XI. *Some farther observations, on the current that often prevails, to the westward of the Scilly Islands.* *By* James Rennell, *Esq. F. R. S.*

Read April 13, 1815.

DURING the interval of 21 years, since the Society did me the honour to receive my Observations on the Current to the Westward of Scilly, more facts relating to that current, have been collected; as well as observations on its effects, in different parts of its course, between Cape Finisterre and Scilly: the whole tending to a confirmation of the general system set forth, in 1793; and, in one instance, affording, perhaps, a clearer proof of the strength of the stream, in respect of its *northerly* direction, than any of those, adduced on the former occasion.

In pursuing the detail of these facts and observations, I shall begin, in the neighbourhood of Cape Finisterre, and proceed with the course of the current, along the Bay of Biscay; and thence, across the mouth of the British Channel, to Scilly, and the entrance of St. George's Channel.

The three first facts, regard the current from the open sea, setting into the south side of the Bay of Biscay, and along the north coast of Spain; which current has been supposed, in the former Paper, to be occasioned by the prevalent westerly winds; which force the water near the shore, *into the Bay*, and along the southern coast of it. The water so displaced, would be followed of course, by the adjacent water *behind* it,

in the open sea; and so on, successively, to a certain extent. This cause, and not the effect of the *Gulf Stream*, extended to the coasts of Europe, as some have supposed, must surely be referred to, as the origin of the Scilly current.

I. The first case, is that of the Earl Cornwallis East India ship. The circumstance occurred on her outward passage: she was well provided with time keepers, as most of the India ships are.

On the 12th March, 1791, between the parallels of 43° and 44°; and at 3° 45′ of longitude, west of Cape Finisterre, (about 53 leagues), this ship experienced an easterly current, equal to 26 marine miles. Her position being directly opposite to the line of the southern coast of the Bay of Biscay, it is a fair conclusion, that the current was occasioned by the cause abovementioned; or as seamen call it, the *indraught* of the Bay: which, it appears, extends to, at least, 53 leagues from the shore. And as the rate, in this place, exceeds one mile *per* hour, it may be supposed, that the effect extends to a still greater distance.

It may here be remarked, that the same ship, in coming out of the *Chops* of the Channel, a few days before, was *set* twenty four miles to the westward, 15 to the northward; in the course of the 24 hours: that is, 28 miles, in a direction of N. W. by W. This may be supposed to be the same stream of current, in its course from the *Bay* towards *Scilly*.

II. The second fact, is that of the *drift of a bottle*, which was thrown out of a Danish ship, (I believe, sent on discovery) since the publication of the former Paper.

The bottle was thrown out, in lat. $44\frac{1}{2}°$, lon. 12° west from Greenwich: that is, about 48 miles to the N. E. of the Corn-

wallis's station, at the time that she began to feel the current, on the 11th March. It was taken up by a centinel on duty, near Cape Ortegal; and, as was supposed, at the moment of its driving into the surf. If this was really the fact, the bottle, according to the date of the letter contained in it, must have been carried, at the rate of half a mile *per* hour, in the direction of about E. b. S. $\frac{1}{2}$ S.; the distance was about 64 leagues.

The report of this circumstance was transmitted by the French consul at Corunna, to the Academy of Sciences at Paris.

It may be observed, that the drift of the bottle was much to the *south* of east; whereas, that of the Cornwallis, was east: that is, both pointed towards Cape Ortegal, or its vicinity; as if the main stream of the current, was concentrated there.*

With respect to the velocity of the current, in the present case, all, of course, depends on the time of the arrival of the bottle at the shore. It might have been thrown up long before it was seen, and washed off again, by the tide, or surge of the sea. The *direction*, the most important point, cannot be questioned.

III. The third fact is very simple, and perfectly conclusive. Off Cape Ortegal, at a considerable offing, Admiral Knight found the current, at the rate of one mile *per* hour, setting to the E. S. E.; that is, nearly *along-shore*.

The reader will immediately perceive that these three

* It is observed, that, in the mouth of the Strait of Gibraltar, between C. St. Vincent and C. Cantin, the currents point in all directions, between SE. and NE. towards the entrance of the Strait, which may be considered as the pipe of a funnel.

facts, converge, as it were, to one point: that is, in the proof, that the waters of the Atlantic flow into the Bay of Biscay, along the north coast of Spain.

It would seem that the north-westerly current, by Scilly, did not, at least in many cases, balance the easterly current round Cape Ortegal, and the land of Finisterre.* The loss of His Majesty's frigate, Apollo, with most of her convoy, may surely be attributed to the operation of this current. Captain (afterwards Commissioner) WALLIS, assured me, that after having made, as he supposed, ample allowance for clearing Finisterre, yet, in the night, he had a very narrow escape from shipwreck. Very many others have been brought into the same kind of danger: so that the land of Finisterre, were it not discernible at a considerable distance; and its offing clear of rocks and shallows; and moreover, situated in a finer climate, would prove a kind of Scilly, to mariners.

I have not been able to obtain any proofs, on record, concerning the course of the current, *round* the Bay of Biscay. I formerly collected some information from a French commander respecting it. He said, that the setting of the current along the coast of France, to the north and north-west, was a fact well understood; and even acted on by many, in the choice of the *tack*, on which the current gave the greatest advantage, with dead winds.

One circumstance, and that a very striking one, in respect

* Nor, admitting an equal rate, in both places, could it well be. For the current enters the Bay of Biscay, in an *east* direction, but goes off from it, *north-west*. So that, if a ship was carried fifty miles to the NW. from Ushant, she would only have made about thirty-five westing: but in the other case, she would be carried the *whole* fifty, eastward towards the Bay, and Cape *Finisterre*.

of this particular, is, that the soundings in the Bay of Biscay show little, or no *muddy bottom* to the *southward* of the *Garonne* river; but every where to the *northward.* This seems to show that the mud of the *Garonne, Charante, Loire,* &c. &c. is all carried to the northward; and by what cause, but a northerly current? Had the motion of the sea been variable, the mud would surely have been distributed, to the south, as well as the north, of the mouth of the Garonne. The alluvial *embouchures* of the rivers in general, here, and the positions of the banks formed by them, in the sea, point to the N. or NW.; apparently the effect of the same sea current.*

IV. In continuation of this current, along the Bay of Biscay, I shall next mention, that Captain (afterwards Admiral) JOHN PAYNE assured me, that being in His Majesty's ship, Russell, in a severe gale of wind at SW., and with the ledge of rocks called the *Saintes,* not far to leeward, he was under apprehensions for the safety of the ship, during a whole night: but to his surprise found himself carried clear of the danger, by a current; which set the ship, in all, about seventy miles to the north-west.

V. The flowing of the tides, on the west of Scilly, cannot well be accounted for, on any other supposition, than that the flood is prolonged by a southerly current. The flood tide is

* From a view of the chart of soundings, between Spain and Ireland, one might be led to suppose, that the deep water and steep shore, along the north coast of Spain, had been *partly* occasioned by the water driven in from the Atlantic, in westerly storms, along that coast; and which had gradually worn away the matter *there,* and deposited it on the bank, which extends from Bayonne to the westward of Ireland. For the bank seems to expand, as it goes northward, in like manner as the current: and the water is shallower than might be expected, in proportion to the depths, farther in.

known to run nine hours to the northward; but the ebb, in the opposite direction, only three hours. This particular had not come to my knowledge, when the Paper of 1793 was written.

VI. But the most satisfactory proof, not only of the *existence* of a *northerly* current, athwart the mouths of the British and Irish channels, but also of its *velocity* (at least during certain intervals), is a statement in a book published in 1733, entitled JOSHUA KELLY'S Treatise of Navigation,* (in two volumes octavo). This case is the more satisfactory, as it happened in a *dead calm* of forty-eight hours continuance: so that all uncertainty, regarding the accuracy of a *sea reckoning*, allowances for *leeway*, *drift;* &c. is precluded; since the changes of position that took place, could only have been effected by the motion of the sea, either in the nature of a *current*, or of a *tide:* and this latter must be placed out of the question, since the interval of time, included no less a space than that in which four *fluxes*, and as many *refluxes* have their periods: so that they may well be supposed to balance each other.

" It has been observed (says Mr. KELLY)† by an experi-
" enced commander, who used the West India Voyages for
" many years, from England, (in his return from one of
" these) that in about the latitude of 48° 30′, open with our
" British channel, having a good observation (of latitude) at
" the same time, it proving calm and smooth water, insomuch
" that he handed his sails, and so lay forty-eight hours. The

* This was originally pointed out to me by Mr. JOHN PURDY, the very able hydrographer, employed by Messrs. LAWRIE and WHITTLE, Fleet-street.

† Volume the first, page 434.

" first twenty-four hours at noon, he observed the latitude " again, with clear weather; and found by the same that he " had *drove to the northward twenty miles;* which made him " *distrust his former observation*, though his mate agreed " with him; because the ship had not gone, to his knowledge, " one mile: and upon review, he found that he was not mis- " taken. The next twenty-four hours, being still calm, he " had again another good observation; and then found him- " self about twenty-six miles to the northward of his last " observation; which confirmed him that he was right, the " day before; and that this must be imputed to a strong " northern indraught, or current, there. For when you come " near the soundings, and till you bring Ushant south of you, " on the E.S.E. course,* *you will hardly hold your latitude;* and " the general course is E. N. E. or E. b. N; if but a small " matter to the southward of latitude 49°. And he says, " that would have been my course, if we had not met this " opportunity of discovering this strong indraught: and " for want of observation [i. e. if he had not known the lati- " tude] must have run up St. George's channel, or the north " channel, as many have, and still do, for want of the same " [information.]

" After his last observation, the wind sprang up; and " making allowance for the said indraught [i. e. in his future " course], the next day he was brought into soundings; and " the following day, he was brought in sight of the *Lizard*, " by steering to the southward of the east.†"

* These are *compass* bearings. The magnetic variation, at that time, being about a point and a half, westerly, these will be respectively E ½ S; NE ½ E; and ENE ½ N; true.

† Meaning, no doubt, the ESE course, by compass, as above, or true E ½ S.

It will naturally occur to the reader, that although this case gives the *northing only;* yet that, in respect of the main question, which is, the danger of shipwreck, on Scilly; or of being carried into the Bristol Channel; it is sufficient to produce a conviction of the necessity of attending closely to the ship's course, when on the point of entering the British channel, after, or during, a course of strong westerly, or south-west winds. But it would, doubtless, have been more satisfactory, had the *direction* of the stream been known. Had that been *north-westerly*, as I have before supposed, the rate of velocity must have been more than a mile and a quarter *per* hour; or approaching to one and a half (the northing being twenty-three at a mean in the twenty-four hours): whilst that in the Atlas East Indiaman, recorded in a former Paper, was about one mile *per* hour, during four days, consecutively.

The statement in Mr. KELLY's book, which is indeed, altogether, more brief than could be wished, is also defective through the want of the distance sailed, from the place of the last observation for the latitude, to that, from whence they saw the Lizard point. They had their first soundings, the day after that observation; and on the following day, they saw the Lizard. His course appears to have been regulated with a view of preserving nearly, his parallel of 49° 16′; to which he had been carried, by the current. It is not likely that he sounded to any great depth: perhaps seventy fathoms; which in that parallel might have been about twenty leagues south-west from Scilly: and it does not appear that he considered himself in soundings, when the calm began; which

however, it is probable he was, although in deep water.* Accordingly, one may conceive that his position, *at the end of the calm*, might have been about the meridian of Cape Clear, or somewhat to the eastward of it. It must be recollected, that in running towards the channel, after the calm, he had still to encounter the same adverse current: and that, possibly, to within thirty or forty miles of his seeing the Lizard.

But, whether his position, during the time that he was under the influence of the current, be a degree more or less, to the eastward, the fact bears the same on the main question; since a ship, in crossing the stream, wheresoever it may be situated, must have been carried out of her reckoning; and thereby placed in danger; in the event of thick weather happening subsequently, and preventing their setting themselves right, by an observation of latitude.

His idea of the eastern edge of the stream, is worth remarking; as it approaches, in a general view, to the truth. It was, that in *about* the parallel of 49°, it approached to the meridian of Ushant. And with respect to the *direction* of the stream, as he calls it a *northern indraught*, he certainly concluded that it ran to the northward, into the St. George's, or Irish channel; brushing the west side of Ushant, and the Land's End. And the effect of the current, on his ship, was no doubt, such as to warrant that belief, with those whose knowledge of the subject was confined to the mere effect of setting them to the northward of Scilly, and into the mouth of the Bristol channel.

The information contained in this statement, does not even

* Perhaps thirty to thirty-five leagues to the west of *Ushant*, and in about 100 fathoms.

terminate in the mere facts of the existence, and force of the current. The commander of the West India ship, is said to have made *many voyages* to, and from, that quarter; and his narrative shows him to have been *an observant man*. Yet *he* was ignorant of the existence of such a current, until the case occurred, which has been just stated. This then, alone, may serve to show, very satisfactorily, that the current does not exist in strength, but at certain intervals: and therefore operates in a more dangerous, because a treacherous manner.

Had it constantly prevailed, like that round the Cape of Good Hope, &c. it could not have escaped detection; and, in consequence, few, or no evils, would have ensued: but these effects being only felt casually, they were considered as mere contingencies, arising from wind and weather, as in other parts of the sea; and not as resulting from a fixed cause, always operating, although in very different degrees: since no person at that time, had collected the different cases, with a view to examine, and to compare them. Some indeed, referred it to the indraught of the Bristol Channel; without considering, that if such a power existed at all, it was difficult to conceive how it could be suspended; and why it should not operate at all times.

Our navigators, in earlier times, appear to have entered the British Channel, on a more southerly parallel, than they have done in latter times. For, although they might have been ignorant of the real cause of the disturbance in their course, yet many of them believed that there was an *indraught*, as they called it, into the St. Georges's Channel: so that one effect of the current; that is, the *northern set*, had not passed unobserved, although the *cause* was not understood: nor, of

course, could it be known, when to expect it. But I have also heard it remarked by sea officers, as long ago as I can remember, that " it was unaccountable, what should occasion " their *running down so much distance*, in coming in with the " land, from the westward." I never heard, however, that there was any suspicion of a current, setting to the westward.

The idea of a northern *indraught* into St. George's Channel, (but which applies equally to the current west of Scilly) is clearly set forth, in a publication by Captain JOSEPH MEAD, in 1757; but which only came to my knowledge very lately, by the favour of Mr. PURDY; to whom I stand indebted, also, for the knowledge of the important fact of the *set* of forty-six miles, during the calm, in the Chops of the Channel.

Captain MEAD first relates the case of the ship Hope of Liverpool, bound from the coast of Guinea, to that port, in November 1735. (Preface, page iii.)

" Having had a good observation, by which they found " they had the Irish Channel open, the wind continued to " blow strong from between the south and west, but mostly " from the former. Having no other observation [of lati- " tude] for six days, in which time, they carried sail, con- " stantly, they by reckoning expected to fall in with Cape " Clear; but in the following night, they fell in with the " *Blasquets.*" These islands and rocks are situated in lat. 52° 10′; or about forty-eight miles to the north, and one degree of longitude to the westward of Cape Clear.

Again (page 10) he says, that the Bristol merchant ships, which fall in with Cape Clear, on their homeward passage [from the West Indies, &c.] shape their course from thence, with a large wind, to the high land, near *Padstow;* which is

the land they choose to make, to lead them to the entrance of the Bristol Channel. That in estimating this course, they allowed four or five degrees in the bearing, to compensate for the indraught into St. George's Channel. This angle would give about thirteen or fourteen nautic miles: and is probably what they found by experience, to be the general amount of the *northern set*.*

He goes on to say, that, in like manner, the safety of ships, after they come into soundings, till they reach Scilly, depended on their making *no less allowance*, than the Bristol men do, in the other Channel. For, says he, " experience " informs me, that from the commencement of soundings, in " lat. 49° 30′ N. to the length of Scilly, in *fair weather*, I had " found the northern indraught to be six or eight miles in " the twenty-four hours."

Here then, the fact of the *northern set*, is a second time recognised; though without any suspicion, any more than before, of there being a *westerly set*, also.

Here it may be proper to state, what appears to me to be a very important fact; although perhaps, not connected with the current in question; but materially affecting the safety of the navigation, between the British Channel and Dublin. It was communicated to the Author, by Captain EVANS, a gentleman who superintends the harbour works at Holyhead; and who has had much experience in the navigation of the Irish sea.

* Although they might not have known at that day, the *true* latitude of Cape Clear, yet it may reasonably be supposed that they knew the quantity of the *difference of latitude*, between Cape Clear, and the high land of Padstow; as it was so necessary to their purpose, and so easy to be obtained.

All navigators, says he, in their voyage from the Land's End to Dublin, find themselves, more or less, carried to the eastward, whilst running up St. George's Channel: which is the cause of so many vessels finding themselves in Cardigan Bay; where, in tempestuous weather, and westerly winds, many have been lost. And this he justly supposes to be occasioned by a current setting to the north-eastward.

If the stream, which occasions this disturbance in the reckonings of vessels, here, be a portion of the Scilly current, it cannot well happen in any other way, than by the eastern part of that current falling on the Irish Coast, to the *east* of Cape Clear; and being thence diverted to the north-east, along the south-east coast of Ireland. This may certainly happen; and may form a part of the cause. But I conclude that the principal part of the cause, is, a current *generated* on the south-east coast of Ireland, by the prevalency of south-west and WSW. winds; to which, the position of the coast, between Cape Clear and Carnsore Point, seems particularly adapted.

This effect, from whatsoever cause it may arise, ought to be generally known; as it may produce great inconvenience and distress, to those, who for the first time make use of that navigation: and especially to such vessels, as are either not calculated, or not in a state, to beat off a *leeshore:* for the recesses of the Cardigan Bay are deep, and without shelter.

It may be conceived that a current, so generated, on the south-east coast of Ireland, (and possibly augmented by a portion of the stream from the Bay), would *shoot off* to the north-eastward, pointing towards the Bay of Cardigan; as it

cannot *turn short round* so acute a point, as that formed by the Cape of *Carnsore:* such being the nature of all currents, whether of water, or of air. And vessels will be carried to the north-eastward, accordingly, whilst they continue in the stream of the current. The *southerly* current which passes by Dublin, enters probably into, and merges in the stream in question; as the same kind of current, on the eastern side of England, falls into that, which passes the Strait of Dover, and afterwards runs along the Coasts of Flanders, Holland, &c.

The use of being well informed, concerning these *partial* currents, in narrow seas, is obvious: since the want of such information may, in a moment, be fatal to a ship, and her whole crew. This cannot be more strongly enforced, than by calling to mind the circumstances under which a frigate was lost, with her crew, during the war, just terminated. She sailed either from the Downs, or the Thames, to the *Helder*, and ran in the night, under full sail, on one of the shoals, lying before it. Had the Commander known that there is a general *set*, or current, from the strait of Dover (i. e. at the *back* of the Goodwin Sand), along the Coast of Flanders, Holland, Jutland, &c., and which is estimated to be equal to twenty-five miles, on an ordinary passage to the Texel, he would not have run on, during the night: or, at least, without the precaution of sounding.

Again, the Britannia India ship, in 1809, was lost on the *back* of the Goodwin Sand; probably through ignorance of the *acceleration* of the same current, during a violent gale at west, or south-west. A pilot would be reckoned deficient, who did not know the direction and force of the several streams of tide, at all seasons, within his province. There

is a current generally, if not constantly, running up the British Channel; that is, the eastern tides are the strongest; and in stormy weather from the west, *run longer* than the western, (or ebb) tides. At the same time the level of the channel is raised two feet or more, above that of the North Sea; and consequently, the former will discharge plentifully into the latter. Here then, is an *acceleration* of the current; and which men who have the charge of piloting of ships, ought to have known. And who can be ignorant of the high level of the Channel, when they know that the ports in the Channel are some feet deeper in strong westerly winds, than at ordinary times?

Although the following remarks do not apply to the *Scilly*, or *Thwart* current, yet as relating to currents, that at all times affect the navigation around the British Islands; it is hoped that the utility of inserting them, may atone for their being out of place.

It is proper to state, that the facts here set forth, are assumed, on the ground of *detached* notices, and not from a connected chain of observation. Indeed it could hardly have been expected. And it is also proper to be stated, that the currents here intended, only form a portion of the ordinary stream of tide, along the coast. And it is the *difference* between the degrees of velocity of the opposite streams, on the same coast, that constitutes the current in question: as indeed, it cannot be manifested, in any other way. An instance has just been given in the British Channel.

Where rivers form any quantity of alluvial ground, at their entrance into the sea, there, most infallibly, the direction of the

sea current will be shown, by the arrangement of the alluvial ground; or by the sand or mud banks contiguous to it, in the sea. The process is explained in a note: and those, to whom I may not have rendered myself intelligible, may easily satisfy themselves, by observing the junction of any two streams, that are very much disproportioned to each other, in point of bulk; and in which, no art has been employed to counteract the natural course of things.*

* The point of junction of two rivers (or of a river with the sea, provided that the sea has a predominant stream of current) will always form an *acute angle*, if the soil, through which they run, be not of a texture, firm enough to resist the corroding power of the stream; but composed of alluvial matter, deposited by one, or both of the waters; as is ordinarily the case. This point of junction, may be either *firm alluvial land*, or a *bank* of *sand or mud*, under water; as the case may happen. And finally, the acute angle of junction will always point in the direction of the stream of the *recipient* water; be it a river, or the sea.

The reason of this is, that two streams, at their confluence, have a natural tendency to *slide* into each other, as the easiest mode of effecting their junction; and were they, either by reason of the natural solidity of their banks, or by artificial means, compelled to join at right angles, or at a very large angle, the meeting of their waters, in a case where they had any degree of rapidity, would produce an agitation; that would prove injurious to their banks, and inconvenient to the navigation.

For the sake of illustration, let it be supposed that a small river is conducted artificially, into a larger one (or into a sea which has a current along shore,) through a *cut* made through the alluvial soil; and the angle of junction to be very large, or approaching to a right angle; and without any artificial aid, to keep it in that state; the following train of consequences would ensue: (It is to be supposed, of course, that the recipient river had its bed previously enlarged, to receive the other, in order to prevent floods).

The first effect would be, that the head of the *adjunct* river, entering with an almost perpendicular course, into that of the *recipient*, would meet with so much resistance from it, that it would be partly beaten back, and compelled to seek its way along the bank of the recipient river. This bend in its course, would induce such a pressure on the bank, at the *lower* angle of junction, as would soon wear it away; and an *oblique course* of approach, of the whole body of the adjunct stream,

In effect, the *embouchures* of rivers, situated in alluvial ground, always *point in the direction of the stream of the sea current.* The sand, mud, or gravel banks formed by the same current, *lie in the same direction;* and with their *narrowest*, or *sharpest* point, downwards.

In many places along the coast, water courses are found to terminate in long narrow lakes, with narrow sandy tracts, between them and the sea (through which the water still oozes, though all appears to be *stagnant*). These also have been formed by the sea currents, and point the same way. Originally, these water-courses, or rivers, gained the sea, near the place where the *head* of the lake now is; but the sea current, forming sandy alluvion, along that part of the coast, the river kept its course within it, along the former sea shore;

would commence. In the mean time, *a triangular space* of *still water*, would be formed between the *original* upper angle of junction, and the *new* one, occasioned by the obliquity of course: and this *still water*, as is its nature, would let drop the mud and sand which it had held suspended, whilst in motion; and thus begin to form *a triangular bank*, of the same shape and extent,*

Here then the operation is commenced, in all its parts: and the *triangular bank* by its being constantly on the increase, will force the adjunct stream to borrow still more and more, on its opposite bank; which will gradually wear away, until the *angle of junction* of the two waters, becomes so acute, that the adjunct stream no longer meets with any resistance, from that of the recipient; but may be said to *slide* into *contact* with it. This then, is the *natural state* of the junction of streams: but after all, the point of junction will, although almost imperceptibly, move downwards; because the *triangular bank* must continue to receive additions, if left to itself. Mean time, the body of it rises by the continual depositions, above the surface of the water, and becomes firm alluvial land; its *apex* being the point of junction of the two waters; and its *direction*, of course, the same with that of the stream of the recipient water.

When two streams that are nearly equal to each other, in respect of bulk, and of velocity, join; each of them, as it were, asserts *its own rights*; and the collective

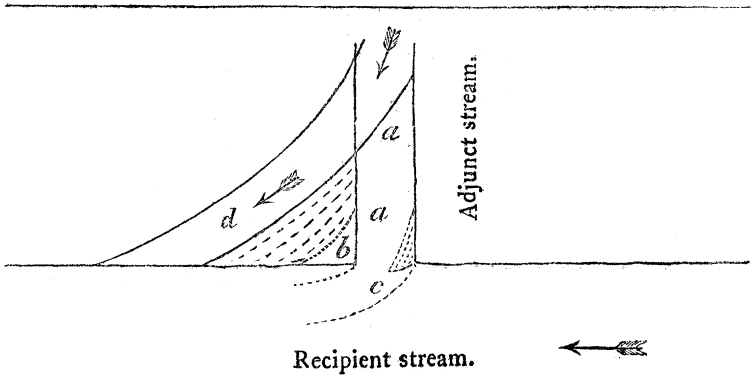
* The reader is referred, for explanation, to the sketch on the following page.

but growing sluggish, for want of *declivity*, it formed a lake within the increasing alluvion; and occasionally, in time of floods, forced open again, a communication with the sea. These lakes equally prove a sea current, as well as its line of direction.

If the reader requires examples, on a large scale, the mouths of the *Senegal* and *Missisippi* rivers, may be referred to. In both cases the currents are well known. And for lesser ones

stream takes a direction, which is generally a mean, between those of the two streams, whilst they remained in a separate state. And in like manner, the falling in of a stream that bears any proportion to the recipient river, will occasion a proportionate determination of the collective stream, towards the line of the former course of the adjunct.

It will be recollected, that all that was meant to be said here, applies to the courses of streams, through alluvial ground: and also to such, as have some degree of velocity.



(*a*) Artificial cut, through alluvial ground.

(*b*) The angle of the bank first worn away.

(*c*) The commencement of a triangular bank formed by the *still water* above the point of junction.

(*d*) Progress of the adjunct stream, towards a more permanent junction.

the rivers on the coasts of our own Islands; as those of *Christ-church*, *Shoreham*, *Newhaven*, *Orford*, *Yarmouth*, *Dublin*, &c. The small water-courses prove, equally with the large ones, the state of the current.

It is assumed, on the ground of various notices that the author has collected, that along the western side of Ireland, occasioned by the prevalence of westerly winds, the preponderance of the stream is northwards:* that it turns round the north end of the Island (or at least, a part of it does,) and thence southward, along the eastern coast: probably the whole way to Carnsore Point; but certainly past Dublin. The effect of a southerly current, or prevailing southerly tide, over the northern, is visible in the present *outfall* of the Liffey; and still more in the traces of the former one; previous to the erection of the *long wall:* both having an inclination to the south. And possibly, the *direction* of the wall has itself occasioned a part of the present difficulty, arising on the matter of the pilotage.

And here I beg leave once more to quote Captain MEAD; who, speaking from his own experience, says (page 11), "on the "western Coast of Ireland, off the *Shellocks* (qu. Skelligs?) "the *northern indraught*, was not less than four leagues in "twenty-four hours, even in *moderate* gales. Also, off the "western coast of *Lewis* Island, I find it stronger than in "*soundings*, [that is, more than six or eight miles in the "twenty-four hours]; and also, off *Foul* Island, (Shetland) "something weaker than the latter."

Along the south-eastern coast, from the Mizen head, and

* Articles of various kinds, known to have come from the southward, and south-east, are continually casting up in Galway Bay.

Cape Clear, to Carnsore Point, the Author is less informed, in respect of notices from others, than concerning any other part of the Coast; but having visited it repeatedly, and considered all the circumstances belonging to it, he is firmly persuaded that there is a *north-easterly* current; and that it is *this* stream, prolonged from Carnsore Point, that carries vessels to the eastward of their course, in their way up the Irish Sea. (See above, page 194.)

The same kind of northerly stream, and occasioned, probably, by the same cause, is produced on the western coast of Scotland; from whence it turns round the north end of the island, and thence southward, along its eastern side, as far as Harwich; where it falls into the strait of Dover, or Channel Current, which comes up at the back of the Goodwin Sand.

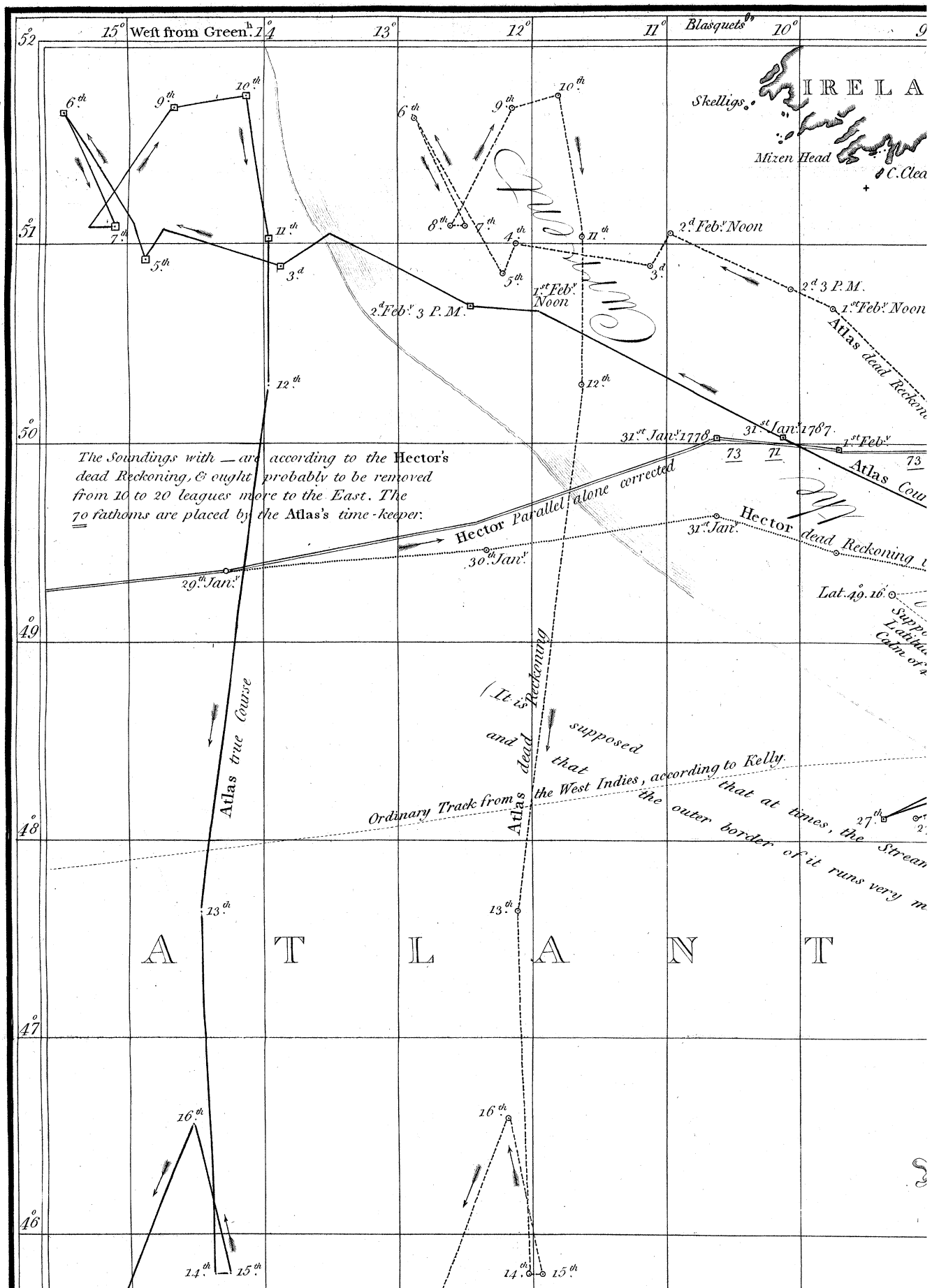
The Channel Current has already been mentioned (page 196.) and can hardly be questioned, as to its existence, when the circumstances already set forth, are considered: such as the *elevation* of the *level* of the Channel, at times, by two feet or more; the *longer continuance* of the *eastern* stream of tide, than the *western;* together with the stream that runs to the north-east, from the Strait of Dover, along the whole Coast of Flanders, Holland, and Jutland: and which, affording, as is said, a help of twenty-five miles, ordinarily, between the Thames and the Texel, a run of only 160 miles, or less; cannot but be referred in part, to the Channel, or Dover Current. (For more particulars concerning the current at the Strait of Dover, &c. the reader is referred to Vol. XVIIth. New Series, of the Society's Transactions.)

At the mouth of the Baltic sea, the Jutland current is joined by the *outfall* of the former; which, at all times, receives more

water than it can evaporate. The collective stream then proceeds along the coast of Norway; continuing its northerly course. Off the *Naze*, it is known to run two miles *per* hour.

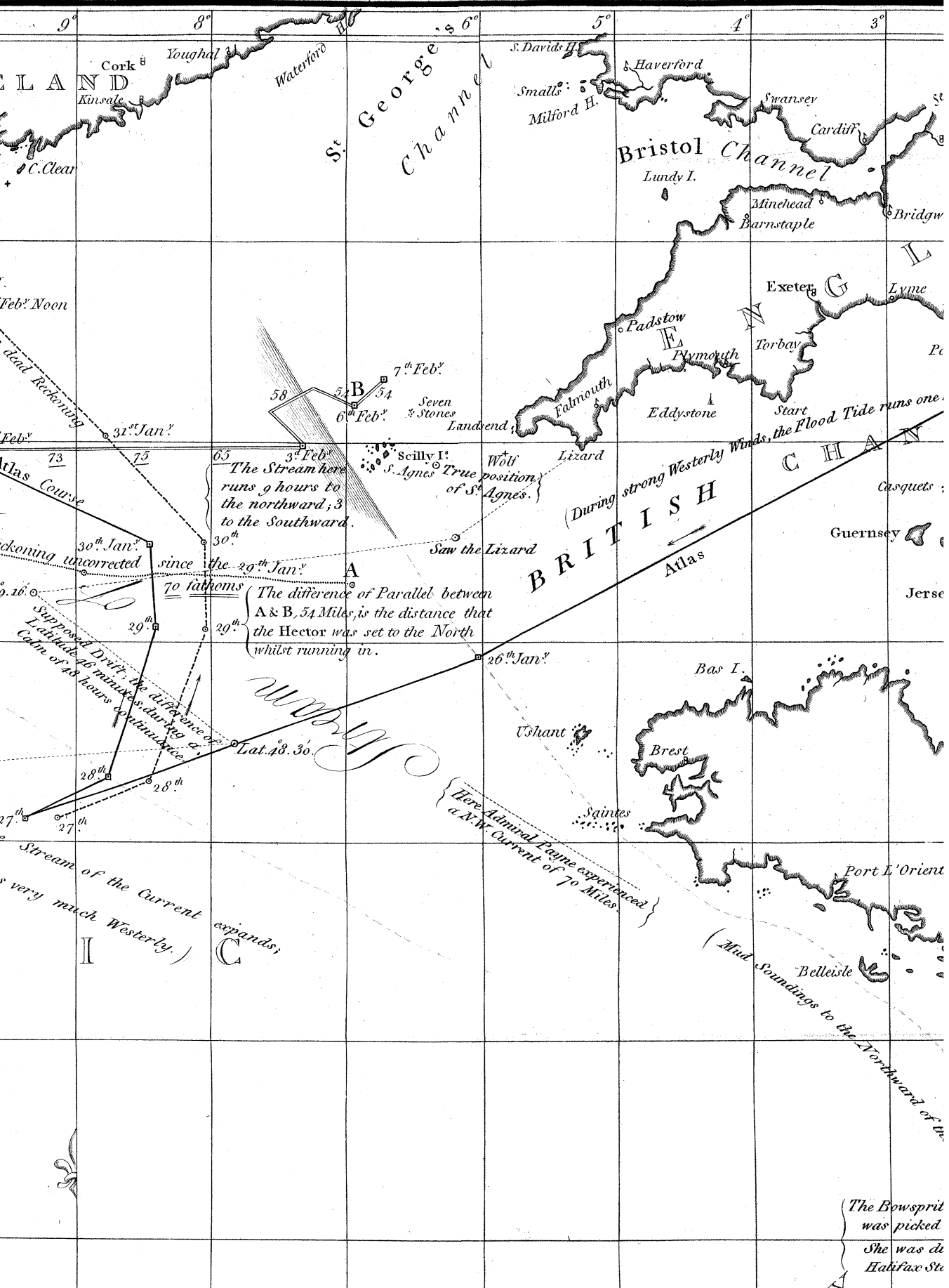
Such is the general course of the stream of current, around these Islands. There are, however, many particular exceptions to be made; as happens in the case of tides, where a deep recess in the coast often disturbs the uniformity of the general course of the stream.

CHART of the *TRACKS* of the HECTOR and ATLAS *EAST IN*



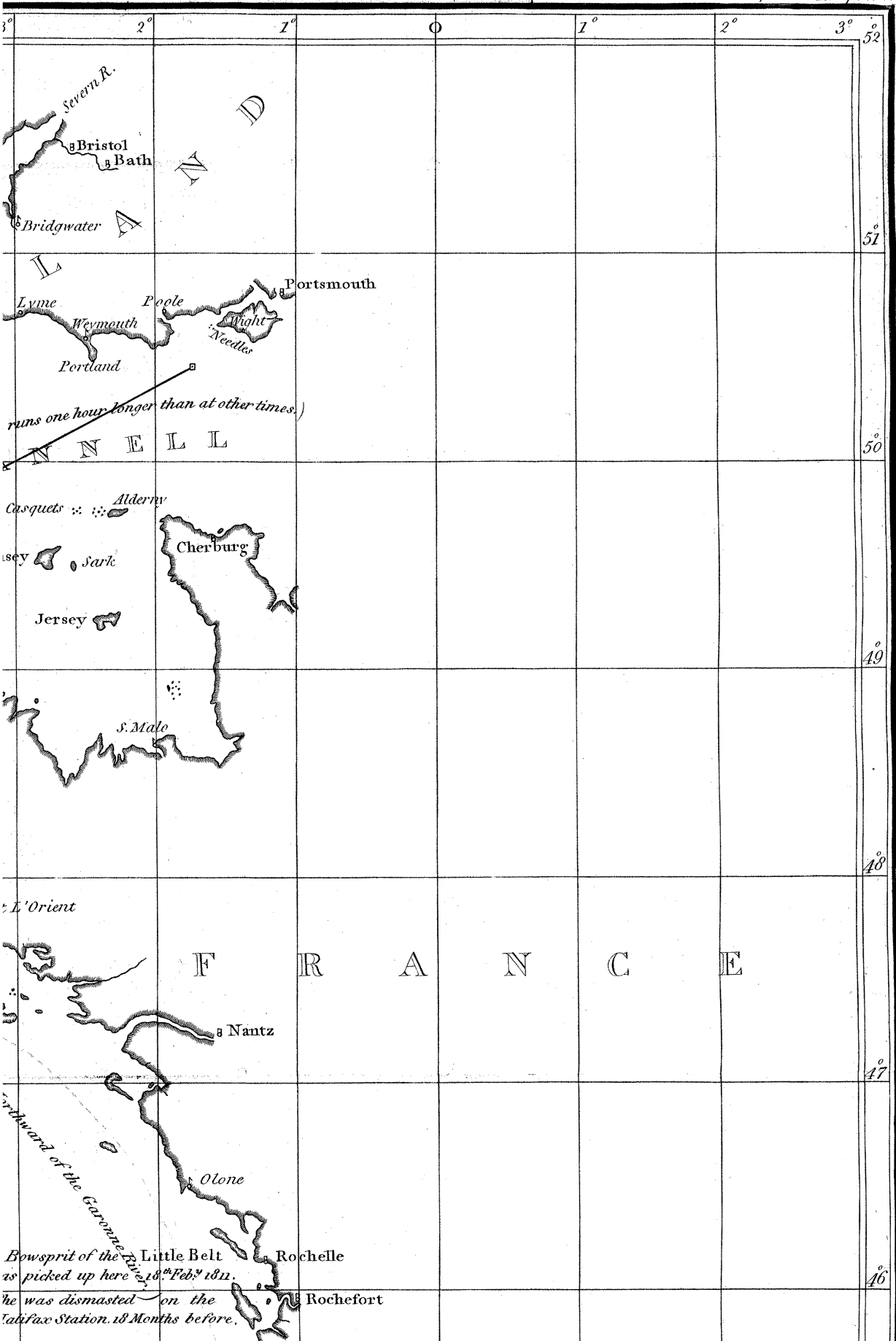
T INDIA SHIPS, in 1778 & 1787, Exhibited with a Design to prove the Existe

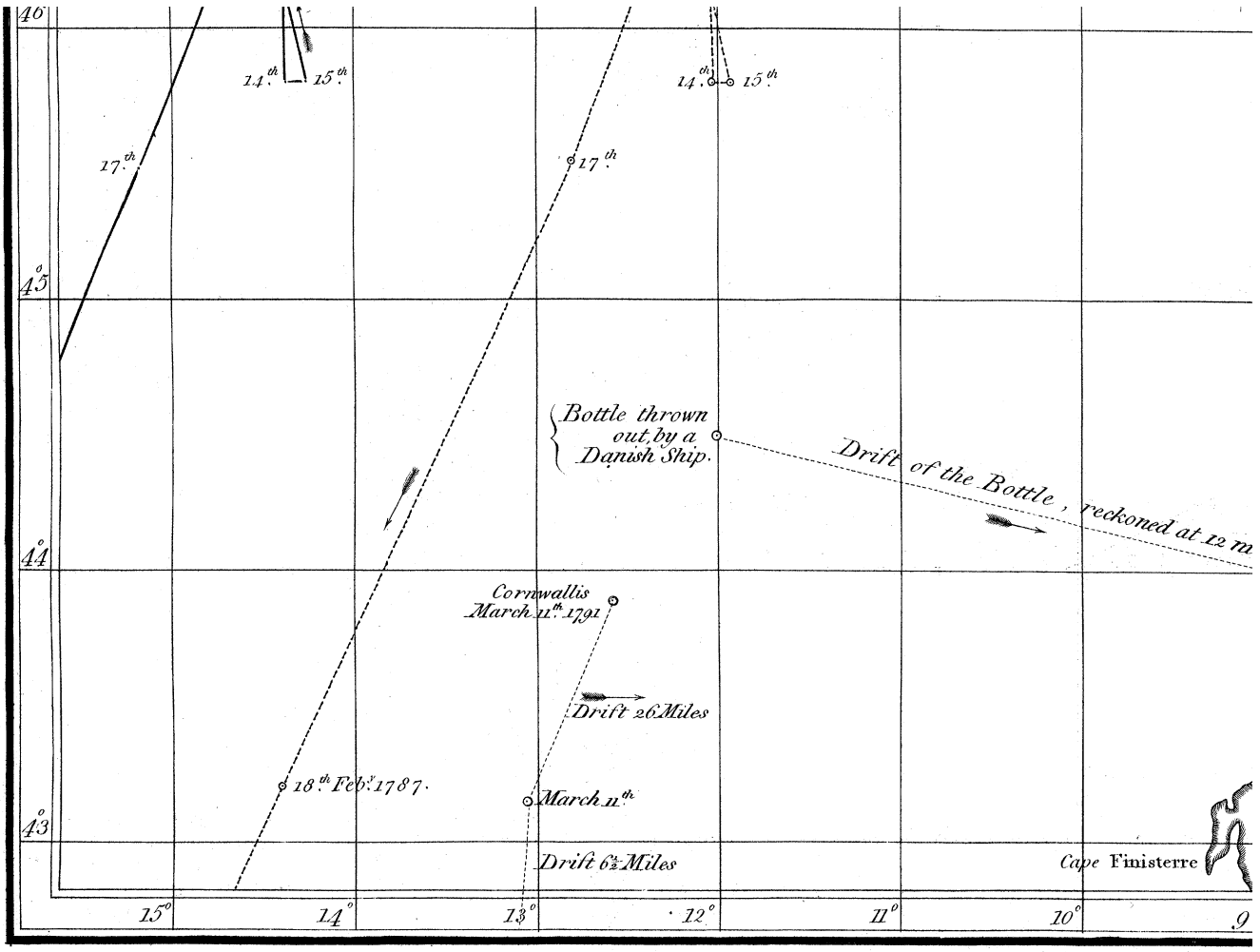
With Additions in 1815.

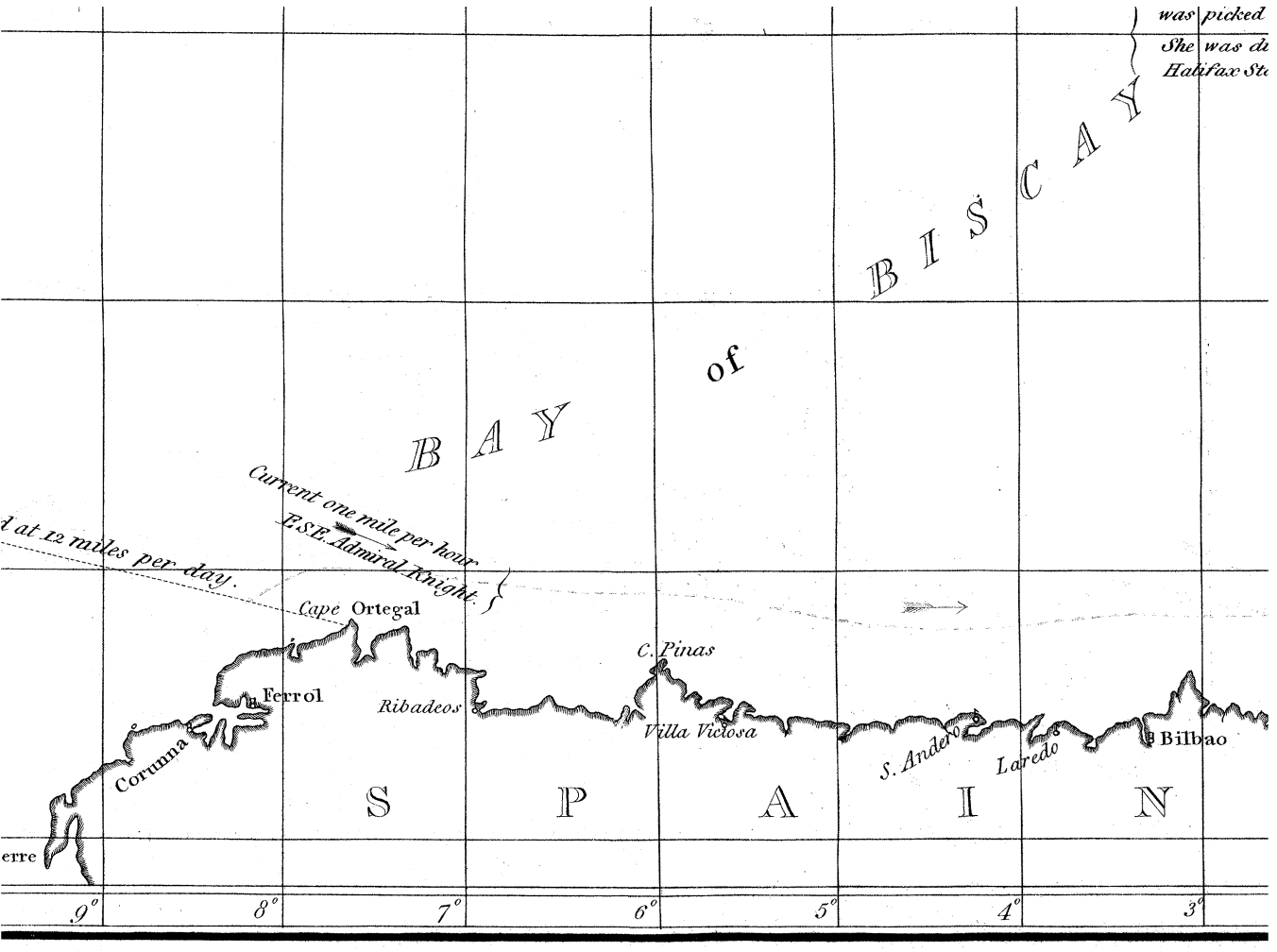


Existence of a CURRENT, between USHANT and IRELAND.

Philos. Trans. MDCCCXV, *Plate* X. *p.* 202.




46°
14.th
15.th
14.th
15.th
17.th
17.th
45°
Bottle thrown out, by a Danish Ship.
Drift of the Bottle, reckoned at 12 ma
44°
Cornwallis March 11.th 1791
Drift 26 Miles
18.th Feb.y 1787.
March 11.th
43°
Drift 6½ Miles
Cape Finisterre
15°
14°
13°
12°
11°
10°
9


was picked
She was di
Halifax Sta
BISCAY
BAY of
Current one mile per hour
ESE Admiral Knight
d at 12 miles per day.
Cape Ortegal
C. Pinas
Ferrol
Ribadeos
Villa Victosa
S. Ander
Laredo
Bilbao
Corunna
SPAIN
erre
9°
8°
7°
6°
5°
4°
3°

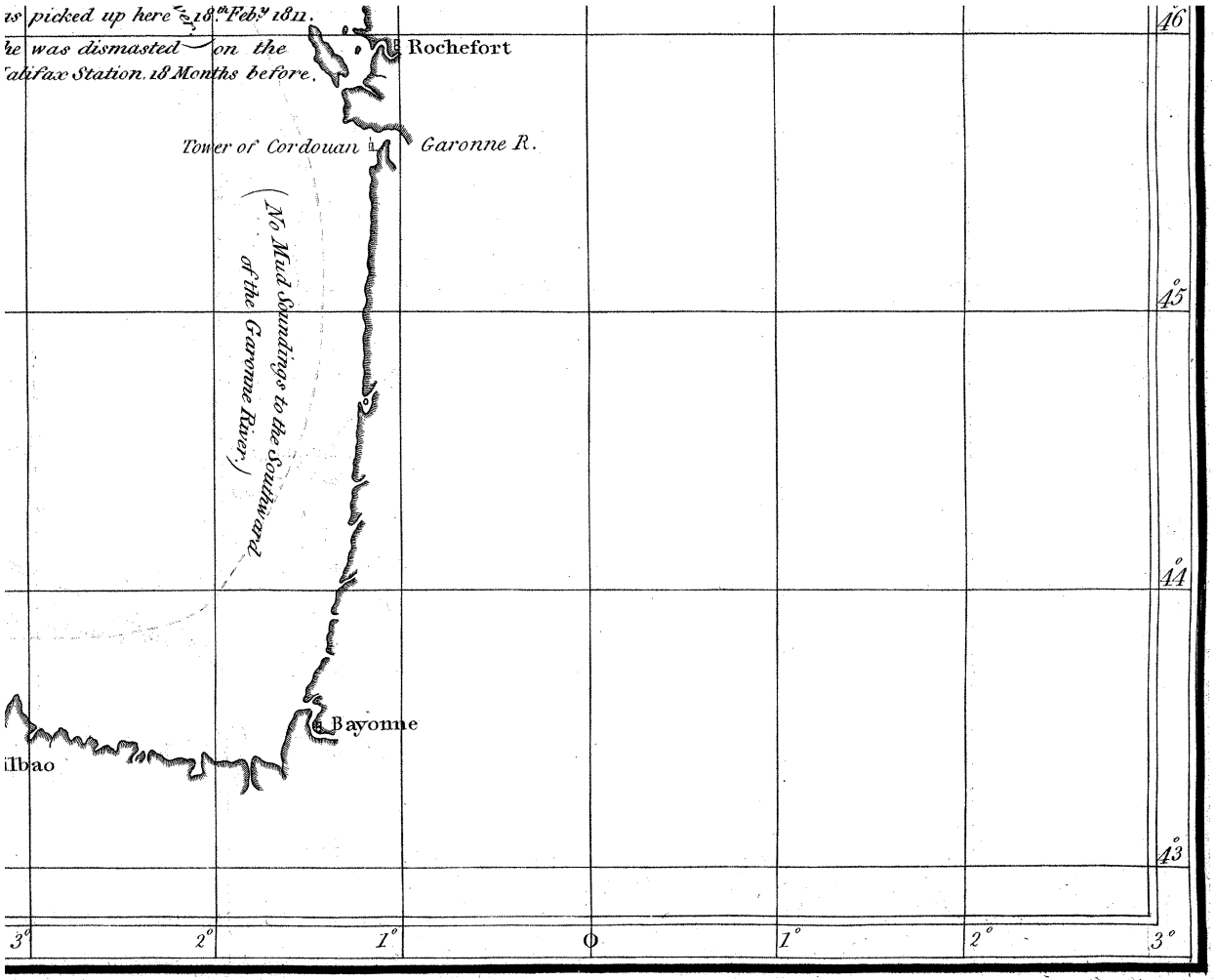

is picked up here 18th Feby 1811.
he was dismasted on the
Tabfax Station. 18 Months before.
Rochefort
Tower of Cordouan
Garonne R.
(No Mud Soundings to the Southward
of the Garonne River.)
Bayonne
ilbao
46
45
44
43
3°
2°
1°
0
1°
2°
3°

CHART of the *TRACKS* of the HECTOR and ATLAS *EAST INDIA SHIPS*, in 1778 & 1787, Exhibited with a Design to prove the Existence of a CURRENT, between USHANT and IRELAND.

With Additions *in 1816*.

Philos. Trans. MDCCCXV, *Plate* X. *p.* 304.

IRELAND

Cork

Kinsale

Youghal

Waterford

Skelligs

Mizen Head

C. Clear

St. George Channel

S. Davids Head

Haverford

Smalls

Milford H.

Swansey

Cardiff

Severn R.

Bristol Channel

Bristol

Bath

Lundy I.

Minehead

Barnstaple

Bridgwater

ENGLAND

Exeter

Lyme

Poole

Portsmouth

Weymouth

Padstow

Falmouth

Plymouth

Torbay

Portland

Eddystone

Start

Landsend

Scilly I.

St. Agnes

Seven Stones

Wolf

Lizard

ENGLISH CHANNEL

(During strong Westerly Winds, the Flood Tide runs one hour longer than at other times.)

Caroquet

Alderney

Cherburg

Guernsey

Sark

Jersey

Bas I.

S. Male

Brest

Ushant

Sginas

Port L'Orient

Belleisle

Nantz

Olone

Rochelle

Rochefort

Tower of Cordouan

Garonne R.

FRANCE

BRITISH

BISCAY

BAY of

SPAIN

ATLANTIC

The Soundings with — are according to the Hector's dead Reckoning, & ought probably to be removed from 10 to 20 leagues more to the East. The 70 fathoms are placed by the Atlas's time-keeper.

Hector Parallel alone corrected

Hector dead Reckoning uncorrected since the 29th Jan.y

Atlas Course

Atlas dead Reckoning

Atlas true Course

Atlas dead Reckoning

(It is supposed that at times, the Stream of the Current expands, and that the outer border of it runs very much Westerly.)

Ordinary Track from the West Indies, according to Kelly

The Stream here runs 9 hours to the northward; 3 to the Southward.

The difference of Parallel between A & B, 54 Miles, is the distance that the Hector was set to the North whilst running in.

Supposed Drift, the difference of Latitude 45 minutes, during 24 Hours Continuance

Lat. 49. 16

Lat. 48. 30

70 fathoms

Saw the Lizard

True position of St. Agnes

Atlas

Hon.ble Admiral Pasley experienced a N.W. Current of 70 Miles

(Mud Soundings to the Northward of the Garonne River.)

The Bowsprit of the Little Belt was picked up here 18th Feb.y 1811. She was dismasted on the Halifax Station 18 Months before.

(No Mud Soundings to the Southward of the Garonne River.)

Bottle thrown out by a Danish Ship.

Drift of the Bottle, reckoned at 12 miles per day.

Current one mile per hour. R.S.E. Admiral Knight.

Cape Ortegal

Cape Finisterre

Corunna

Ferrol

Ribadeo

C. Pinas

Villa Viciosa

S. Andero

Laredo

Billbao

Bayonne

Cornwallis March 11th 1791

Drift 26 Miles

March 11th

Drift 62 Miles

18th Feb.y 1787.

1st Feb.y Noon

2d Feb.y 3 P.M.

31st Jan.y 1778

31st Jan.y 1787

30th Jan.y

29th Jan.y

26th Jan.y

3d Feb.y

7th Feb.y

6th Feb.y

West from Greenwich