 4	+ 3	− 3									
17.	1 4	+ 5	− 1									
18.	1 4	+ 2	− 3									
19.	1 4	+ 9	+ 2									
20.	1 5	− 1	− 1									
21.	1 6	0	——									
22.	1 7	− 2	+ 1									
23.	1 8	+ 3	+ 3									
24.	1 10	− 2	− 3									
25.	2 0	+ 1	0									
26.	2 3	+ 8	− 6									
27.	2 7	−11										
28.												

Danish Coast.

	Altona.			Pin Aue.			Gluckstadt.			Meldorf.		
	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
June 9.	·7	+ ·1	− ·1	1·0	+ ·2	− ·2	1·0	+ ·2	− ·2	1·0	·0	+ ·1
10.	·9	+ ·2	− ·1	1·2	+ ·2	− ·1	1·2	+ ·2	− ·1	1·3	+ ·2	·0
11.	1·0	+ ·3	− ·2	1·3	·0	− ·2	1·3	·0	− ·2	1·4	·0	− ·1
12.	1·3	·0	·0	1·4	·0	·0	1·4	·0	·0	1·6	·0	·0
13.	1·4	− ·2	·0	1·5	− ·2	+ ·2	1·4	− ·2	+ ·2	1·7	− ·2	+ ·1
14.	1·6	− ·4	+ ·6	1·6	− ·3	+ ·6	1·6	− ·3	+ ·3	1·9	− ·3	+ ·3
15.	1·7	− ·3	+ ·5	1·8	− ·3	+ ·7	1·7	− ·2	+ ·6	2·0	− ·4	+ ·3
16.	1·6	+ ·4	+ ·3	1·7	− ·7	+ ·3	1·6	− ·7	+ ·3	1·9	−1·0	+ ·4
17.	1·3	− ·8	+ ·5	1·5	− 10	+ ·9	1·3	− ·8	+1·0	1·7	− ·9	+ ·8
18.	1·2	−1·1	− ·2	1·4	− 11	+ ·0	1·1	−1·0	+ ·2	1·5	−1·4	+ ·1
19.	1·2	+ ·7	+1·9	1·3	+1·1	+1·11	1·1	+ ·9	+2·1	1·4	− ·6	+2·0
20.	1·1	....	− ·3	1·2	− ·6	+ ·5	1·1	− ·3	+ ·8	1·3	− ·4	+1·0
21.	1·1	+ ·2	− ·2	1·2	− ·1	+ ·3	1·1	·0	+ ·5	1·3	+ ·6	+ ·7
22.	1·1	·0	+ ·3	1·2	——	+ ·5	1·1	+ ·6	——	1·4	+ ·6	+ ·7
23.	1·0	+ ·4	+ ·1	1·2	+ ·6	+ ·2	1·1	+ ·6	+ ·2	1·4	+ ·2	+ ·4
24.	·9	+ ·4	+ ·4	1·1	+ ·6	+ ·2	1·2	+ ·5	+ ·3	1·5	+ ·0	+ ·2
25.	·8	− ·8	+ ·2	1·2	− ·8	+ ·1	1·2	− ·8	+ ·3	1·7	− ·0	+ ·4
26.	1·2	− ·3	+1·2	1·6	− ·4	+ ·8	1·6	− ·4	+ ·9	2·2	− ·6	+ ·3
27.	1·8	−1·0	−	2·7	− ·4	....	2·3	− ·4	....	2·6	+ ·1	
28.												
29.												

TABLE XI. (Continued.)

	Stein Schleuse.			Vollerwick.			Ording.			Pelworm.		
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
June 9.	·9	+ ·2	− ·1	1·2	+ ·3	+ ·2	1·1	·0	+ ·2	·5	·0	+ ·1
10.	1·1	+ ·1	·0	1·5	+ ·0	− ·1	1·3	·0	·0	·8	·0	+ ·1
11.	1·2	·0	− ·1	1·6	+ ·1	− ·1	1·4	·0	− ·1	1·0	− ·1	·0
12.	1·4	·0	+ ·1	1·7	·0	·0	1·5	·0	·0	1·1	·0	− ·3
13.	1·4	− ·4	+ ·2	1·7	− ·3	+ ·1	1·5	− ·2	+ ·1	1·1	− ·3	− ·9
14.	1·5	− ·2	− ·2	1·7	− ·2	+ ·4	1·6	− ·3	+ ·3	1·1	....	+ ·2
15.	1·5	− ·2	+ ·5	1·7	− ·4	+ ·3	1·6	− ·3	+ ·4	1·2	− ·3	+ ·3
16.	1·5	− ·7	+ ·3	1·7	+ ·1	+ ·4	1·5	− ·8	+ ·5	1·1	− ·7	+ ·4
17.	1·5	− ·7	+ ·8	1·6	− ·9	+ ·9	1·2	− ·6	+1·0	1·0	− ·6	+ ·9
18.	1·5	−1·2	− ·2	1·5	−1·3	− ·1	1·0	− ·9	+ ·2	·8	− ·9	+ ·3
19.	1·5	+ ·2	+1·5	1·5	·0	+1·5	1·0	+ ·5	——	·7	+ ·6	− ·4
20.	1·6	− ·5	+ ·6	1·5	− ·9	+ ·6	·9	——	+ ·6	·7	− ·4	+ ·8
21.	1·6	....	− ·3	1·4	− ·5	+ ·5	1·0	− ·1	+ ·7	·7	− ·1	+1·0
22.	1·6	+ ·6	+1·0	1·4	+ ·6	+ ·8	1·1	+ ·8	+ ·9	·7	+ ·9	+1·1
23.	1·7	+1·0	+ ·4	1·4	+ ·2	+ ·4	1·2	+ ·2	+ ·4	·9	+ ·5	+ ·4
24.	1·8	+ ·2	·0	1·4	+ ·2	——	1·4	+ ·2	− ·5	1·1	+ ·3	− ·6
25.	2·0	−1·2	+ ·6	1·6	−1·8	+ ·6	1·6	....	+ ·4	1·4	+ ·6	− ·1
26.	2·2	− ·2	+ ·2	2·0	− ·2	+ ·6	2·0	− ·3	+ ·4	1·7	+ ·6	− ·1
27.	2·6	·0	....	2·4	·0	....	2·5	....	....	2·6	−1·1	
28.												
29.												

	Amrum.		
June 9.	·8	− ·1	+ ·1
10.	·9	− ·1	·0
11.	1·1	− ·1	− ·1
12.	1·1	+ ·1	+ ·1
13.	1·1	− ·4	+ ·2
14.	1·1	− ·2	+ ·3
15.	1·0	− ·2	+ ·4
16.	1·0	− ·5	+ ·6
17.	1·1	− ·5	+ ·8
18.	1·1	− ·3	+ ·1
19.	1·1	·0	+ ·9
20.	1·1	− ·8	+ ·3
21.	1·2	− ·5	+ ·3
22.	1·3	+ ·3	+ ·7
23.	1·3	+ ·3	+ ·1
24.	1·4	——	·0
25.	1·5	− ·5	+ ·4
26.	1·7	·0	+ ·7
27.	2·1	− ·5	
28.			

Table XI. (Continued.)

East Coast of Scotland.

	Port Logan.			Lerwick.			Scrabsters.			Buckie.		
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	in.	in.	in.	ft. in.	in.	in.
June 9.	3 2	+ 3	− 2	2 5	− 2	− 1	3 2	− 1	0	3 1	− 1	+ 1
10.	3 6	+ 2	− 1	2 8	0	+ 1	3 10	0	0	3 5	0	0
11.	3 8	0	− 1	2 8	0	− 2	4 1	− 1	+ 1	3 6	0	0
12.	3 7	− 3	+ 2	2 9	− 2	——	4 1	− 3	+ 5	3 5	+ 1	− 1
13.	3 5	− 4	+ 5	2 9	0	+ 4	3 8	− 2	+ 1	3 3	0	——
14.	3 3	− 3	+ 3	2 9	+ 1	− 4	3 2	− 5	+ 9	2 11	+ 1	− 5
15.	2 10	− 6	+ 6	2 7	+ 2	− 2	2 10	− 7	——	2 7	+ 3	− 5
16.	2 6	....	....	2 6	+ 3	− 3	2 6	+11	− 4	2 2	+ 12	− 3
17.	2 2	....	....	2 3	+ 5	− 4	2 3	+ 8	− 15	1 9	+ 12	− 8
18.	1 7	....	....	2 1	+ 6	− 4	2 1	+ 8	− 5	1 4	+ 4	+ 1
19.	1 2	....	....	1 11	− 2	− 2	1 11	+ 3	− 6	1 1	+ 1	− 7
20.	1 3	....	....	1 11	+ 2	− 6	1 11	+ 6	− 7	1 2	+ 4	−11
21.	1 7	....	....	2 2	0	0	2 2	+ 1	+ 5	1 8	− 2	+ 3
22.	2 3	....	....	2 9	0	+ 3	2 9	+ 2	+ 1	2 5	− 1	+ 2
23.	2 7	....	....	3 0	− 2	+ 2	3 0	+ 1	− 2	2 7	− 3	− 4
24.	2 7	....	....	3 0	0	0	3 0	+ 0	+ 4	2 7	− 2	− 2
25.	2 7	....	....	3 0	− 4	+ 2	3 0	− 5	+ 1	2 8	− 2	+ 4
26.	2 5	....	....	2 9	− 1	+ 1	2 9	− 3	+ 8	2 7	+ 1	− 1
27.	2 2	....	....	2 5	− 1	....	2 6	− 1	....	2 5	+ 3	

	Cullen.			Fraserburg.			Banff.					
June 9.	3 1	− 1	+ 1	3 0	0	0	2 9	− 1	− 1			
10.	3 3	+ 1	+ 1	3 2	0	0	3 0	+ 1	− 1			
11.	3 3	− 1	0	3 2	0	+ 1	3 1	0	——			
12.	3 3	——	0	3 1	− 1	0	3 1	− 2	0			
13.	3 2	0	+ 1	3 1	0	+ 1	2 11	+ 1	+ 2			
14.	3 0	0	− 3	2 11	+ 1	− 4	2 9	0	− 3			
15.	2 9	+ 2	− 5	2 8	+ 2	− 5	2 4	+ 2	− 4			
16.	2 5	+ 5	− 7	2 4	+ 5	− 4	2 1	+ 8	− 4			
17.	1 11	+11	−10	1 10	+ 9	− 8	1 9	+11	−10			
18.	1 6	+ 2	− 1	1 6	+ 2	− 1	1 5	+ 2	− 2			
19.	1 3	+ 1	− 3	1 4	+ 2	− 4	1 2	+ 2	− 6			
20.	1 1	− 3	− 3	1 4	+ 4	− 6	1 1	+ 4	− 8			
21.	1 7	0	+ 4	1 8	0	+ 7	1 6	+ 2	+ 4			
22.	2 3	− 2	+ 3	2 4	− 1	+ 3	2 2	− 2	+ 3			
23.	2 6	− 3	− 1	2 7	− 2	+ 1	2 3	− 2	0			
24.	2 6	− 2	+ 3	2 7	− 2	+ 3	2 3	− 1	+ 3			
25	2 6	− 3	− 2	2 6	− 3	+ 1	2 2	− 2	0			
26.	2 5	——	+ 4	2 5	——	− 2	2 1	——	− 1			
27.	2 4	+ 4	....	2 2	+ 6	....	1 11	+ 8				

Table XI. (Continued.)

South Coast of Cornwall.

	St. Agnes, Scilly.			Mousehole.			Mullion.		
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	4 1	− 1	0	3 7	− 1	0	3 5	+ 1	0
10.	4 7	− 1	+ 3	4 1	− 1	+ 4	3 7	0	− 1
11.	4 11	0	+ 1	4 6	− 1	+ 1	3 9	0	− 3
12.	4 11	− 2	+ 2	4 5	− 3	+ 2	3 11	+ 1	+ 6
13.	4 7	− 2	+ 3	4 2	− 3	+ 4	3 10	− 2	+ 4
14.	4 1	− 5	+ 3	3 9	− 5	+ 5	3 6	− 4	+ 5
15.	3 4	− 5	+ 4	2 11	− 5	+ 4	3 0	− 3	+ 5
16.	2 5	− 7	+ 5	2 2	− 6	+ 8	2 4	− 8	+ 6
17.	1 8	− 4	+ 9	1 7	− 5	+ 8	1 7	− 7	+ 8
18.	1 0	− 2	− 5	1 1	− 6	+ 3	1 1	− 9	+ 5
19.	0 6	+ 1	− 3	0 11	− 4	+ 4	0 9	− 5	+ 4
20.	0 8	——	+ 5	0 10	——	− 3	0 8	——	− 5
21.	1 1	+ 2	− 1	1 0	+ 2	− 3	0 10	+ 4	0
22.	1 6	0	0	1 5	0	0	1 2	− 4	0
23.	2 2	0	+ 2	2 0	0	+ 1	1 10	− 2	− 5
24.	2 8	+ 2	+ 1	2 6	0	0	2 7	− 1	+ 4
25.	3 0	− 4	− 4	2 9	− 6	− 2	3 0	− 3	0
26.	3 3	− 5	+ 9	3 0	− 1	+ 7	3 3	− 1	+ 2
27.	3 4	− 4	....	3 0	− 1		3 3	− 1	
28.									

	Gerran's Bay.			Mevagissy.			Polperra.		
June 9.	3 4	− 1	+ 1	3 5	0	+ 1	4 2	0	+ 1
10.	3 10	− 1	+ 2	3 11	− 1	+ 2	4 6	− 1	+ 3
11.	4 1	− 2	+ 1	4 1	− 1	+ 2	4 9	....	+ 3
12.	4 1	− 3	+ 4	4 1	− 4	+ 4	4 8	− 4	+ 5
13.	3 10	− 4	+ 6	3 11	− 4	+ 4	4 5	− 3	+ 6
14.	3 5	− 6	+ 7	3 6	− 6	+ 5	4 0	− 5	+ 7
15.	2 10	− 7	+ 6	2 10	− 7	+ 5	3 6	− 6	+ 7
16.	2 2	− 8	+ 7	2 1	− 8	+ 9	2 10	− 8	+ 8
17.	1 7	− 6	+ 7	1 6	− 5	+10	2 4	− 7	+ 9
18.	1 1	− 7	+ 4	1 0	− 6	+ 3	1 10	− 8	+ 2
19.	0 10	− 3	——	0 9	− 3	——	1 7	——	− 3
20.	0 10	+ 3	− 3	0 9	+ 3	− 3	1 7	+ 2	− 3
21.	1 0	+ 3	− 2	0 10	+ 4	− 1	1 9	+ 3	− 4
22.	1 4	0	+ 1	1 3	0	+ 2	2 3	− 2	+ 1
23.	2 0	0	+ 1	2 0	− 1	0	2 10	− 3	+ 5
24.	2 6	0	+ 1	2 7	0	+ 2	3 4	− 1	+ 1
25.	2 7	− 5	0	2 9	− 8	− 4	3 6	− 9	− 3
26.	2 8	− 2	+ 5	3 0	− 4	+ 7	3 6	− 3	+ 9
27.	2 8	+ 1	......	3 0	− 2	......	3 4	− 1	
28.									

TABLE XI. (Continued.)

North coast of Ireland.

	Raughly Point.			Rutland Island.					
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	4 1	+ 1	− 1	5 5	− 8	+ 12			
10.	4 5	0	+ 2	6 3	− 5	+ 3			
11.	4 6	− 2	+ 3	6 9	− 6	+ 18			
12.	4 5	− 4	+ 7	6 9	− 9	+ 4			
13.	4 3	− 9	+ 9	6 2	− 2	+ 1			
14.	3 10	− 10	+ 9	5 4	− 8	+ 14			
15.	3 4	− 12	+ 11	4 4	− 5	+ 3			
16.	2 7	− 9	+ 19	3 1	− 6	+ 14			
17.	2 0	− 13	+ 16	2 0	− 12	+ 13			
18.	1 8	− 11	——	1 5	− 14	——			
19.	1 7	+ 12	− 10	1 0	+ 23	− 6			
20.	1 8	+ 10	− 10	7	+ 5	− 12			
21.	2 0	+ 2	− 4	7	− 10	− 5			
22.	2 7	+ 3	+ 2	10	+ 7	+ 6			
23.	3 0	− 2	− 4	1 6	− 2	+ 7			
24.	3 3	+ 3	+ 5	2 0	+ 6	+ 4			
25.	3 2	− 6	+ 1	2 9	+ 15	+ 8			
26.	3 0	− 4	+ 9	3 4	0	+ 6			
27.	2 8	− 2	......	3 5	+ 12				
28.									

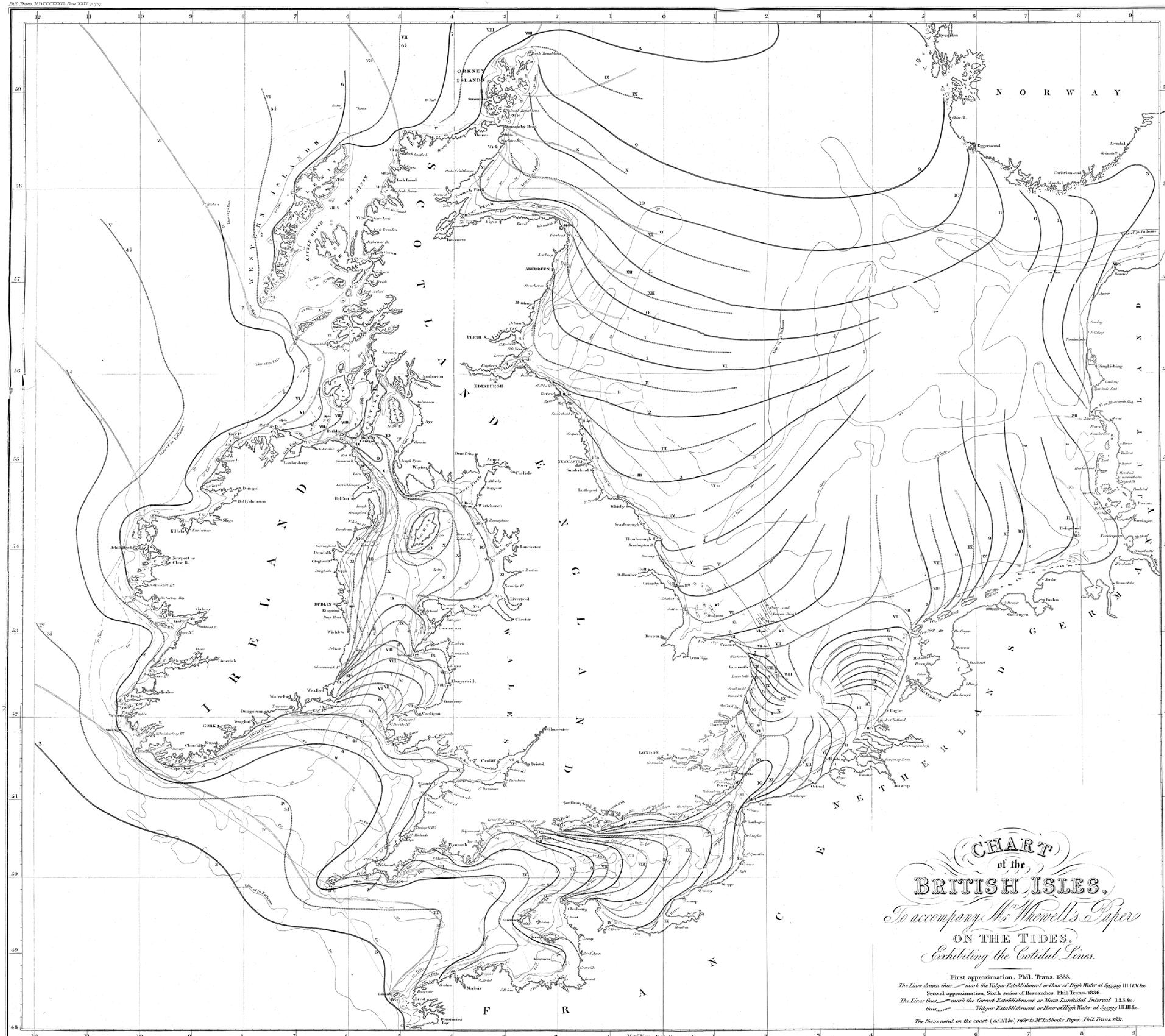
West Coast of Ireland.

	Minaird.			Port Magee.			Brandon.		
June 9.	4 7	− 1	+ 1	3 4	− 1	+ 2	4 2	− 11	0
10.	4 7	− 4	+ 1	3 10	− 2	+ 2	4 9	+ 2	− 1
11.	4 9	− 1	+ 1	3 11	− 1	+ 1	5 0	0	+ 1
12.	4 7	− 1	+ 2	3 9	− 3	+ 2	4 10	− 2	+ 2
13.	4 1	− 4	+ 3	3 6	− 4	+ 3	4 2	− 4	+ 4
14.	3 8	− 2	+ 4	3 1	− 3	+ 3	3 6	− 5	+ 7
15.	3 1	− 4	+ 3	2 7	− 3	+ 1	2 10	− 4	+ 5
16.	2 6	− 4	+ 6	2 0	− 4	+ 3	2 5	− 1	+ 5
17.	1 11	− 4	+ 1	1 6	− 3	+ 2	1 10	− 9	+ 10
18.	1 6	− 2	+ 2	1 1	− 1	+ 1	1 6	− 9	+ 8
19.	1 5	− 2	− 1	11	− 2	+ 4	1 2	− 5	——
20.	1 7	− 2	+ 3	1 0	− 2	——	1 2	+ 1	− 4
21.	1 9	——	− 1	1 1	0	0	1 7	+ 1	+ 2
22.	2 0	− 2	+ 2	1 6	0	+ 1	2 1	− 1	+ 1
23.	2 4	− 2	+ 2	2 1	− 2	0	2 5	− 2	− 2
24.	2 8	− 2	+ 3	2 6	+ 1	+ 3	2 11	+ 8	+ 6
25.	2 10	− 1	− 3	2 7	− 5	− 3	3 2	+ 1	+ 5
26.	3 0	0	+ 6	2 6	− 8	+ 2	3 2	+ 5	+ 6
27.	2 10	− 3	......	2 3	0	......	3 1	− 5	
28.									

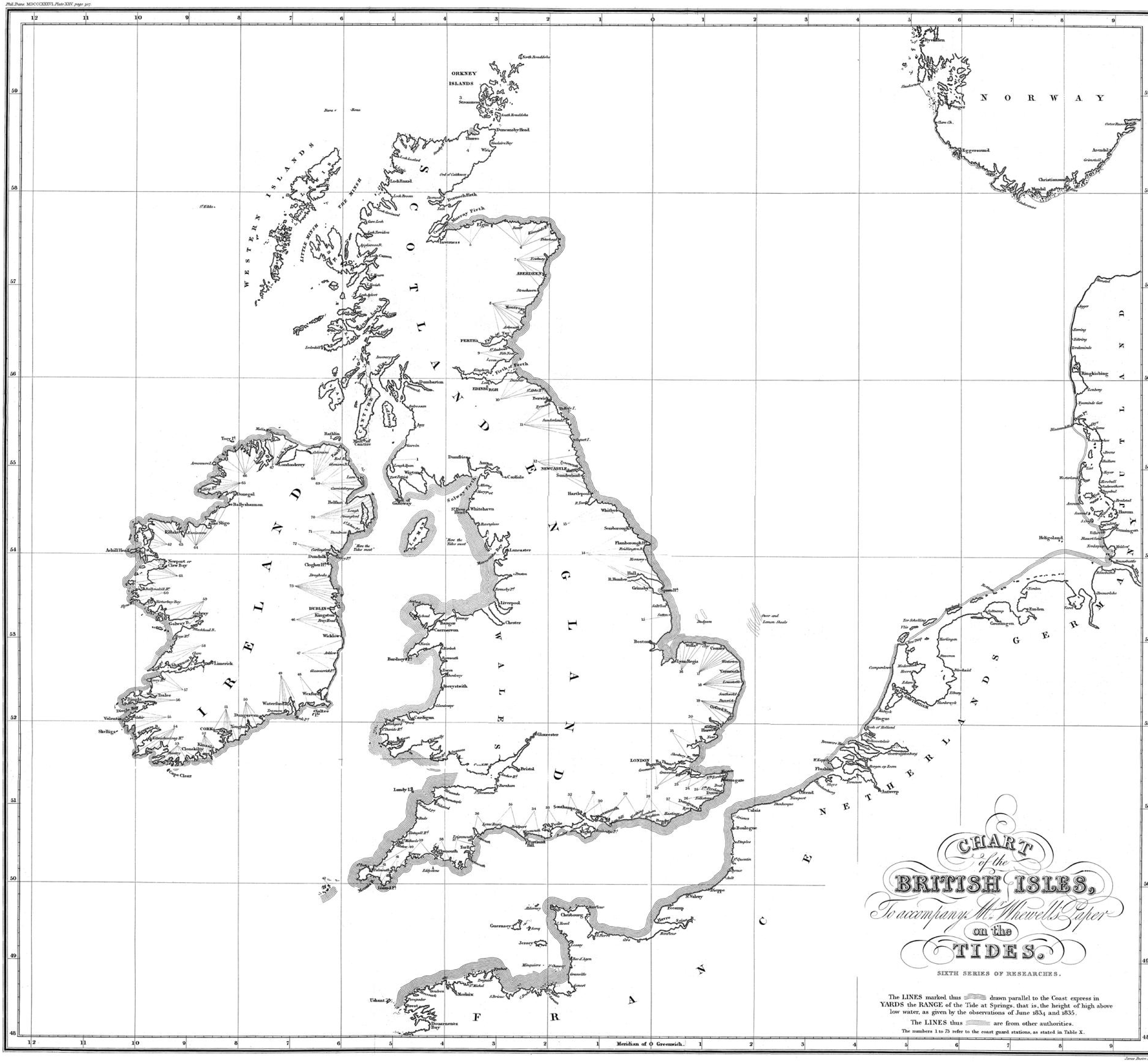
Table XI. (Continued.)

	Ballyonughan.			Barna, Port of Galway.			Killery.		
	Mean.	A.M.	P.M.	Mean.	A.M.	P.M,	Mean.	A.M.	P.M.
1835.	ft. in.	in.	in.	ft. in.	in.	in.	ft. in.	in.	in.
June 9.	3 9	− 2	+ 2	4 4	+ 1	+ 1	4 1	− 3	+ 4
10.	4 8	− 2	+ 3	5 2	+ 2	+ 2	4 7	− 3	+ 6
11.	4 11	− 3	+ 3	5 6	− 2	+ 4	4 9	− 6	+ 4
12.	4 8	− 7	+ 4	5 4	− 7	+ 3	4 7	− 4	+ 4
13.	4 3	− 3	+ 4	4 11	− 3	+ 3	4 3	− 6	+ 6
14.	3 8	− 4	+ 5	4 4	− 3	+ 4	3 8	− 2	+ 3
15.	3 0	− 4	+ 7	3 9	− 1	+ 4	2 10	− 4	+ 5
16.	2 3	− 3	+ 5	2 11	− 2	− 5	2 4	− 4	+ 12
17.	1 7	− 4	+ 3	2 2	− 3	+ 2	1 9	− 6	+ 2
18.	1 0	− 2	+ 2	1 8	− 3	+ 1	1 4	− 4	+ 2
19.	11	——	− 3	1 6	− 2	——	1 4	− 4	+ 2
20.	10	+ 3	− 2	1 7	+ 4	− 2	1 6	——	− 3
21.	1 2	− 1	0	1 10	− 2	− 1	2 0	0	0
22.	1 8	0	+ 3	2 4	+ 2	+ 2	2 7	+ 2	− 4
23.	2 4	− 2	0	3 0	− 4	0	2 10	+ 2	+ 2
24.	2 9	+ 2	+ 2	3 3	+ 4	+ 6	3 2	0	+ 9
25.	3 0	−1 1	− 2	3 5	− 10	+ 1	3 3	− 1	− 2
26.	3 0	0	+ 3	3 5	+ 3	+ 5	3 1	+ 1	− 3
27.	2 10	− 2	......	3 2	0	......	2 9	+1 0	
28.									

	Achil Beg.			Dulaugh.			Doonkeeghan.		
June 9.	4 7	− 6	+ 13	4 4	− 2	+ 4	3 0	0	0
10.	4 10	− 7	+ 4	4 9	− 2	+ 8	3 4	− 2	+ 3
11.	4 11	− 7	+ 5	4 10	− 8	+ 7	3 5	− 4	+ 5
12.	4 10	− 4	+ 4	4 7	− 5	+ 6	3 4	− 7	+ 7
13.	4 5	− 5	+ 2	4 3	− 5	+ 8	3 0	− 8	+ 10
14.	3 9	− 5	+ 10	3 9	− 17	+ 9	2 6	− 8	+ 13
15.	3 3	− 6	+ 8	3 3	− 7	+ 10	1 11	− 10	+ 14
16.	2 9	− 7	+ 19	2 9	− 7	+ 10	1 5	− 10	+ 16
17.	2 3	− 6	+ 4	2 3	− 10	+ 7	1 0	− 3	+ 10
18.	1 9	− 6	......	1 10	− 9	+ 4	8	− 12	0
19.	1 7	+ 2	− 2	1 7	− 3	+ 5	6	+ 8	− 8
20.	1 6	+ 2	− 2	1 8	− 3	......	6	+ 7	− 6
21.	1 10	0	+ 1	2 9	0	+ 1	9	+ 3	− 2
22.	2 4	+ 2	+ 3	2 5	+ 3	+ 3	1 3	+ 4	0
23.	2 10	− 2	+ 3	2 11	− 3	+ 4	1 9	− 3	+ 1
24.	3 3	− 1	+ 5	3 3	− 2	+ 5	2 0	0	+ 3
25.	3 3	− 13	0	3 3	− 15	− 1	2 0	− 12	− 1
26.	3 1	− 1	+ 4	3 2	− 2	+ 5	1 10	− 4	+ 6
27.	2 10	− 1	......	2 10	− 3	......	1 6	− 4	
28.									



Jas. C. Walker Sculpt.



James Basire sculp.

Phil. Trans. MDCCCXXXVI. Plate XXVI. p. 297.