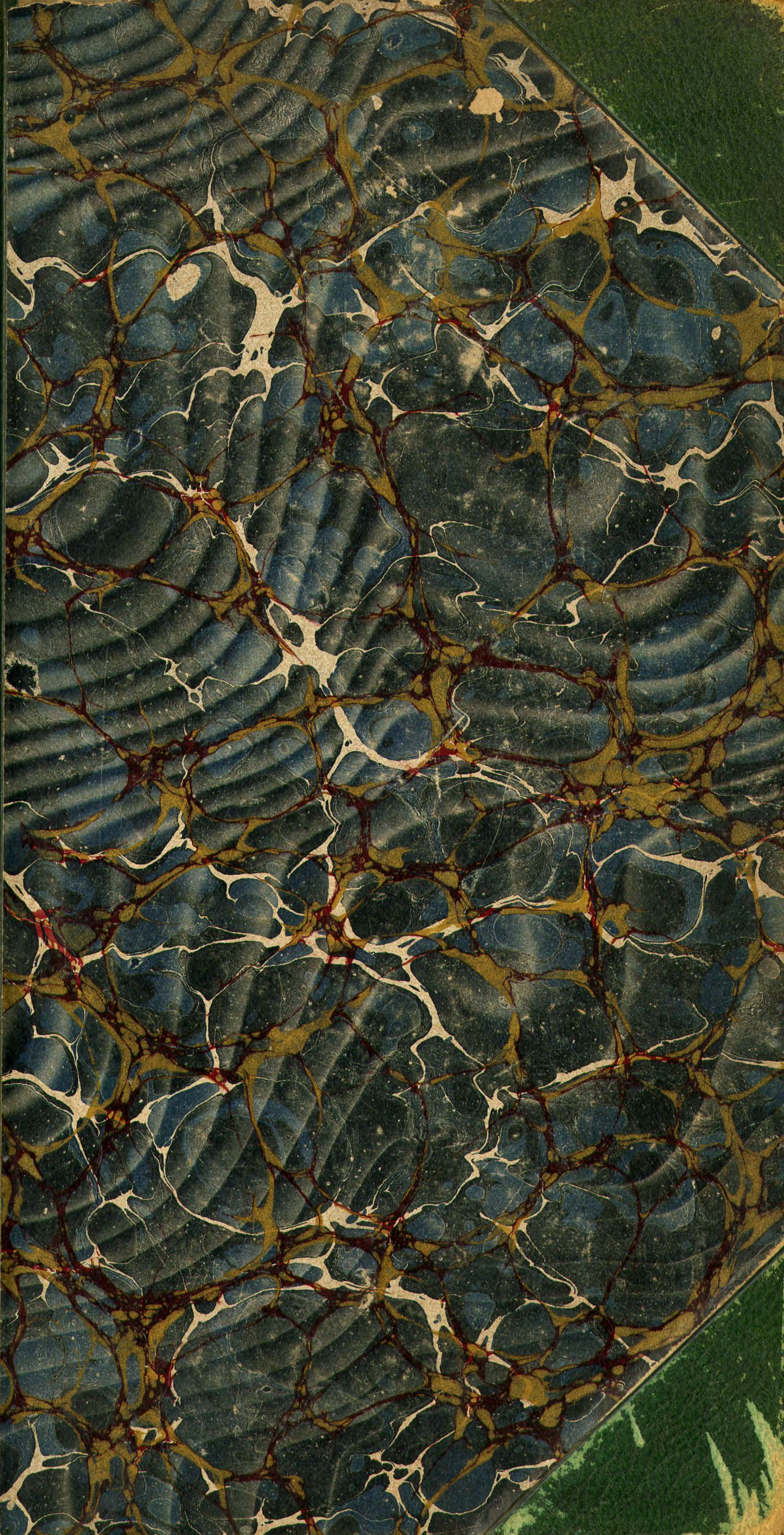


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REMARKS

ON

DAVIS STRAIT, BAFFIN BAY,
SMITH SOUND,

AND

THE CHANNELS THENCE NORTHWARD
TO $82\frac{1}{4}^{\circ}$ N.

COMPILED FROM VARIOUS AUTHORITIES.

LONDON:

PRINTED FOR THE HYDROGRAPHIC OFFICE, ADMIRALTY,

AND SOLD BY

J. D. POTTER, *Agent for the Sale of Admiralty Charts,*
31, POULTRY, AND 11, KING STREET, TOWER HILL.

1875.

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ADVERTISEMENT.

This pamphlet, comprising remarks on Davis strait and Baffin bay, was originally published in 1853. To the information then given is now added that derived from later voyages and explorations, especially in those made by Dr. E. K. Kane, U.S.N., 1853-55; Captain F. L. McClintock, R.N., 1857-59; Dr. I. J. Hayes, U.S.N., 1860 and 1869; Lieutenant C. Normann, Danish Royal Navy, 1869, as also from the official report of the Secretary of the United States Navy on the voyage of the U.S.S. *Polaris* (Commander C. F. Hall) in 1871 as far north as lat. 82° 11' N. by way of Smith sound, together with some published remarks by Mr. G. E. Tyson, who accompanied that expedition.

F. J. E.

Hydrographic Office, Admiralty, London.
April, 1875.

REMARKS

ON THE

PASSAGE OF H.M. SHIPS RESOLUTE, ASSISTANCE, PIONEER [STEAM TENDER] AND INTREPID [STEAM TENDER] THROUGH BAFFIN BAY IN 1850-1.

BY MR. R. C. ALLEN, MASTER, R.N., H.M.S. RESOLUTE.

ROUNDING CAPE FAREWELL or FARVEL.—The passage across the Atlantic, from the Orkneys to cape Farewell, is usually made on or about the parallel of 58° N. latitude. Cape Farewell should not be approached within 100 miles, and after rounding it, the coast of Greenland should be kept at that distance until the parallel of 61° is attained. Captain Graah of the Danish Royal Navy, in his "Voyage to Greenland," makes the following remark which bears on this subject. Speaking of the ice, which is carried from the Polar sea along the east coast of Greenland, he says: "It often forms a belt round Statenhook or cape Farewell, reaching from 120 to 160 miles out to sea, and frequently extends along the south-west coast of Greenland, or district of Julianas Hope (Julianeshaab), making it necessary for ships bound thither to seek a more northerly port, and there await its breaking up."*

Having attained the parallel of 61° N., the coast of Greenland should be hugged as closely as possible by ships desirous of visiting Whalefish islands, Disko, &c.†

ICE.—This Expedition, under the command of Captain Horatio Austin, left Long Hope in the Orkneys on the 15th May 1850; thirteen days afterwards cape Farewell was sighted, passing 63 miles to the southward of it, where a small quantity of stragglng ice, was sailed through. Two days later, when about 70 miles from the land, some stream ice was easily avoided by standing away to the westward.

In proceeding to the Whalefish islands the vessels cleared a heavy stream of ice, lying nearly mid-channel between cape Walsingham and the opposite coast of Greenland, by hauling³ up to the eastward. A vast [number of

* See Admiralty Charts, North Polar chart, No. 260; Davis strait and Baffin bay, to 75° 45' north latitude, No. 235; Arctic sea discoveries, 2,118.

† A current sets to the southward on the east coast of Greenland to cape Farewell, the south extremity, whence it takes a north-westerly direction along the Greenland shore, until it meets the southerly current from Baffin bay at Queen Ann's cape (cape Anna) near the Arctic circle. Drift timber is frequently cast on shore as far north as Holsteinborg, but never to the northward of that place. The breadth of the current at cape Farewell may be considered to extend about 100 miles off the land, gradually diminishing its distance off the coast, until it is entirely lost at Queen Ann's cape. *Narrative of an Expedition to Greenland in 1828, by Captain W. A. Graah, Danish Royal Navy: London, 1837; note by Captain J. C. Ross, Royal Navy.*

icebergs between the parallels of 67° and 69° N., and the meridians of 55° and 57° W. were passed through.

WHALEFISH ISLANDS.—The *Resolute* and *Assistance* with their tenders arrived at Whalefish islands on the 14th of June, sailed again on the 23d, touched at Upernivik on the 25th, and reached the ice at midnight of the same date.

After passing Whalefish islands vessels intending to pass through Melville bay make direct for the ice, and having arrived at its edge, they at once ascertain which is the "land ice," and either secure to it or to some convenient berg lying aground, and there await its farther opening.

ARRIVAL at the EDGE of the ICE.—The Expedition of 1850-51 passed between Brown and Berry islands on the 26th June, and made fast to bergs lying aground in from 12 to 20 fathoms to await the farther breaking up of the ice, which at that date was impenetrable to the northward of 73¼° N., and was resting close home upon the land. Captain Penny's two vessels, together with fourteen whaling ships, were found similarly situated.

BERRY ISLANDS.—Advantage was taken of this opportunity to land on Berry islands, and some observations were taken to determine their position. That of the berg to which the ship was moored was also determined, and with these as a base the surrounding land is laid down.*

HORSE HEAD; BROWN ISLAND.—Horse head,† Berry islands, Brown island, and the Duck islands are known to the whaling crews by those names; Wedge island and Cone island were so named from their resemblance to those objects as seen from Berry islands.

CONE ISLAND.—In passing to the N.W. of Cone island the *Pioneer* towing the *Resolute* ran on a 10-foot pinnacle rock, and the *Resolute* struck it also. The reason for keeping the ships so close in arose from the circumstance of the ice resting home upon the land.

CAPE SHACKLETON.—On the 2d July the vessels were abreast of the noble headland called cape Shackleton, distant from it only half a mile, when the latitude was obtained from the sea horizon; its position may be considered true to within 2 or 3 miles. The headland rises perpen-

* "The greatest length of Berry island is from east to west. It is almost inaccessible on all sides except the eastern, where there is a reef about a mile long running due east, and so raised in two or three parts as to resemble several islands, between which there are accumulations of sand in consequence of a favourable eddy. Along its north and west sides the water seems to be deep, for huge icebergs approach near before they take the ground. On the south and east sides the icebergs take the ground at a much greater distance, perhaps a quarter or half a mile."—*Voyage to Baffin Bay, 1850-51, by Dr. P. C. Sutherland.*

† Dr. I. J. Hayes' vessel the *United States* in 1860 narrowly escaped running upon a sunken reef, which lies off Horse head and at that time not known to exist.

dicularly from the sea to the height of upwards of 1,400 feet, and its vicinity is the resort of many thousands of looms.

Rookery of Looms.—These birds are very much esteemed by Arctic navigators; their flesh is infinitely preferable to that of the wild duck of those regions; and the places to which they annually resort to breed and rear their young should by future navigators be marked in the charts.

In passing up from the position of the 26th June towards Baffin islands numerous deep fiords in the land were seen from the crow's nest between the parallel's of 73° and 74° N., giving it the appearance of a series of islands. Behind these was seen a continuous glacier, or ridge of land wholly covered with snow, and considered to be the main land of Greenland. Lieutenant Brown said that Sir James C. Ross' expedition passed up through a mass of islands (which I have marked in the chart, as probably being an archipelago), entering at the southern end on the parallel of 73° , and emerging northward of cape Shackleton.

On the 3rd July the vessels were fast to a large berg, lying aground in 48 fathoms under Baffin islands.

DUCK ISLAND WATER.—On the afternoon of the 4th July Duck islands were passed. While proceeding from Horse head to Duck islands the whaling ships took advantage of their experience, and passed the *Resolute* and *Assistance*, notwithstanding the latter vessels had steam power. Off Duck islands the masters of the whaling vessels state that they always find water, and therefore it is designated "the Duck island water." On arriving abreast of Horse head they always make straight for Duck islands, so that while the *Resolute* and *Assistance* were hampered by the ice near the Baffin islands they passed up outside of us with studding-sails on both sides.

DUCK ISLANDS.—Duck islands are low, and though the position (lat. $73^{\circ} 54'$ N., long. $57^{\circ} 10'$ W.) given to them is by estimation, it cannot be far from the truth. They are probably the "Three islands" of Baffin.*

Devil's Thumb and Wilcox Head.—On the evening of the 5th July Devil's Thumb was opened out from behind a high headland (probably

* Nearly half way between the southern Duck island and the one nearest to it, the *Panther*, in which vessel Dr. Hayes was a passenger, in 1869, ran upon a sunken rock formerly unknown.

Dr. Hayes' states that the islands proved to have been well named, as they abound with eider ducks. The whole aspect of the islands is extremely forbidding. Near the centre of the island there were some pools or lakes of snow-water which furnished moisture for the growth of great quantities of moss, and in this moss, after the waters had left it dry, the birds had built their nests lining them with down from their breasts.

Duck islands were in former years a sort of rendezvous for whalers. On one of the islands seven graves were found at about fifty yards from the beach on a sloping hill side facing the west, beneath a tall cliff which forms a conspicuous landmark for vessels approaching from the westward.

the Wilcox Head of the chart), bearing N. 50° E. (*true*); and on the 6th, from an astronomical observation, its true bearing was obtained, while its distance was estimated at 24 miles. Also on the 11th, from an astronomical position, the true bearing of the highest part of Wilcox Head was S. 58° E., distant 9 or 10 leagues.

According to the testimony of several whaling captains, about 24 miles due West (*true*), from Devil's Thumb, there is a bank 100 fathoms deep, on which the large bergs ground, and arrest the floating ice. The above bearing and distance are for its south end, and it extends thence 5 or 6 leagues to the northward.*

ERROR in QUITTING the "LAND ICE."—From the 12th to the 17th of July the vessels were closely beset; the ice then loosened considerably, and the opportunity was eagerly embraced to push forward, but unfortunately a dense fog came on. It was on this occasion that the great error of leaving the land ice became manifest, as from that time until the 9th of August the vessels were drifted about with the loose ice called the "middle ice;" and it is possible that we might have experienced a fate similar to that of H.M.S. *North Star*,† in the previous season, had we not made in for some lanes of water to the eastward, though contrary to the opinion of the ice quarter-masters, who were for going to the north-west.

REGAIN the LAND ICE, and SEARCH the "NORTH WATER."—On the 9th of August the vessels in lat. $75\frac{1}{2}^{\circ}$ N. and long. $61\frac{3}{4}^{\circ}$ W., were enabled to make some progress, and at midnight on the 12th passed cape Melville at the distance of 3 miles.

Cape York.—On the 13th at noon we passed close round cape York, and having been detained there a few hours in communicating with the natives, passed Rugged island late in the evening of the 14th. On the 15th we pushed to the westward through some loose ice on the parallel of $76\frac{1}{4}^{\circ}$, and during the afternoon of the same date were enabled to haul to the S.S.W. into open water.

To reach Lancaster Sound.—There are few seasons perhaps in which vessels cannot by perseverance succeed in reaching Lancaster Sound, by

* Devil's Thumb is supposed by Dr. Hayes to be an island, or if not an island, a piece of land connected by a low and narrow isthmus, which is situated at the head of a deep bay, and is from 5 to 8 miles long by 3 to 5 miles wide. The Thumb itself is on the farther side from the sea, and is about 600 feet high above its base, rising like a church spire and as abruptly; the height of the summit is 1,300 feet above the sea. Numerous icebergs are formed from two glaciers situated to the north and east of Devil's Thumb.

No part of Baffin bay is so dreaded as this; the icebergs are so numerous that the locality is often called Bergy Hole, and the currents are so strong that a sailing vessel becalmed off the Thumb would be in great danger of being drifted on a berg.

The *Panther* anchored about 2 miles from Devil's Thumb in a position involving great risk.

† See note p. 11.

way of Melville bay, but in most cases it is attended with serious delay. The whalers generally give it up about the middle of July, or perhaps in the third week, when they go away south, and get over to the west land to fish near cape Walsingham.

KNOWLEDGE of the ICE.—A person may soon acquire considerable knowledge of the ice by employing a large portion of his time in watching its movements from the crow's nest. With a good glass he must carefully trace the different "lanes of water" as they fork into each other, and after a little practice he will attain sufficient skill to direct the ship through the best "leads." Daily observation is the only way to gain the requisite knowledge.

In making the passage through Melville bay no appearance of water, however promising, should induce the seaman to part from the "land-ice." It would be difficult to say now how much sooner the *Resolute* and *Assistance* might have reached the North Water, had they not lost the land-ice during the fog before mentioned.

Tidal effects in moving the ice.—In studying the movements of the ice the tides should be considered. During the progress of the vessels through Melville bay great hopes were entertained that the spring tides would lift the large bergs off the ground, and liberate the ice which they confined. And though the vessels did not succeed in getting very far on those occasions from the circumstance of their being adrift among loose ice, many opportunities occurred of seeing the effect produced upon the lanes of water in-shore; and it was the lift of a spring tide that at last set the ice in motion and released the vessels. A spring tide also liberated them from their winter quarters in 1851.

The disposition of the ice and its various movements in Baffin bay, from the early part of each season after it begins to break up until the close of each year when such as has not escaped out of the bay to be melted in more temperate latitudes again becomes frozen up, is a subject of great interest.

USUAL ROUTE.—The usual route is through Melville bay. The whaling vessels which leave our northern ports annually towards the latter end of February and the beginning of March, after endeavouring to catch a few fish to the eastward of Greenland, make their way up Davis strait towards the latter end of April. Their object is to get over to the western shore near Ponds inlet or bay, where the greatest number of fish are to be found, and to this end they proceed on the eastern side of the strait along the coast of Greenland, and cross to the northward of the "middle ice;" or a few take the "pack"* about the parallel of 73°,

* The *Fox*, under the command of Captain F. L. McClintock, R.N., was caught in the pack on the 18th of August 1857, in lat. 75° 17' N., long. 62° 16' W., and was not

and by dint of great labour, and at considerable risk, they get into the "West Water."* All the Government expeditions have pursued one or other of these routes, the time being too short to risk the chance of a failure by experimental trial of others.

NORTH WATER.—From the combined reports of the several Arctic navigators, who have made known the results of their experience, we may gather that early in every season there is water in Baffin bay, in the vicinity of Lancaster sound. Where and when this water first makes is not so well known. After a tedious passage through Melville bay, and rounding what was considered to be the north end of the "middle ice," the *Resolute* and *Assistance* found themselves in an open sea, which continued all the way down to Ponds inlet, a distance of upwards of 100 miles, and scarcely a particle of ice to be seen! After having been beset nearly a month off cape Walker, and after having been fifty days in the ice, the transition seemed so wonderful that the following queries naturally suggested themselves: How long has this great space of water been formed? How far east does it extend on the parallels of Lancaster Sound and of Devil's Thumb? What is the breadth of that ice called the "middle ice," which lies between the edge of this open water and the track pursued by our expedition? Could the energetic Captain Penny have been right when during the struggles of the two vessels through the ice he several times confidently declared that they were close to the North Water; and that there was a "water sky" in the N.W. quarter?

[“The whalers have long called by the name of Melville bay the expansion of Baffin bay which begins at the south with the "middle ice" and terminates at the north with the "North Water." The North Water is sometimes reached near cape York, in lat. 76°, but more frequently

liberated until the 25th of April 1858, an interval of 250 days, during which period the vessel drifted to lat. 63° 47' N., long. 56° 36' W., 1,194 miles to the southward, perhaps the longest drift ever recorded. The winter thus passed was considered to be rather mild, but very windy.

* About ten powerful steam whalers leave Dundee annually for the fishery in Davis strait. They usually proceed to sea about the beginning of May, and after passing cape Farewell a fortnight or three weeks is devoted to what is called the south-west fishing, in the neighbourhood of Frobisher strait. Afterwards the vessels proceed up the east side of Baffin bay to Melville bay; and if successful in making a passage through this hazardous bay they emerge into the north water, when the course is altered to the westward as much as the ice will admit, until they arrive on the fishing ground at the entrance of Lancaster sound or off Pond's inlet.

Here the fishing is prosecuted until July when the whales are sought for as far as Prince Regent inlet in Lancaster sound. The vessels fish on the west coast of Baffin bay as far south as Home bay and even Cumberland gulf during the months of August and September, returning to Scotland in the beginning of November.—*Commander A. H. Markham, R.N., 1873.*

higher up, and the middle ice which is more generally known as the "pack" sometimes extends to the Arctic circle. The pack is made up of drifting ice floes varying in extent from feet to miles, and in thickness from inches to fathoms. These passes are sometimes pressed closely together, and having but little or no open space between them, and sometimes they are very widely separated, depending upon wind and time. The penetration of this barrier is usually an undertaking of weeks or months and is ordinarily attended with much risk.

The month of August is necessarily the most favourable period of the year for the navigation of the sea so far as concerns the ice; but the winter is then near at hand and presents a serious source of danger; for if the ice once closes, the first fall of the temperature may set the vessel fast for the next ten months. The whalers usually take the pack in May or June, and even sometimes earlier, when the ice is hard and is just beginning to break up."—*Dr. I. J. Hayes, United States Navy, 1860.*]

Varying state of Ice.—It should be borne in mind that the state of the ice is always varying. A strong westerly gale will discharge a large quantity of ice out of Barrow strait, and to a person who had just arrived across from Melville bay late in August it might give the impression that the ice had broken up very late, and that there had been little or no North Water that year. So also a strong northerly wind might cause a great discharge of loose ice from Smith sound into the upper portion of Baffin bay, and it was probably owing to such circumstance that in crossing over from Lancaster sound to Wolstenholme island in August 1851 that the *Resolute* and *Assistance* fell in with so much ice, while on and to the southward of the parallel of Lancaster sound there was an open sea.

State of Ice at close of the season.—On leaving Lancaster sound in the latter part of August 1851 a large space of open water was found at its entrance; but as the vessels passed over to Greenland, towards Wolstenholme sound, the whole coast was found to be lined with great quantities of ice, consisting of large floe pieces and loose sailing ice. During the first week in September endeavours were made to get close in with cape York, but the ice was observed to extend along it also. At the same time lanes of water were seen close in by Rugged island and cape Dudley Digges.

Now had the *Resolute* and *Assistance* just emerged from making the passage through Melville bay round by cape York the ice would have been sufficiently loose, as in the previous season, to have allowed a passage across to the West Water. On the 6th September, cape York being in sight, the vessels bore up for England and steering a course of about S.E. b. S. (*true*) lost sight of the ice in two or three hours; and here is

an instance of there being plenty of open water to the westward of the meridian of cape York, while Melville bay, as in the last season, may have been choked with ice; for cape York was found, as before stated, as much hampered with ice as it was in the preceding year when the expedition passed it.

Possibility of a Bank of Cape York.—It occurred to me that a bank may exist, to the S.S.E. from cape York, say 100 miles, on which the large bergs lie aground and detain the ice; this would account for the slow progress which is always made through Melville bay. Otherwise I cannot account for the ice not moving off when the winds blow from the S.E., East, N.E., and North points of the horizon, which they frequently did, and sometimes very briskly. To the southward of 74° the slightest breeze from the northward was sufficient to make the ice stream off in the most wonderful manner. Strong off-shore winds occurring during spring tides, which latter would raise these bergs off the reef, would produce an open season in Melville bay, and the want of them a close one.

Importance of Deep-sea Soundings in Baffin Bay.—A good series of deep-sea soundings in Davis strait and some portions of Baffin bay might lead to useful results, for it is well known that the large bergs lie aground in some parts which are shoaler than others, and prevent the fields of ice having a free egress out of the bay. And if these spots were known it might possibly lead to the discovery of some route by which Melville bay might be avoided, or at any rate facilitated.*

Were it not that the whalers must have discovered a route by which the North Water may be attained, other than that through Melville bay, and did such other route exist, I should be very much inclined to the opinion that towards the end of June a ship might get across to the westward on or about the parallel of Disko island by watching an opportunity during S.W. winds.

H.M.S. *North Star* in July 1849 being in the latitude of 74° bore up to the southward and attempted to cross the pack in 72° 20', but finding the ice very close there she retraced her course.† The *Abram* of Hull took the pack nearly on the same parallel about three weeks later, namely,

* In lat. 73° 12', long. 64° 56' a deep sea trial sounding was made during the first voyage of H.M.S. *Phoenix*, in 1854, with 2,870 fathoms, no bottom.

† H.M.S. *North Star*, on 29th July 1849, was beset by ice at the east side of Melville bay, and gradually drifted from day to day until on the 26th September she was abreast of Wolstenholme island, when, perceiving the ice a little more loose and Wolstenholme sound perfectly clear, all sail was made and the vessel pressed through it, anchoring in the lower part of the sound that evening. On October 1st she arrived in North Star bay (lat. 76° 34' N., long. 68° 45' W.) where she remained throughout the winter. See plan on Admiralty chart, Arctic sea, No. 275.

It is high water full and change at 11 h. 8 m., rise 7½ feet.

on the 31st July, and succeeded in getting over to the West Water by the 21st August; but neither of those vessels I think, went far enough to the southward.

It has been said that there is no resemblance between any two seasons as regards the disposition of the ice, and it is no small presumption, perhaps, to hazard new opinions with so small an amount of experience.

LANCASTER SOUND.

Having touched at Possession bay and Ponds inlet, the *Resolute* and her tender entered Lancaster Sound on the 25th August 1850, and proceeded along its north shore. Very little ice was seen until they arrived abreast of Prince Regent inlet, with Leopold island in sight, on the 27th.*

Beechy Island.—It was intended to have touched at Whaler point, but finding that the ice would render this a difficult matter, for it stretched east and west as far as the eye could reach, the vessels bore up for Beechey island, where they arrived the same evening. In standing across from Leopold island to the Wellington channel this portion of Barrow strait was found to be filled with ice, consisting of large fields making their way to the eastward. The vessels were detained at Beechy island until the 5th September, when they succeeded in getting across to Barlow creek.

Wellington Channel was found to be entirely blocked with ice. Captain Penny's vessel which preceded the *Resolute* and *Assistance* in their arrival

* The whaler *Queen* of Peterhead spent the winter of 1865-6 in a small harbour in lat. 74° 44' N., long. 80° W. about 12 miles south-westward of De Ros islet, and between point Beatrice and cape Osborne (Hopes Monument) west side of Baffin bay. About 20 foxes, 3 lemmings, a wolf, and 150 ptarmigan, besides some reindeer, antlers, and the skeleton of a musk ox were seen on the land; and upon the ice or sea coast 30 bears and 70 or 80 walruses. No Esquimaux were seen although their traces were abundant. North-east winds prevailed almost constantly and perhaps in some degree aided the strong tides in keeping a considerable space of open water in the offing throughout the winter.

* Dundas harbour lies 9 miles W.N.W. (*true*) from cape Warrender. A tongue of swampy land shelters the bay, but leaves the entrance about a mile in breadth. The eastern shore consists of precipitous and stratified cliffs, about 600 feet high, with a loftier range behind them; and the western side is also high, but sloping. Captain Ommaney, H.M.S. *Assistance*, landed on the east point, off which on a rock were seen a large walrus herd, and near the point, the remains of an extensive Esquimaux settlement, the huts of which were circular, and solidly built of stones and *narwhal* heads; and in the neighbourhood there was a burial place. The adjacent ground was grassy and covered with the antlers of deer and the bones of whales.

Half a mile off East point there were 10 fathoms water, and as an iceberg, which probably drew 12 fathoms, was seen inside, lying aground, it may be inferred that the depth farther in is moderate. Whalers, therefore, who enter the sound might find useful shelter at this place. At the period of Captain Ommaney's visit, August 1850, the harbour was perfectly free from ice.

at Beechey island said that the ice which stretched across the channel was from seven to fifteen feet in thickness, and he was of opinion that it was at least four seasons old; *i.e.*, the ice in the Wellington channel had remained unbroken for four years. He crossed over from Beechey island three days after the *Resolute* and *Assistance* several miles to the northward of the parallel on which the latter vessels got across. The wind which was from the northward was driving out huge "floe-pieces" into Barrow strait, and it was to windward of two of these huge fields of ice that he was seen standing over half courses down. So that this ice of "four seasons," if indeed it was so old, was being disrupted and carried out to sea in September, and this too in a season which may be regarded as having been a very close one.

In a channel like the Wellington, the opposite shores of which are so nearly parallel, the tides exercise a powerful agency in breaking up and carrying off the ice. Each succeeding tides raises or depresses the water level, and with it the ice; consequently, all along the shore, where the depth of the water exceeds the extent of rise and fall, the ice is cracked and left free to float away as soon as the pressure from without is removed. Coupling this fact with the circumstance of the United States ships having been set up the Wellington channel and down again at the close of this season (1850), I should incline to the opinion that the ice is disturbed more or less throughout its whole length every season; and, further, I think it will be found that an open season in the Wellington channel is the rule, a close season the exception.

Thickness of the Ice.—Now with regard to the thickness of the ice being as much as fifteen feet. There are limited portions here and there no doubt where ice may be fifteen feet, or even, as recently seen by Commander Inglefield, upwards of twenty feet in thickness, but these are, perhaps, produced or caused by the coming together of large fields of ice, when, heavy pressure taking place, one part is piled above another, and when this takes place late in the season, they become cemented together. But I do not believe that any extensive field of ice seen by him either in Melville bay or Barrow strait exceeded, I think I may say, seven feet. The ice in Melville bay ranged from about two to six feet in thickness; that of Barrow strait from two-and-a-half to seven feet.

Griffiths Island.—On the 9th September, after much difficulty, and having been in imminent risk of being set out into Barrow strait along with the "pack," the *Resolute* rounded cape Hotham, and proceeding to the westward, arrived on the following day off the point of Griffiths island, where she was rejoined by the *Assistance* and her tender.

At this period an extensive floe rested on the south shore of Griffiths island, and the ice between it and Cornwallis island had not broken up, so

that further progress was arrested. An extensive lane of water leading from the east end of the large floe above mentioned, stretched away to the southward, down which the ever active Captain Penny proceeded in the *Lady Franklin*; he was followed by the *Intrepid*, but both vessels gave it up after a brief examination, as owing to thick fog there was every probability of their being cut off from their consorts. On the return of the *Intrepid* it was said that she had been several miles down the lead in the direction of cape Walker.

On the 13th September, finding the *Resolute* and *Assistance* were driving fast to the eastward with the ice field to which they were moored, we made sail, and plied to the westward amid loose ice, and gained the fixed ice between Griffiths and Cornwallis islands. There they remained for the winter, *i.e.* until the 11th of the following August.

CLOSE of the NAVIGATING SEASON.—About the middle of September the navigating season closes in Barrow strait, or perhaps a week later in very open seasons and when the temperature has not become very low. Sir Edward Parry in his voyage to Melville island decided on going into winter quarters on the 20th September, and with difficulty he succeeded in attaining this object in something less than a week later. On the 14th of the same month he had had the temperature as low as 9°, and it was seldom as high as 20° after that date.

On the 13th September, the last day the *Resolute* and *Assistance* were underway this season (1850), the temperature was down to 1½°, and for a week after it ranged between that and 26°, so that although there were several inconsiderable lanes of water to be seen outside Griffith island, the formation of young ice was so rapid that the ships could not be moved to any considerable distance.

WINTER HARBOUR.—I should think therefore that in Barrow strait a winter harbour should be secured soon after the first great fall in the temperature, whether it be in the middle or end of September, not that a winter station should at once be secured, because the temperature may have fallen a few degrees, but if by the middle of September, with the ice in an unfavourable state for progression, and a temperature varying from 20° to 10° and 5°, then judging from the experience of this season (1850), and from what has been said by former polar voyagers, it is advisable that a winter station should be secured. It would perhaps be advisable to wait a short interval, to see if the temperature rose again, or for an expected wind from a particular quarter, or to watch the effect of a spring tide, but after disappointment in these particulars, the vessel should forthwith get into winter quarters.

NORTH SHORE OF BARROW STRAIT.—Before the expedition of 1850-51 it was thought that there was no harbour or station along the

north side of Barrow strait, between the Wellington channel and Melville island, where a ship could pass the winter in safety. Experience, however, has shown that the north shore abounds in places of security, and that this strait may be navigated, as long as any progress can be made, and up to a late period, provided the north shore be kept aboard.*

In the latter end of April 1851 I was despatched with a sledge party victualled for eighteen days to report upon the state of the ice there. From an eminence on the south end of Lowther island a good view of the ice toward cape Walker was obtained. For several miles across there was a fine smooth floe, interrupted here and there by a few ridges. And the opinion was formed that during some portion of the previous season (1850) this had been a sheet of water, and that had the expedition had the good fortune to have got across from Melville bay three weeks or a month earlier we might have reached considerably farther to the westward than Griffiths island, for at the period of the arrival of the *Resolute* and *Assistance* there the season was fast closing. There were also evidences of there having been extensive lanes of water westward of Lowther island which strengthen this opinion.

To be able to do anything in navigating Barrow strait, vessels should be at the entrance of Lancaster sound early in August, or at the latest by the middle of that month, for early in September the "bay ice" forms rapidly, and cements together the large pieces of ice that may be driving about.

The travelling parties (two of which had been away from the ship for a period of 80 days) had all returned by the 4th July, and all now looked forward to the time of their liberation.

Water to the northward of Melville island.—It is a circumstance worth mentioning in this place, that Dr. Bradford, when making his way to the northward along the eastern shore of Melville island, as well as Lieutenant Aldrich, who was also travelling northward on the opposite coast of the same inlet, had frequent fogs, while Lieutenant M'Clintock, proceeding along the south shore of Melville island at the same time, had fine clear weather. "These fogs" to use Dr. Bradford's words, "came rolling down" "from the northward like great black clouds." This may be taken as evidence of water in that direction, and it probably communicated with that seen by Penny.

* A very snug bight and excellent spot for winter quarters was found by Captain E. A. Inglefield, R.N., in 1854, in Graham harbour, on the north shore of Lancaster sound.

No Icebergs in Wellington Channel or in Barrow Strait.—I would here remark also on the entire absence of icebergs in Wellington channel and in Barrow strait. A stray berg or two may occasionally get well up Lancaster sound, but none have been heard of, or seen to the westward of the meridian of cape Hurd.

Numerous Bergs in the upper part of Baffin Bay.—When the *Resolute* and *Assistance* were in Baffin bay to the northward of the Carey islands in 1851 it was found thickly studded with bergs; whether these came through Smith sound, or were generated by some neighbouring glacier, is not known; but judging from the two facts as they stand, in conjunction with Commander Inglefield's discoveries, if a polar basin or a N.W. passage do exist, I think Smith sound affords the readiest way to get to either. At the same time it must be recollected that the boundary of the visible horizon, as seen from the crow's nest of the gallant little *Isabel*, did not exceed probably 7 miles, and the "open water far far as the eye could reach" might not have been so extensive as her ardent and enterprising captain believed it to be.

First Water seen from winter quarters in 1850-1.—In the season of 1851 the water in Barrow strait was first seen from the south-east point of Griffiths island on the 30th June, and by the 17th July it was seen from the deck of the *Resolute*. For several days from this date it made extremely slow progress toward the ships; but with much satisfaction were seen several large fields of ice outside Griffiths island driving away to the eastward, and giving promise of an open season.

On the 24th July water was observed to be making off the north-west end of Griffith island, and in four days more it had so extended itself as to be within a mile of the ships, while in the N.W. direction the water reached beyond the horizon of the crow's nest, or about 11 miles. This movement took place at the period of spring tides.

Futile attempts to liberate the Ships.—Attempts at forming canals through the ice towards the expected point of liberation by strewing gravel, ashes, &c. in that direction had been made, as well as by cutting it through with saws, and blowing it up with gunpowder, but the results were highly unsatisfactory. And it was not until by the total disruption of the ice between Griffiths and Cornwallis islands on the 10th and 11th of August 1851, during spring tides, that the ships were liberated.

On the 12th of August the vessels passed Wellington channel. On its eastern side along the shore there was a channel of water of considerable breadth (probably 5 miles) extending to the northward as far as the eye could reach from the crow's nest, or about 11 miles. In all records that are kept of the Polar regions this will have to be regarded as a remarkably open season.

The expedition now made the best of its way out of Lancaster sound in clear open water. The *Pioneer* and *Intrepid* parted company off cape Warrender for the purpose of examining Jones sound, while the *Resolute* and *Assistance* proceeded for Wolstenholme sound, where they were to await the arrival of the tenders, the appointed rendezvous being between it and cape York.

The passage of the *Resolute* and *Assistance* across was not so easy as was expected. Soon after passing to the eastward of the meridian of 74° they fell in with some heavy "field ice," and the vessels were plied to the northward along its western edge, but finding that it extended to the N.W. the ships were boldly pushed through it, and passing to the northward of Carey islands succeeded in arriving off Wolstenholme island on the 26th August.

Rookeries at Carey islands.—There are two or three rookeries of looms among Carey islands. The shooting parties from the two vessels bagged as many as six hundred in one day, and a welcome treat they proved.

The east coast from cape Parry to cape York was lined with ice, consisting of large floes which had probably been discharged from Barrow strait, or from the upper part of Baffin bay. It extended out from the land from 3 to 4 leagues, while along the shore there were lanes of water through which the tenders passed while the ships were outside.

RENDEZVOUS.—The selection of places of rendezvous in these regions requires some consideration. Probably the very best is cape Warrender, for near it water may be expected early and late in every season. It is in every way convenient for vessels bound into Lancaster sound, or to those bound south at the close of a season. Vessels bound to Smith sound would of necessity appoint cape York, cape Dudley Digges, or Dalrymple rock as places of rendezvous. The rendezvous appointed for the ships to meet the tenders reached, as before stated, from Wolstenholme sound to cape York, which was by far too extensive; the result was that they passed each other twice unknowingly, and it was by the merest accident that they were enabled to rejoin company at last.

On the evening of the 6th September, with cape York in sight, the expedition bore up for England, and passed down Davis strait with all despatch.

Very little Ice seen in running down Baffin bay.—Proceeding down the bay but little ice was seen. A "stream" of it was seen in 72½° N., and 63° W.; and while steering S.S.E. (*true*) between the parallels of 72° and 69° N. and the meridians of 62° and 57° W. longitude, numerous heavy bergs were passed between, after which no more ice was seen.

Cape Farewell was rounded on the 17th at the distance of 80 miles, and on the 25th September the vessels passed into the North Sea by Fair island passage.

REMARKS BY MR. W. P. SNOW IN SCHOONER
PRINCE ALBERT, 1850.*

MAKING CAPE FAREWELL.—In making the southern coast of Greenland from the eastward it is natural for strangers to give it a wide berth; but the whalers are said to keep it tolerably close aboard, unless the wind is blowing directly upon it; a thing not very common, according to past experience. The advantage of the latter is, that the position of a vessel with regard to the land is then determined, and they can thenceforward, on the passage northward, always regulate their course as required: a very desirable thing where fogs are so frequent, the sun and planets so often obscured, and the obstacles to making any astronomical observations so great. The position of cape Farewell is pretty accurately known, and by sighting, therefore, the southern extremity of Greenland, the after course can be set in accordance.

The appearance of land in advancing to the northward is so deceptive that it is as well to be assured of this one point if possible, when passing up Davis strait; and after rounding the entire promontory, keeping the land either aboard, or within a few hours sight. The voyager is enabled easily to do this, owing to the summits of the lofty mountains of Greenland being discernible at a great distance, above the dense fog and haze that may encircle their base. The Sukkertop is a very conspicuous landmark, and is readily distinguished by its towering majestically above all surrounding mountains.

WHALE FISH ISLANDS.—When making for Whale Fish islands it would appear absolutely necessary to keep the land as much aboard as possible, guarding against the assumed Viktori Ground, in lat. $66^{\circ} 22'$, and the other doubtful dangers marked in the various charts. By running too much off from the land, streams of ice are met; and there is always a chance of running into a bight of the main pack: whereas, by keeping moderately close in shore, the various headlands may be determined, and the ship's true position known. The uncertainty of the currents, and an unsettled state of the weather, generally induce the whaling captains to pursue this course, and to give this advice.†

* In search of Sir John Franklin's expedition.

† See page 5.

DISKO ISLAND may be known from other land in the neighbourhood, by its dark frowning appearance, and its apparently perpendicular aspect when first seen in thick weather. It has a tabular look until closely approached, when a succession of mountains in the form of pyramid appear. Lively bay, or Godthavn,* is in a very large estuary west, and consequently easily found. There are other anchorages and watering places more to the northward, but not possessing any shelter except from winds between north-east and south-east.

Hare Island † is well determined in position, and is not such high land as Disko island.

ICE.—It is about this part that ice is often met with in large bodies, and it is here that some make the attempt, and successfully too, to strike across to the westward through the middle ice. At all events it is generally considered advisable when here, to look at the main pack, if it should exist, and then return to the coast if found impassable.

SANDERSONS HOPE.—Proceeding northward, as the ice permits, cape Lawson, Dark head, and Sandersons Hope, are readily distinguished. The former is somewhat similar to Beachy head at a distance; the second is a high bluff and singular looking mass of dark brown rock, sloping backward from the sea to more somewhat verdant land; and the latter is not unlike the Lions Rump at the Cape of Good Hope.‡ About these three places there are innumerable islets, between which run deep passages, leading, no doubt, to places never yet explored.

Woman islands.—Proven island, Store island, and the whole of the Woman islands present extraordinary features of geological interest. High and bluff, they shoot up from the sea, with deep water around them, as St. Helena does in the midst of the ocean. In most of these passages there appears to be sufficient depth of water close alongside the rock to admit of any vessel entering under easy sail, and manœuvring as required in order to look for shelter if necessary. This was the case with the *Truelove*, during the gale of the 11th July 1849. She ran for shelter to Woman islands, and under the lee of one of those lofty and almost perpendicular iron bound cliffs she lay perfectly secure.§

Upernivik.—The Danish settlement of Upernivik is not, at first, easily discovered. It stands upon the south-west corner of the second island from Sandersons Hope; and bears from it about N.N.E., (*true*), distant 5 miles.

* See pages 28, 32.

† See remarks on coal found on this island, page 34.

‡ At the base of Kasarsuak or Sandersons Hope, whose height is said to be 2,300 feet, is Karsuk, a settlement situated on a green slope.—*Dr. Hayes*, 1869.

§ Captain E. A. Inglefield remarks, 1854, "the survey of Woman islands will prove valuable to whalers, or vessels damaged by the ice in Melville bay."

The anchorage is in a cove at the back of the island; and it is there that the vessel, which annually arrives from Denmark, may be found. Native pilots come off in their kayacks, and English is understood, and partly spoken, on shore. The governor's house is a tolerable building; and the settlement is worth visiting, if only for the opportunity there afforded of forwarding despatches home. The Esquimaux can be fully trusted.*

ICE—IN SHORE LEAD.—As the ice is here very frequently met with in large bodies, great caution is required in working a vessel to the northward. The advice always given by experienced whalers is, if bound through Melville bay—keep to the shore as close as the land ice will permit, and, on no account to be tempted, by any apparently favourable opening to the westward, to abandon the shore. The value of this advice is such, that it ought not, under any circumstances, to be disregarded; unless the intention be to try the middle ice, and not to go through Melville bay; in which case, vessels, if up so far as Upernivik, should bear away direct to the westward, and not allow themselves to be entangled in the vast field and floes that hang about, and within, the outer circle of Melville bay.

Sir Edward Parry in 1819, and Sir John Ross in 1829, successfully crossed over; but they bore off to the westward before they reached the latitude of Upernivik. After attaining that parallel, it is a matter of almost vital importance that the land floe should be kept close aboard. Neglecting this, vessels get among the loose floes, and sometimes remain close beset, drifting hither and thither and placed in great peril. The Americans were thus situated, when venturing in the pack on the 11th July 1850. The safety of a ship depends on her keeping in loving proximity to the land floe.

Leaving Upernivik, the ship's course should be at once directed for the ice attached to the main land, between which and the middle pack, there is almost always a narrow channel of water. Last summer (1849) it unfortunately occurred that the land floe broke up, and the pieces drifting to seaward, and uniting themselves to the large bodies there floating about, intercepted the passage already taken by the ships previously up so far.

This was the cause of the delay attending Captain Austin in H.M.S. *Resolute* and Captain Penny in the *Lady Franklin* in getting through. Had the land floe not broken off, and actually jammed them in against the main body of ice, they would in all probability have got through, and into the north water by the middle of July, and before the *North Star*

* See pages 28, 35. Also plan of Upernivik harbour on Admiralty chart, No. 276; scale, $m = 2$ inches.

had left her winter quarters. The delay therefore attending them was owing solely to the unexpected break up of their main dependence; and they would otherwise have been enabled to proceed onward by the aid of the steamers at a rate probably never known before in Melville bay.

In illustration of these remarks, I may observe that a similar delay, though not for so long, occurred to the *Prince Albert*, but was avoided by the two American vessels; who, having seen their first error in trying to force their way to the westward, wisely availed themselves afterwards of the remaining portion of the land floe, to keep along it in working to the northward. This was the secret of their speedy deliverance from the ice, which so much surprised us on beholding them in Barrow strait, when it was imagined they were still struggling with the same difficulties as the *Prince Albert*. The American vessels encountered no great obstacles after keeping to the land floe; and there is every reason to believe that they found an almost uninterrupted passage.

Choice of Leads.—The cause of the *Prince Albert's* delay was by taking a more seaward lead than the Americans; two doubtful leads having presented themselves; the one, south-easterly to the shore, but with its continuance broken by an apparently difficult neck, and the other to the northward. Neither presented much prospect, but the latter was in the direction wished for; while the former, however, led to the land floe, which, after the 21st, it was evident was lost. The schooner *Felix* under Sir John Ross took the northern lead, and this decided our choice. The result was that in a fortnight the *Prince Albert* made only 12 miles direct progress, while in that fortnight, the Americans by taking the south-east lead, had made the entire circuit of the bay to cape Melville.

MELVILLE BAY.—Keeping to the land floe, then, is the great secret for getting through the bay, although it is involved in many difficulties, and of a somewhat different kind to those that are encountered in the main pack. The first is, the doubtful position of the whole coast marked in the chart as being Melville bay, where even the highest land is all but buried under enormous glaciers, and the islands alone only are seen peeping through the thick ice of the sea that environs them, and where it is therefore a matter of great difficulty to determine, in thick weather, what may be the right position of the ship, especially as the currents are at work in a more mysterious manner than in any other part of the world.

Again, if the land ice should chance to trend in very close to the shore (which is the best position for vessels it can assume), there are several small islands in the direct route to the northward. Upon one of these, Lieutenant Elliott, of H.M.S. *Assistance*, landed, and ascertained the latitude to be $73^{\circ} 14' N.$, and the longitude, by five chronometers, $56^{\circ} 45' W.$

Shackleton reef.—Off cape Shackleton, a reef is said to extend to some distance.

Baffin isles.—Baffin isles, and other groups in the bight of the bay, have all to be avoided, as their positions are inaccurately laid down in the charts; and lastly, there is some confusion in all the charts in the names of both the headlands and islands.

CAPE DUDLEY DIGGES.—From cape York until reaching cape Dudley Digges, there is no impediment in the shape of rocks or islets. Off the latter cape there is a small sugar-loaf island, having, I believe, deep water all round.

Stoppages by interrupting floes.—Looking at the progress of the *Prince Albert* through Melville bay, the following ideas occur. Frequent stoppages are occasioned by two floes of ice being connected or hung together by other smaller pieces, heaped upon and between them. Where two fields have suddenly met, and thrown up large masses by the heavy blow each has received, the same thing occurs; and perhaps, if no attempt be made to remove the obstacle, the vessel may be detained for days; but here, as in everything else, force is not always the best agent to apply to a stubborn difficulty,—the readiest way to master it will be, as much as possible, to remove the cause whereby it was produced.

Passage between the floes.—Two floes of ice having been driven together by wind, or current, or both; wind or current may, or may not again separate them: human power cannot. But human power can possibly remove the first result of that collision, and a little ingenuity may indirectly accomplish the desired end. Thus, when the *Prince Albert* was first stopped by one of these impediments in Melville bay a very narrow neck, only, intervened between the vessel and some open water. The adjoining floes had been driven together, and their tongues had over-lapped underneath the surface of the water. This could be seen by walking round the spot, and examining it minutely. Upon the tongues, and thus binding them together, several large and small pieces of ice had been thrown in wild confusion; and merely looking at what was presented to the eye, it would have been vain to attempt pushing the vessel through.

But, beginning with the upper pieces, and pushing them through into the open water, the under pieces become eased; the action of the tide or current set the floes in work, and the passage soon began to open. Such passage whether so opened, or made by blasting, can always be kept open sufficiently long for a ship to pass through, by placing some of the loose blocks of ice, as wedges between the two floes, ahead and astern of the vessel; as otherwise, the ice might again suddenly close by the very action of the tide that had assisted in opening it.

Danger in passing between two floes.—There are few positions more dangerous than threading through a fleet of bergs in thick weather.

There is the danger of coming suddenly upon one of these masses of ice, unseen through the fog and rain until it is close aboard. There is danger in making fast to them in such weather, for they themselves are often in motion, and may carry the vessel unawares upon a grounded mass, or heavy floe: there is danger too from an overturn, or a break up, or from overhanging pieces unexpectedly tumbling down: nor should it be forgotten, that innumerable eddies and counter currents are here at work, whirling and rushing with great velocity in every direction. Thus, unceasing watchfulness is necessary to avoid unceasing danger; and when fast to a floe, a very sharp eye must be kept upon any bergs that are near, lest they come unceremoniously upon the vessel, without either noise or perceptible motion.

Natural and Artificial Docks in the Ice.—From the 27th to the 31st July the *Prince Albert* was all but closely beset, and during that time the whole body of ice drifted to the N.N.W., the vessel resting in comparative safety in a natural dock; and to ensure as much as possible the obtaining the shelter of a natural dock, it would be well, in making fast to a floe, to take a position where a bight is formed by two stout projections. Many such places may be found, with the almost certainty of finding security in the event of other ice setting down towards the ship. The projecting angles of the floe serve as outer breastworks, and receive the first shock of any collision that may ensue between two fields.*

At all events some little time is given to a vessel to guard against the danger; and, for her crew, if need be, to escape more leisurely. It is, indeed, absolutely necessary, at whatever expense of toil and effort, to cut an artificial dock, when no natural one is accessible; but no pains should be spared in seeking for the latter. A natural dock was fortunately found for the *Prince Albert* at the time mentioned, and though the ice closed in fast and heavily, it could be seen to hang on the projecting angles of the bight we had entered.

These angles, however, occasionally gave way before the great pressure upon them; and consequently narrowed the small space of open water left to us: still, when the outer edges of each floe of ice had broken up, and the solid portion of the one came in contact with the solid portion of the other, the vessel was liable to no further injury. The two masses became united, and drifted together, with the vessel enclosed therein, and in that manner protected.

When such a bight can be found in a solid floe its power of offering security might be ascertained by examining the projecting points, and

* A natural dock formed by the ice saved the *Phoenix* when the *Breadalbane* was lost.—Captain E. A. Inglefield, *H.M.S. Phoenix*, 1854.

seeing to what extent they would probably be broken up by the sudden collision of another floe ; and at what distance from the outer edges, the floe offering shelter, would be able to resist the attack of the other. If the bight still runs within this mark, perfect reliance may be placed on such a natural dock.

Cracks in the Ice.—On the 31st July, a fog and calm produced the usual slackening of the ice ; it appeared to crack gradually, and, in the evening, the entire field, large and thick as it was, parted asunder, in east and west directions. At first it appeared as a mere thread ; but, by the time the vessel had entered, it had enlarged and formed a passage precisely like a canal, and as even and straight as such, with steep banks on either side.

Now this was not a place where two floes had met and stopped the passage : for, save at the western entrance, no masses had been raised up to denote such collision ; but it was the solid floe severed in twain, as if by some unseen power, to admit of our extrication. Passing along it, I observed from the “nest” several small holes, such as are occasionally found in a floe ; and, it appeared, that it was in the line of these holes that the break had taken place. The inference I drew was, that any other floes might be so separated by the application of blasting.

Even in common ice, if a crack is anywhere but partly made, it is soon seen to extend itself much farther, and this applies still more strongly to ice exposed to the united action of sweeping tides, and collision with other masses in motion. If, then, blasting be brought into operation wherever an intervening floe blocks the passage to some open water, there would be a good chance of success ; for, without supposing that whole solid fields of ice can be thus blown up and rent asunder, yet, what can be done, in causing a convulsive movement, is sufficient to crack the entire mass ; and, where a crack is made, the other causes named speedily assist in enlarging it.

Thus in breaking a neck of ice by a vessel coming upon it, end on, the sudden shock it receives produces the crack, and it afterwards rends without much difficulty. The vessel's strength does not break it but the sudden shock ; and here is seen the great advantage of steam, in being able at all times to give a certain power to the blow made, which power a vessel, under canvass alone, can only derive from whatever wind may exist : which, in the ice, is generally very light.

PRECAUTIONS.—On the 2d of August the *Prince Albert* was close to her position of the 29th July, and again tried for the northward by rounding a floe near some bergs ; but once more had to go backward to the south-east ; until at noon of the 5th she was not far from where she had been just nine days previous. On the 4th of August the vessel was very closely beset, and in greater danger than at any time before. Among very

heavy ice and bergs, no natural dock was found, nor any time for cutting an artificial one before the floes closed in upon her ; and we at once prepared for possible disaster.

No material injury is likely to occur to the crew of a vessel at such a period, if they are only on the alert and prepared beforehand ; and the course that we adopted was certainly judicious, the boats being placed on the ice, with provisions, clothing, and portable fuel, ready to accompany them. This gives but little trouble and is well bestowed. The return journey to Upernivik has not unfrequently been made in such manner.

Those who go to work on the ice, at such times, and those who cross it on foot to examine for a lead, should not forget to hold a book-hook or small ice-pole in their hands horizontally, to guard against suddenly falling through a partly hidden crack. A strong plank, drawn after one of the party, would be also very useful ; for there are many broken places where the best leaper cannot make a bound across, without incurring the too great risk of falling short of his mark, or missing his footing, and instantly disappearing from his comrades ; who, if not very alert, may lose him altogether.

Sometimes a vessel is jammed between the corners of two small floes ; and she becomes so fixed that more labour than could be supposed has to be employed, for perhaps hours to move her, with all the heaving, warping, &c., applied for the purpose. The first thing done is, generally, to clear away the ice at the sides ; but it is not always the mere ice at the sides that is the cause of stoppage : it is often the “tongues,” underneath the water ; and these cannot be very well reached. In such case it is not amiss to cease working alongside of the ship, and proceed to the opposite part of the floe, where, possibly, a great deal can be cut away with greater facility ; and, perhaps, enough to ease the pressure, and permit the ship to pass.

LANCASTER SOUND.—On the 15th August, the “North Water,” was gained, and on the 17th the vessel bore away direct for cape Hay ; but instead of being there on the next morning, found herself to the southward of cape Liverpool. It appears, therefore, that there is a very strong current sweeping out of the southern entrance of Lancaster sound ; and, if the dead reckoning at noon of the 17th be correct, its rate, according to a calculation I have made, must have been $2\frac{1}{2}$ knots. Sir James Ross mentions this current ; and the whalers who visit Lancaster sound, speak of it as existing up to Admiralty inlet. Captain Parker, of the *Truelove*, gives the following good advice :—

“In making for Lancaster Sound, if a gale should come on from the north-west (*true*) avoid the south shore, and at once stand right over to the northward, to meet the north wind which will be there found. In all

gales from the westward, keep well to the northward in Lancaster sound; and, remember the current running down on the south side."*

Looms.—About cape Hay there is a famous Loom rookery, on a high table land.

Between capes Hay and Castlereagh on a low point, about $2\frac{1}{2}$ miles from the former, there is a cask of preserved meat, a cask of letters, and thirty bags of coals, placed there by Mr. Parker; besides which, in Eardley bay, Prince Regent inlet, two cases of pemmican may be found. I placed them upon a hilly mound near the beach, and in a line due West from the beacon on the mountain at the back.†

Inside of cape Riley there appears to be good anchorage; and also between Beechey island and the main land. Close in to and eastward of cape Spencer, the water likewise shoals gradually.

* Captain Inglefield, H.M.S. *Phoenix*, 1854, remarks, "in three voyages I have found the north shore of Lancaster sound the best, a lane of water may be found close in on that side, when not a crack appears in any other part of the strait—good anchorage may be had in from 7 to 16 fathoms on the south shore, abreast of cape Hay, and to the eastward and westward as far as the Wollaston islands, where shelter might be obtained from any breeze. A very large Loom rookery exists near cape Hay.

† Captain Inglefield found the *cache* left at $2\frac{1}{2}$ miles from cape Hay, plundered by the Esquimaux and destroyed.

REMARKS BY COMMANDER E. A. INGLEFIELD, R.N.,

IN COMMAND OF STEAM SCHOONER ISABEL,* 1852.

ROUNDING CAPE FAREWELL.—In approaching the entrance to Davis strait, a tolerably wide berth should be given to cape Farewell, as much loose ice is usually found drifting about that promontory, being hung there by the currents and counter-currents setting in and out of the strait. In being anxious to sight the land in order to test the chronometers, the *Isabel* passed within 15 miles of the small islands off cape Christian, and was therefore quickly surrounded by ice, from which it cost us many hours to extricate her by standing off to the southward for some miles, and then stretching away to the westward.

The ice-master, Mr. Donald Manson, asserted that at this time of the year (July 29th), and indeed during the whole of the summer, ice is found drifting in greater or less quantities from cape Desolation to cape Farewell.

Heavy weather obliged us to bear up for some islands observed in the parallel of 63° ; and when tolerably close in to the shore, several kayacks were observed putting off. Amongst the Esquimaux who came on board there was an intelligent individual, who made us understand that we were not far from the Danish Settlement of Fiskernæs; and we proceeded there to await a change of weather.

LICHTENFELS.—Our Esquimaux showed himself to be well acquainted with this part of the coast by carrying the vessel past some dangerous half-tide rocks which lie off a little island on the port hand when going into Lichtenfels, and by piloting her into a snug little bay, at the bottom of which lies the village of Fiskernæs, consisting of one tolerable wooden edifice belonging to the Governor, besides a church and store-house and several Esquimaux huts of mud.

Though several soundings, varying from 35 to 40 fathoms, were obtained about 3 or 4 miles off-shore before entering between the islands the water was found to be very deep in the channels between them, as well as strong currents, rendering great care necessary in rounding the points.

Directions.—A vessel in running with a leading wind for Lichtenfels harbour should shorten all sail and, rounding-to, drop into her berth,

* In search of Sir John Franklin's expedition.

as there is no room for laying her head to the tide. Though the water is not more than 12 fathoms deep inside, yet it is considerably more at a short distance in the offing entrance; and perhaps the better way to secure a good berth would be to let go the anchor in about 20 fathoms water, and veer her in on the north side till within convenient reach of the ringbolts, which are placed in the rocks on either shore of the bay, for the convenience of the Danish vessels that visit Fiskernæs annually.

The bight in which the *Isabel* anchored was almost too small to allow of swinging; indeed, she once touched in tending to the tide, and gave the rudder an ugly pinch. Being perfectly sheltered from seaward, Lichtenfels will be found a secure and snug port for ships requiring refuge from a gale, but not large enough to shelter more than two at a time. There are several similar bays to the westward where, with a little caution, an equally safe anchorage might be obtained.

The Governor of Fiskernæs was friendly and hospitable, and soon supplied the vessel with abundance of cod-fish, which seems to be the staple commodity on this coast. The natives were found very honest, and ready to barter their fish and deer skins for such trifles as we could spare. They are always on the look-out for vessels approaching the coast, and promptly offer their valuable assistance, for which their best pilot considers himself amply paid by an old pair of trowsers or a waistcoat.

Hund islands, which lie to the southward of the Whale-fish group, form another convenient anchorage. A flagstaff on a cairn may be seen on the largest of them, and is the only mark that can be given to distinguish them from the other groups lying in Disko bay. Excellent water is to be obtained there with little difficulty, the Esquimaux as well as the Danish authorities rendering every assistance in obtaining it.

GODTHAVN, or LIEVELY as it is sometimes called, when approached from the southward may be known by a stone beacon, painted red and white in vertical stripes, with a flagstaff on the top. This beacon is placed on a rocky point to the westward of the settlement, and indicates the extremity of a small neck of land which must be rounded in order to enter the harbour. This harbour was found to be a most convenient and safe anchorage. A Danish pilot boat came out—took charge of the vessel—led her safely to a proper berth—attended her while in the port—guided her again to sea—and for all, charged about 14s.*

UPERNIVIK, another Danish settlement, lies just to the northward of the very remarkable headland called Sandersons Hope, which rises abruptly from the sea to the height of more than 3,000 feet. At Upernivik there

* See page 32; also Admiralty plan Godthavn or port of Lievely, No. 2,382; scale, $m = 5$ inches.

are two anchorages, one at the back of the settlement, behind a point of the island, and the other to the westward of the town. In the latter, the Danish trader, which makes her periodic visit for government produce, always moors, being secured there by piles placed so as to prevent her being struck by the ice that is always driven by south and southwest gales into the bay.*

DANGERS.—In passing to the northward amongst the numerous islands which lie off the coast, great care should be taken, for there are also several sunken rocks known only to the whalers.

Berry island, which is readily known by a peculiar white stripe on its western side, forms a good land-mark.

Horse head, cape Shackleton, Sugar Loaf island, and Devil's Thumb are conspicuous marks, showing the approach to Melville bay.

CAPE YORK is bold and may be approached without fear to within half a mile, the depth of water varying from 30 to 40 fathoms.

Petowak glacier.—Near cape Dudley Digges, is a fine mark for this part of the coast, as it extends about a mile to seaward, and upwards of 4 miles inland.

Anchorage.—On the north side of that vast ice formation, a good anchorage may be found with a depth of from 23 to 25 fathoms, mud.

Loom Rookery.—A tribe of Esquimaux visited the *Isabel* at the foot of the glacier; they had no kayacks, but they and their sledge-dogs were fat and healthy, and busily employed in taking birds and eggs from a great Loom rookery in the vicinity.

Rock awash.—About 18 miles to the northward of the Petowak glacier, a low table rock, lying about a mile off shore, must be looked for. This rock is little more than awash, but there is plenty of water between it and the shore.

WOLSTENHOLME SOUND.—In Wolstenholme sound there are many good spots for anchoring, as well as some snug bights in which a vessel might conveniently winter; but I do not doubt that she would be detained there some time after the ice had elsewhere broken up, owing to the islands which cover the entrance of the bay.†

* In 1860 the population of Upernivik was about 200, comprising about twenty Danes, and the remainder half breeds and Esquimaux. Dogs, and various skins suitable for Arctic clothing, were obtained there, including seal-skin boots of native manufacture, which, when properly made, are perfectly waterproof. The services of three native hunters and of an interpreter were obtained there.—*Dr. Hayes.* See plan of Upernivik harbour on Admiralty chart, No. 276; scale, $m = 2$ inches.

† See Admiralty chart, Smith sound, Kennedy and Robeson channels, No. 275.

North Omenak.—If necessary to round mount Dundas, which is a very peculiar square-topped hill, a wide berth should be given to the next point near which the village or settlement of North Omenak is placed in the chart. Some low dangerous rocks will be found there, not only dangerous in themselves, but mischievous in holding back the ice, in the head of the bay, which would otherwise float out during the summer months.

Saunders island.—Deep water will be found between Saunders and Manson islands, but from the southern Sister Bee a shelving reef extends, on which ice has been seen grounded.

Blackwood point.—There is also some foul and shallow ground off Blackwood point, but the bergs which ground there will generally give due notice of its position; indeed, in this sea the bergs become faithful beacons to its rocks and shoals, and may even furnish some idea of the depth of water where they stand, by multiplying by 8 the supposed height of the ice above the surface of the sea.

Whale sound.—The southern shores of Whale sound are bold and may be passed within 2 miles.

About a mile from the shore and 2 miles north of cape Parry, soundings were obtained in 45 fathoms (sand), and occasional soundings at a mile or two from the land gave 40 to 45 fathoms. I would not hesitate to run under the lee of cape Parry, and anchor for shelter from a S.E. gale.

Bardin village.—Bardin bay, where an Esquimaux village was discovered should be entered with great caution, as about the middle of the bay we struck a pinnacle rock about 10 feet below the surface, and after all found no convenient spot for anchoring.

NORTHUMBERLAND ISLAND REEF.—In returning out of Whale sound, between Herbert and Northumberland islands, the north-west point of the latter should have a wide berth, as we observed that a long reef of rocks, extending from it, had brought up a fleet of ice bergs.

A strong northerly set, amounting to 3 knots, was experienced along this coast after passing Saunders island.

From cape Robertson northward, the coast may be approached within 2 miles fearlessly; and at a mile west of cape Alexander, soundings were struck in 145 fathoms.

SMITH SOUND.—LYTTELTON ISLAND.—A bay to the southward of Lyttelton island appeared to be the only spot in Smith sound, offering either a temporary anchorage or a safe position for wintering, but we had no opportunity of examining it more closely.

*Extracts from remarks on the Passage of the Franklin Search Squadron (H.M. Ships Assistance, Resolute, North Star, Pioneer [steam], Intrepid [steam]), under the command of Captain Sir E. Belcher, C.B., through Baffin bay, 1852.**

WHALEFISH ISLANDS.—Nothing can be more deceitful than the first sight of Whalefish islands when distant about 10 miles, and more particularly if the wind should be light and the sea very smooth, when probably it would prove glassy calm at the islands. They would then appear like a scattered reef on the surface of the ocean, and without the slightest prospect of shelter. If they display a wide extent the vessel is to the south-west, and if made to bear nearly North (*true*), she will be in the fair way for the entrance, which is by the south-east end of the southern island. When bearing E.N.E. by compass (variation 74° W.) they show in the centre of Disko island and as one island. After one visit, however, they will readily be recognised, and the very remarkable mountain over Lievely in Disko will, bearing North (*true*), be an infallible aid.†

The two main islands are about 600 feet high, and will exhibit a deep gap between them. It is in this gap, about half a cable wide, that vessels anchor. The Danish establishment is on the southern island, termed Kron-Prins island. If the breeze be steady pass close on the east side, as a rock lies off about a cable's length N.N.E. (*true*), and run for the gap until Boat island is seen midway in the channel; anchor in the mouth, and veer to secure to either or both shores. Five of Her Majesty's ships were safely berthed well within the mouth.‡

If Whalefish islands should be approached from the northward, bring the easternmost point of the high eastern island to bear South (*true*), and run down until the channel with a rock in the centre, between the two highest islands, is perceived. Pass to the eastward of all rocks, give them a good berth, and enter this channel boldly; steer for the starboard channel; pass

* See "Last of the Arctic Voyages" by Sir E. Belcher, C.B. Two vols. London, 1855.

† See plan of Whalefish islands on Admiralty chart, No. 276; scale, $m = 1\frac{3}{4}$ inches.

‡ There are three entrances to the anchorage at Whalefish islands as shown on the chart. Two shoals were discovered in the north and south-east channels having 13 feet and 19 feet at low water. At the anchorage two or three ships may, after dropping their anchors, moor head and stern to iron rings in the rocks. Kron-Prins island on which the Danish settlement stands will best be known in sailing along the south side of the islands, by a flagstaff on the hill.—Captain W. E. Parry, R.N., H.M.S. *Hecla*, 1824.

Boat island; after which run for the port side, to avoid a rock close inshore, on the starboard hand; anchor as the narrows are opened. Bergs sometimes plant themselves at the southern mouth of this gully; it is, therefore, safer to be well within, as they ground, and may break the anchor if the vessel should be just outside the opening.

The moment any vessel is noticed steering for these islands the Esquimaux or "Huskies," as the Danes customarily term them, come off in sufficient numbers to satisfy her that she is near the haunts of uncivilized men, and will afford sufficient information to guide any stranger to the anchorage. They are all in the pay of, or dependent on, the Danish resident there or at Lievely, and carry on the seal-fishery for the Company's interest.

DISKO ISLAND—LIEVELY.—The Expedition taking their departure from Whalefish islands on the 5th of June, passed up the eastern side of those islands, being bound for Lievely, which is situated in latitude $69^{\circ} 13' 56''$ N., longitude $53^{\circ} 42'$ W. The surest and most unerring mark for Lievely is a flat crowned beetling cliff 2,100 feet high, about one-third from the western point of Disko island, where indeed the cliffs appear to terminate. On nearing the land, which is "safe to" the rocks which form the port of Lievely will be seen to project well to the southward, and fine gravelly beaches commence immediately to the eastward of the rocks which externally form this very close port. At about 2 miles westerly from these fine dark gravelly beaches, and on the outer or southwestern headland, there is a large red beacon, which points out the locality of the port.

False bay, which lies to the north of the beacon, at first sight might be mistaken for port Lievely. Steer past this bay on the outer side of the islet, which lies off, and round the next inner point, within which a deep strait will open, and pilots will meet the vessel. The port lies at the eastern extremity of this strait, and is a land-locked and safe anchorage large enough to accommodate three large vessels. The town cannot be seen until the eastern bight of this strait is reached. The tenders having been directed to look out, the beacon was signalled by *Pioneer*. Some difficulty was found in ascertaining where the port lay, but immediately on rounding the inner point, the warping-rings let into the rocks, and numbered, clearly indicated where to proceed.

Lievely as a port of refuge and call is much preferable to Whalefish islands. Seal skins, dogs, and other supplies were obtained at Lievely.

WAIGAT STRAIT.—The Expedition quitted Lievely on the 10th of June, intending to examine a locality in Waigat strait,* which divides

* Waigat strait varies from 9 to 15 miles in width; on each side the mountains are 3,000 feet high, the north end of Disko is almost a precipice, the snow-capped summit

Disko island from Greenland, where it was reported that coal abounded, and might be obtained at the beach with little labour. A spot was found where the banks exhibited unmistakable signs of a coal-bearing district; the coal was found in detached pieces on the beach, but not in sufficient quantity to reward delay. After further search, during which other small quantities of coal were found, it was concluded that the coal must lie inland, and is probably brought down by the heavy streams which the thaws throw down through the valleys. The interval between the nearest mountain-faces and the shore was covered by a thick peaty soil, in which a person would sink deeply in any thaw; the labour, therefore, of transporting coal, even if it existed within one mile, would be excessive.

The coal found was not bituminous, but more of a slaty-wood coal, burned well, and retained its heat when mixed with other coal.

During the day and night previous to the departure of the vessels from Lievely it had snowed heavily, and covered the land generally to some depth, but the line separating this coal-bearing region was clearly delineated by the total absence of snow.*

[In Disko island, at Ritenbenks, 24 miles from the south-eastern entrance of Waigat strait, there is a long range of sandstone cliffs in which horizontal seams of coal were seen. Here the *Fox* in August 1857 anchored and immediately commenced coaling. Having secured eight or nine tons of coal the vessel had to leave from stress of weather.

The *Fox* coaled again at this spot in May 1858, being assisted on the latter occasion by a party of seal hunters from Atanakerdluk. The seal hunters stated that within a range of 20 miles upon the Disko shore there are four separate coaling places, but in the latter end of May two of them are deeply covered with snow. There is also very good coal at south-east

of which is 4,000 feet high. In 1858, the ice in this strait broke as early as the 3rd of April, and drifted out to the northward; only a few icebergs remained.—*Captain F. L. McClintock, R.N., steam vessel Fox, 1857.*

A very dangerous rock, about 6 feet above water, was seen and sounded round in 1854. This rock lies abreast of Noursoak on the main, and nearly mid channel of the Waigat. It is often passed unseen owing to icebergs grounding upon it. The *Phoenix* nearly run stem on to it during a dark night, whilst returning from her first voyage in 1853. Either shore may be hugged with safety in order to clear it.—*Captain E. A. Inglefield, H.M.S. Phoenix.*

* During the voyage of H.M.S. *Phoenix* in 1854, a search was made for coal in Waigat strait, and at a spot called by the natives "*Ritenbenks Kulbrud*," a good seam was discovered, where coal of a species called anthracite might be obtained in any quantity, and with little labour. Two good harbours at Atanakerdluk, on the opposite shore of the strait, may be found very useful, as shelter from a northerly or southerly gale during the coaling operations.—*Captain E. A. Inglefield, R.N.*

end of Hare island where it can easily be obtained.—*Captain F. L. McClintock, R.N.*]

[The existence of coal in Disko island, and in the peninsula of Noursoak has long been known, and of late years has come more particularly under the notice of this country, from the fact that some of the English Arctic expeditions (Inglefield's and McClintock's) supplied their vessels with it from the seams at Kudlisaet and Atanakerdluk. Many years ago it was commenced to be mined for use in the Disko bay settlements. It was, however, soon found that it was more profitable to employ the natives in fishery operations, and to import coal from Europe. Accordingly, for 30 years the use of it was discontinued. But since Mr. Andersen has had charge of Ritenbenk, the workings have been resumed for a few days every summer, and he takes out yearly about 300 Danish tøndes (barrels about the size of a sugar hogshead), which costs at the rate of 48 skillings, or about 1s. 1½d. per tönde. The coal is, like all tertiary coal, rather poor, little coherent, and breaking with a cubical fracture, though bright and glistening in colour. It gives as little ash as wood does, and the heat power is estimated at being only one half of English coal; it gives off less smoke than English coal. Mixed with the latter coal, it works well in every respect.

At the following places coal can be conveniently dug, namely, (1) Atanakerdluk, (2) Patoot, (3) Atane, (4) Kordlutok, (5) Nulluk cape, (6) Ekkorgvøet, (7) Mibersteen Fjeld, (8) Patsorfik, (9) Sarfarfik, (10) Kone, (11) Upernviik cape, (12) Innerit Fjord, (13) Hare island, (14) Ritenbenk coal mine (various places on Disko shore of the Waigat), (15) Skandsen, (16) Makkak, (17) Igligtsiak.

The first five localities named are on the Noursoak shore of the Waigat; the next five are on the Noursoak shore of Omenak Fjord; No. 12 is on Svarte Huk peninsula in Upernivik district; while the last mentioned three places are on the southern shore of Disko island, Igligtsiak being only 16 miles from the settlement of Godhaven, to which the natives sometimes bring the coal on their sledges in winter.—*Geological notes on Disko island, by Robert Brown, Esq.: Glasgow, 1875.*]

Having contended in this neighbourhood for some time with strong breezes, and loose ice increasing so fast as to render the navigation a severe duty to the crew, even to keep the ship clear of it, and the prospect to windward being unsatisfactory the vessels on June 12th bore up round the south end of Disko island, and passing Lievely, reached the sea again, only to find larger and more numerous bergs than had before been noticed. This, however, indicating a great southerly motion, afforded hopes of making an easier passage, as these monsters generally clear away all before them and break up the small floes.

UPERNIVIK.—This neighbourhood is very dangerous to navigate, and it is said, that scarcely a whaler passes by this route without striking on, or discovering, some new rock. Several just capped by ice were noticed; and the *Resolute* when intending to graze the ice which concealed one of these rocks narrowly escaped striking; great caution must therefore be exercised. Fog and other difficulties entirely prevented fixing the position of any of these rocks or even knowing the vessel's position.

The navigator in these regions must, like the pilots of the Bermudas, carry his chart in his head, and use his eyes properly. Latitude and look out may help him, but the water is very deep, too deep for the lead, and but few soundings on the chart.

The anchorage point of Upernivik bay is situated in latitude 72° 48' N. and longitude 55° 53' W., about one mile east of the church.

The approach to Upernivik is considered to be the safest by the inner passage, immediately under the high cliffy part of Sandersons Hope, inside of the two islands. When the last point on the right exhibits the eastern passage open, haul easterly and southerly withal. The settlement will be noticed about south-east, on the starboard hand, with the Danish colours flying, and a white-faced chapel beside it.

The Danish vessel, which makes her annual visit, moors within a line of rocks, in the depth of this bay, which forms a natural dock; and is apparently, in perfect security. The squadron anchored in the outer bay, in 11 fathoms stiff clay, with the flag staff of the settlement open between the two outer islands, and with a ledge of rocks, probably, between each vessel and her anchor, as the grinding noise of the cables evinced, also the anchors and hawsers used in warping were entangled with much kelp. The *Assistance's* anchor was let go when the flag-staff was clear outside the rocky islet.

Leaving Upernivik the expedition endeavored to follow up the track of the whaling vessels reported to be about twenty days in advance.

The termination of the open water was soon reached, the vessels secured to the floe or sheet of field ice which averaged generally from three to four feet in thickness, six-sevenths of which are supposed to be immersed; but it was found by experiments, at a later date, that eight-ninths is nearer the truth.

BROWN ISLANDS.—On the morning of the 23rd, on the fog clearing off, the vessels were discovered to be in 4½ fathoms and rather too close to one of the Brown islands, the bottom being plainly visible; moreover the ice was drifting the vessels fast towards the island; but the *Pioneer*, having got her steam up, towed the whole squadron into deeper water. Eider duck's eggs are said to abound on Brown islands.

From a piece of moving ice, the latitude was obtained, which placed the *Assistance* in $74^{\circ} 7' N.$, the Devil's Thumb bearing N.E. 15 miles; shortly before midnight, the ship was secured to the floe.

About noon on the 24th June, the steam vessels having now become indispensable, they towed the others through a lead until 8 p.m., and then secured to afford the crew rest; but at midnight a large berg, in rapid motion towards the squadron, compelled them again to resort to the use of steam.

The squadron had now reached Melville bay, and the remarkable objects known as Devil's Thumb, Sugar-loaf, Melville Monument, and cape Walker, all familiar to Arctic navigators, were clearly defined, and apparently very near. But the positions on the chart, if they be truly placed, and we have reason to doubt it, would place us about 40 miles from them.

ARSUK FIORD.—BY LIEUTENANT C. NORMANN,
DANISH ROYAL NAVY, 1869.

All bearings are true.

GENERAL REMARKS.—East of cape Farewell the ice constantly accumulates on the coast, and it is impossible to approach nearer to the coast than a distance of 3 miles. West of cape Farewell the ice accumulates also on the coast during a part of the year and renders the navigation difficult; however, in general, this only applies to the harbours near the bay of Julianeshaabs; for after having passed Nunarsoit, or cape Desolation, the current begins to leave the coast and the ice separates, so that only during a bad season, and after a prevailing fresh breeze blowing inland, would it be very difficult to enter Arsuk fiord in coming from the open sea.

Nearly the same may be said of the colony of Frederikshaab; the ports in the north of this colony, called Fiskernæs and Godthaab, are on the contrary rarely obstructed by the ice, and even those which are more north, like Sukkertoppen and Holsteinsborg, are almost always accessible. It may be considered as certain that Arsuk fiord is navigable from the end of April till the beginning of October.*

When the shore ice is very compact it may happen that vessels bound to Arsuk fiord have to go as far north as Fiskernæs, and even, although rarely, to Godthaab in order to find an opening in the ice leading to the shore. If it should happen that the ice is pressed towards the land, it would be better to take refuge at either one of those places until the ice

* See plan of Arsuk fiord on chart No. 276; scale, $m = 0.4$ inch.

recedes, and it should be remembered that north winds generally dislodge the ice from the coast, whereas south winds heap it up there.

In the months of May and June we may expect to meet the largest icebergs packed together in the eastern region of Davis strait, and fogs are also more frequent than in any other part of the year. From the end of April till the beginning of October the ice in the strait is stationary, especially from the middle of July till the middle of September.

DIRECTIONS.—A vessel approaching from the eastward, after having passed the meridians of 35° or $38^{\circ} W.$, ought to be constantly on the look out for the appearance of the ice, especially of icebergs, which have been seen sometimes even at $32^{\circ} W.$ A vessel should never proceed more north of the meridian of cape Farewell than $53^{\circ} 30' N.$, for the ice-belt extends sometimes as far as 120 and 160 miles from the land, and especially with a south wind she ought never to go beyond that limit. Thence the vessel may direct her course to the N.W. by N. (*compass*) as far as 47° or $48^{\circ} W.$, and if no ice have been encountered she may gradually proceed a little farther north as far as about $61^{\circ} N.$ by $49^{\circ} W.$, then she may make for the land, which, in clear weather, is visible at a distance of 65 to 70 miles. The farther north the vessel makes the land the easier it will be to find a passage for penetrating into the ice. By observing frequently the temperature of the water the approach of the ice may often be detected.*

The vessel should be coned from aloft and worked as quickly and as carefully as possible, so as to avoid striking the ice, for even the smaller pieces might prove dangerous for the vessel's hull, and especial care should be taken not to touch upon those pieces of ice which lie detached at the foot of the ice-berg. If the "lead" should be found blocked up and no other passage be seen it is better to abandon the land, and while proceeding on the outer edge of the ice, keep a constant look out for a passage more north, or go round the margin of the packed ice-masses, if these should happen to be only blocked up before the fiord.

In stormy or in foggy weather the vessel ought not to remain between the icebergs, unless they be very far apart, but keep outside until the wind moderates and the weather clears up. If the fog should set in after having entered between the icebergs, it is better to try to proceed between them and the land until the latter becomes visible; but it must be remembered that the currents run generally towards N.N.E. (*compass*) with a velocity of 2 to 4 miles.

* The temperature of the sea water, after having passed the ice-belt, rises from 37° to 38.5° and even to 41° in proportion as the land is approached, especially during the summer, and when there is a wide space of open sea near the coast. The temperature of the water in the ice region often varies from 30° to 34° ; in the straits beyond the ice current, and in the summer (August) it is about 45° .—*Lieutenant C. Normann, Danish Royal Navy.*

In clear weather Arsuk fiord may be recognized without difficulty, as to the south of it is the isle of Umanak, of which two hills in the shape of a nine-pin (870 feet high in the north, 1460 feet high in the south) are easily seen from a distance of several miles; Mount Kûngnât, 4,500 feet high on the north shore of the fiord, is also pretty well seen, but not distinctly enough to reckon for certain upon it. On the north-west extremity of Storö island is also a conical hill, which, although of an inferior elevation, is very remarkable and may be seen at a distance of several miles. Vessels entering the fiord should pass between Umanak and Storö islands. A channel may also be found south of Storö, but it is so encumbered by rocks that scarcely any use can be made of it.*

Pilots.—In favourable weather Greenlanders in their kajakker will be met between Umanak and Kajartalik islands; they do not afford much assistance as pilots, as their language is very difficult to understand, but still they may by signs and gestures warn the ship of any danger. The charge for pilotage from Umanak island to any part of the fiord is 3 rixdalers; for the pilotage of Frederikshaab to Ivigtut, 10 rixdalers; for the intermediate stations a proportionate sum is paid.

After having passed Umanak island the channel which leads to Ivigtut, is divided into two parts, one passing north and the other south of the Arsuk island.

Torssukatak channel.—The north, or Torssukatak channel, has the advantage of anchoring ground; it is also the shortest route and a pilot easily be procured there, but it is so narrow that only a steam vessel or a sailing vessel with a fresh and favourable breeze can make use of it.†

In passing through this channel it is advisable to keep nearer to the south side, which is free from dangers, and with the exception of Mitdluvfik island (near the west side of Arsuk island), the land may be closely approached everywhere. But directly west of this island there are several rocks which scarcely show above water.

On the north side of Torssukatak channel is a chain of islands and rocks, which are partly covered at high water, and are very dangerous to navigation. About a cable to the southward Pamiagdlok point there is a sunken rock having only one foot at low water, and a little farther out another having 12 feet. To pass southward of these dangers, the southernmost point of Umanak island must be kept open to the south of the two islands which lie to the southward of Kajartalik island.

* On the south-west coast of Dadloodit there is said to be a harbour or two, as well as among the small low Innusutut islands, east of Storö island. None can be entered by sailing vessels during southerly winds.—*Captain W. A. Graah, Danish Royal Navy, 1828.*

† See plan on Admiralty chart, No. 276; scale, $m = 3\frac{1}{2}$ inches.

To the south of the landmark at Pingo (near Arsuk village) are some rocks, on which the sea breaks. And a rock having 10 feet water lies south of Kekertasugssuk, an island which forms the harbour of Fortunas; care should be taken not to go too near it, because the adjacent coast has not been examined.

Kajartalik.—In Torssukatak channel are the two explored harbours of Kajartalik and Fortunas, which are, however, only moderately good. When the channel of the former is free from ice, a very heavy sea enters there with south winds. In this harbour there is only room for one vessel, which moors in the middle of the channel secured to the rings fixed in the rocks. In north winds there is good shelter, but it is difficult for a sailing vessel then to get to it; in south winds it is almost impossible to get out of it. The depth varies from 6 to 8 fathoms.*

Position of Kajartalik, $61^{\circ} 9' 42''$ N., $48^{\circ} 33' 30''$ W.

Tides.—It is high water full and change at 6h. 25m. Spring rise 12 feet; neaps 9 feet.

Fortunas Harbour, situated between Kekertasugssuk island and the main land, is a good place for vessels to touch at in leaving Arsuk fiord; if they wish to wait until the separation of the ice permits them to go out of the fiord. This harbour can be entered from the east and west, and there is room for several vessels. The best anchorage is in the wide part with a depth of 6 to 10 fathoms. North winds blow with some violence in this harbour, where they take a N.E. direction which is the most dangerous quarter. On the coast of the main land are several large rocks to which the vessels can be secured in order to protect them from these winds.†

Ikerasarssuk.—Torssukatak channel leads to Ikerasarssuk or Smallesund, which in its narrowest part only measures half a cable; but it has no great windings, and the water is deep enough for large vessels quite close to the land. Near the south-east point of Imartunarssuk island, which is on the north side of the channel or sound, are two rocks with only one foot and 3 feet at low water; but in keeping towards the southern coast of the sound, the rocks may be easily avoided. The soundings in the narrowest part of Ikerasarssuk, in the middle of the channel, are from 6 to 8 fathoms, the greater part of the bottom is rocky, the western parts small flint, but east as well as west of the narrow part there is no bottom in the middle of the channel at a depth of 30 fathoms. The rocks which are on each side are perpendicular.

* See plan on Admiralty chart, No. 276; scale, $m = 9$ inches.

† See plan on Admiralty chart, No. 276; scale, $m = 9$ inches.

The depth in the eastern part of Imartunarssuk bay is from 20 to 30 fathoms, the bottom mud and small flintstones, and in the western part is the last-mentioned rock; but in all the other part there is no depth at 30 fathoms. In the entrance of the channel between Imartunarssuk island and the mainland the depths are from 10 to 12 fathoms stony bottom. In the channel there are only a few feet at low water.

On both sides of the land from Kajartalik to Ikerasarssuk stone beacons are placed, but they do not serve as guides for navigators.

Channel South of Arsuk Island.—This channel should be preferred by sailing vessels with a contrary wind or with a gentle fair wind. With the exception of some rocks, situated westward, of Mitdluvfik and Manitsok islands, and which should not be approached too near, this channel is clear, as far as is known, and is spacious enough for tacking. The winds also are generally steadier in direction and force than in Torssukatak channel.

Near Akussak or Isua point a pilot could probably be taken on board, as some Greenlanders reside here. But care should be taken never to go nearer to the rocks off the point, than one cable, as at a distance of three-quarters of a cable are some sunken rocks having only a few feet at low water.

Isua Bay.—At Isua is a moderately good anchorage when the sea is calm and the wind north; but the land should not be approached nearer than an imaginary line drawn between the west point of the little bay and the middle post on the inner rock, and the rock should not be approached nearer than 70 yards, as W.N.W. (by *compass*) from this rock, there is a rock having only 5 feet water. Within the above-mentioned limits there is everywhere a depth of 5 to 8 fathoms, gravel bottom; beyond these limits the soundings are uniform. Within a line drawn between the two points of the bay, there is no anchorage, and the channel between the rocks and the land is navigable.

To the west of Isua bay there is another bay, where a moderately good anchorage may be found, especially in north winds. In 1860, four vessels were anchored here at the same time.

After having passed Ikerasarssuk or Isua, the remainder of the navigation to Ivigtut presents no difficulties; the channel is clear, and the coast, with the exception of Upernivik point, may be approached at a distance of several hundred yards. In this part of the channel are the following harbours:—

Taylor's harbour, near Inugsuk, has only room for one or two vessels. The vessel should anchor in the western part of the bay in 6 fathoms—soft bottom, and be secured to the shore by hawsers, as there is not

sufficient room for swinging. This harbour has, in the eastern part, rocks, having only a few feet of water, and is scarcely safe in a fresh breeze from the south.

Webers harbour.—Near Upernivik point, a little more north, is Webers harbour, with good holding-ground and room enough for several vessels. The harbour is sheltered from north and east winds by the perpendicular rising hills which form it; from south and west winds by a chain of cliffs. There are two channels which lead to the anchorage; one from the south, the other from the west, so that the anchorage can be reached with almost any wind. Situated just opposite to Ikerasarssuk this harbour is of importance, because it can be made use of in the beginning of the spring, when the inner part of the fiord is encumbered with ice, or as a temporary anchorage for vessels bound for Ivigtut, when the wind shifts to the north or east and a fresh breeze is blowing.*

Near Upernivik point are some rocks having a depth of 9 to 12 feet. Two white beacons which can be seen from Ikerasarssuk, are erected in the inner part of the haven to lead clear of these rocks, and to point out the route to vessels; when the land is free from snow, the smaller one can be very plainly seen against the dark background of the coast behind. The beacons lie S. 28° E. and N. 28° W. (*compass*) from each other; one is close to highwater-mark, and the other so high up on the slope of the mountain that the top of the first, seen from the sea, is in a line with the base of the other; the lower one is of white stone, the upper one of grey stone, but the side which faces the West channel is painted white.

To enter into the harbour by the West channel, the two beacons must be kept exactly in line; which will lead in 4 fathoms, and scarcely more south than the centre of the channel. After having passed Maagetueskjoer island, the vessel can steer eastward to take the best anchorage in the east angle of the harbour.

If a vessel should enter the harbour by the south channel, she ought not to go nearer to the land than three-quarters of a cable, as there is a sunken rock inshore; and should keep at a distance of a cable and a half from the most eastern of the visible rocks on the west coast, as there are shoals having a depth of 2 to 15 feet; keeping a long cable off the coast, there will be not less than 10 fathoms water.

Soundings.—The soundings in Webers haven vary much. In the west channel the depths are from 4 to 6 fathoms, rocks and shells; more to the eastward there are from 7 to 9 fathoms, rock, but directly after having

* See plan on Admiralty chart, No. 276; scale, $m = 9$ inches.

passed Maagetueskjoer island there is a depth of 17 fathoms, mud. The nature of the bottom of all the eastern part of the haven is stiff mud and blue clay, and the depth varies from 13 to 22 fathoms. In a bay of a depth and width of about $1\frac{3}{4}$ cables, extending into the land in an E.S.E. (*compass*) direction, the best anchorage is in a depth of 7 to 9 fathoms, stiff clay. The bottom in the south channel towards the coast is steep, at a distance of 40 yards from the land there is a depth of 4 fathoms, and at a distance of 14 yards, $3\frac{1}{2}$ fathoms, clay and mud. A rapid ebb stream setting first north and then west, causes Webers haven to be free from ice early in the year, and keeps it open late for the navigation.

Christians harbour is the name of the sound situated between Christians isle and the continent; it is $2\frac{1}{2}$ miles N.N.W. (*compass*) from Ivigtut; in the middle of the sound is a good anchorage with a depth of 8 to 10 fathoms, mud and clay. It is entered from the south, but the island must be kept at a distance of half a cable, as there are several sunken rocks having a depth of 6 to 12 feet. In the northern part of the harbour the depth in the channel diminishes rapidly, and there are several rocks partly uncovered at low water, on account of which a vessel ought not to go farther north than to the centre of the island; these rocks make it very difficult, if not impossible, even at high water, to enter this harbour from the north.*

In south-east winds, the worst ones for Arsurk fiord, Christians harbour is not a good anchorage, but is much better than that at Ivigtut; on the land-side of the harbour there is a convenient place for beaching vessels. The depth in this part diminishes regularly on a sandy ground mixed with small stones; but this is certainly the best place in the immediate neighbourhood of Ivigtut.

The depth in the middle of Arsurk fiord is everywhere very considerable, and several cables off the land there is in some places no bottom at 100 fathoms; in the middle of the navigable channel there is no bottom at 120 fathoms; this shows that there are scarcely any places between Ikarasarssuk and Ivigtut where it is possible to anchor.

Ivigtut.—A vessel should avoid going too near Kamigtalik point, for although there is a great depth of water near the land, the current runs there with considerable strength and prevents her steering properly; if the vessel have not the current with her she must keep at least 3 or 4 cables off the land. To point out the route which leads to the anchorage, two beacons are placed on the top of Kamigtalik-Noesset; keeping them in a line, bearing S. 40° E. (*compass*), they indicate the exact distance from the land, where the vessel should anchor.

* See plan on Admiralty chart, No. 276; scale $m=9$ inches.

The anchorage near Ivigtut is not good. The most western anchorage is at a place, which is the nearest to a two-storied house, and thence eastward about half a cable between each vessel. They should not be moored inside the line traced by the beacons; but should lie at about one cable from the land in a depth of 20 to 30 fathoms, rocky bottom, and should moor head and stern to iron fastenings in the rocks. The bottom to the northward of the anchorage deepens very suddenly, and care is required to prevent being blown by the landwinds off the bank of soundings.* S.E. winds sometimes blow with great violence.

If a vessel enter the fiord with S.E. winds, which often blow in the straits direct from south, sometimes even S.W., or if such a wind should blow before Ivigtut can be reached, she should make for the harbours of Fortunas, Christians, or Webers, which offer a much greater security. It is impossible during S.E. winds for a vessel to enter and moor with safety off Ivigtut, and it might happen that, after having probably lost anchor and chain, the vessel would be nevertheless obliged to go into one of the above-mentioned harbours.

The directions of the quaymaster, who as regards anchorage, is the best authority in the place, should be complied with. Near Kryolith-bruddene is a controller, nominated by the Government, who, after having provided for the security of the vessel, asks for the papers and consents to pratique; with the exception of pilotage there are no other port dues to pay.

Tides.—The rise of tide is from 10 to 12 feet.

Supplies.—Fresh water can be obtained by casks from a river which flows 2 cables east of Ivigtut. Vessels calling at Ivigtut should take in provisions for their return, as none can be procured in other places; vessels bound for Greenland should never leave this port without sufficient provisions to last for five or six months; it should not be taken for granted that any kind of assistance may be found at Ivigtut, for a vessel is entirely thrown upon her own resources.† A few blacksmiths and perhaps carpenters are the only people who can give assistance.‡

* See plan on Admiralty chart, No. 276; scale, $m=9$ inches.

† The United States steam vessel *Tigress* on her return voyage in 1873 called at Ivigtut, and obtained 190 tons of coal; there is abundance of coal here.—*Mr. G. E. Tyson.*

‡ The entrance to Arsurk fiord is often seriously obstructed by ice fields. The *Panther* was fortunate enough to find it free and aided by the Danish charts got in without trouble, but the anchorage is bad. The famous kryolite quarry is situated at a place in the fiord called Ivigtut. The soda is the product which makes the quarry valuable; about one half the produce of the mine (6,000 tons) is annually shipped to

Ellerslie harbour, the best of all the harbours in Arsuk fiord, is situated about 6 miles north of Ivigtut, safe with any wind, but not generally navigable until June, and sometimes it is covered with ice in September. Ellerslie is the only safe port of Arsuk fiord during the winter, as there is no moving ice; the depths vary from 5 to 8 fathoms, partly clay and partly sand; in the western part is the best place for anchorage, where there is also to be found an excellent place for beaching the vessel. Entering the port keep near the centre of the channel, but rather nearer to the east coast.

Fox harbour, situated in the inner part of Arsuk fiord, about 8 miles from Ivigtut, is unsafe and entirely useless for navigation, because it is still farther inland in the fiord than Ellerslie harbour.

Ekaluit.—At Ekaluit, the mouth of Lax river, a good anchorage may be found, but it is seldom used, as S.E. winds blow there with greater violence than at other places in the fiord.

In the easternmost part of Arsuk fiord is a glacier (ijsblink) half a mile in breadth, and in its neighbourhood on the north coast are two mountains inhabited by an innumerable number of sea gulls.

OTHER PORTS AND SETTLEMENTS ON THE WEST COAST OF GREENLAND.

Julianes-haab, or Julianas Hope, a Danish settlement, is situated about 20 miles from the sea on the bank of Igalliko (deserted homes) a long and tortuous fiord,* the entrance of which is about 80 miles to the north-west of cape Farewell. The fiord is from 2 to 5 miles wide and studded with islands; it is more than usually difficult of access in the month of July even with a native pilot on board, for then the ice from the eastern side of Greenland drifts down with the great polar current, a branch of which sweeps round cape Farewell into Davis strait and Baffin bay.†

NUNARSOIT ISLAND is separated from the mainland by Torsukatek sound through which the regular traders to Julianeshaab commonly pass, sailing thence to the colony within the barrier of rocks and shoals that line the coast. On both sides of the channel good harbours exist.‡

Philadelphia in from fifteen to twenty vessels. The number of miners employed is about one hundred, and as there are no settlements in the neighbourhood, and therefore no natives to bring them supplies, their provisioning is entirely done from home. Small quantities of iron, tin, lead, silver, copper, and arsenic have been found.—*Dr. I. J. Hayes*, 1869.

* See plan on Admiralty chart, No. 276; scale, $m = 0.4$ inch.

† *Dr. J. Hayes*, 1869. See plan on Admiralty chart, No. 276; scale, $m = 1.2$ inches.

‡ Captain W. A. Graah, Danish Royal Navy, 1828. See plan of Bangs Havn on Admiralty chart, No. 276.

Aurora harbour situated at the eastern extremity of Torsukatek sound is a cove extending W.N.W. into the mainland, and affords good anchorage in 7 or 8 fathoms with shelter from southerly winds. The harbour is large enough to allow of a vessel riding at single anchor, though if preferred she can be secured by hawsers to the shore.

Off the entrance of Aurora harbour and nearly mid-channel lies a sunken rock, to avoid which it is necessary to hug the point of land which shuts in the harbour towards the south.*

FREDERIKSHAAB HARBOUR is a good one capable of accommodating several vessels, but there are some sunken rocks at the entrance, over which, when there is any ice abroad, the sea does not break. The aspect of Frederikshaab resembles that of the harbours on the west coast of Norway, the only difference being that the hills are of a darker hue, and present still fewer signs of vegetation. See plan on Admiralty chart, No. 276.

North of Frederikshaab lies what the Dutch call Witte-blink, a lofty, precipitous coast or cliff of ice, formed by the land-ice or glaciers extending to the water's edge.*

SUKKERTOP.—The Sukkertop or sugar loaf (lat. $65^{\circ} 20' N.$, long. $53^{\circ} W.$) a noted landmark, is a wild isolated peak rising 3,000 feet above the sea. The little colony situated at its base occupies a rocky gorge, so narrow and broken that a stairway connects the detached groups of huts, and the tide as it rises converts a part of the ground plot into a temporary island. Sukkertoppen is a principal depôt for reindeer skins; these furs are valuable for their lightness and warmth.†

HOLSTEINBORG is an important place for whalers, as the harbour is good (see Admiralty plan, No. 2,266, scale, $m = 6$ inches), and from the great rise and fall of tide affords every facility for repairing the damage caused by ice to vessels. Reindeer are abundant at Holsteinborg.*

Holsteinborg is called Wylie fiord by the whalers, and is, it is said, the only place on the coast suitable for beaching a vessel. Landing is not possible at all times of tide, for at high water a broad fringe of ice which is convenient to step on, at low water is several feet above the boat. The harbour is so small that the *Fox* was moored by hawsers to the rocks on each side.‡

* Captain W. A. Graah, Danish Royal Navy, 1828.

† *Dr. Kane*, United States Navy, 1853–1855.

‡ Captain F. L. McClintock, Royal Navy, 1857.

Proven, one of the most prosperous of the Danish settlements, is situated in a snug little harbour about 40 miles to the southward of Upernivik, the passage in, however, is tortuous. Dogs were very scarce at Proven in 1869 owing to a disease which had prevailed amongst them. The occupation of the inhabitants consists chiefly in seal hunting.*

Settlements.—The settlements comprised within Upernivik, the most northern of the Greenland districts, are Upernivik (the capital), Proven, South Proven, Karsuk, Aukpadlartok, Kasar-suak (Sanderson's Hope) Kryatok, and Tessuisak, a small Danish hunting station situated in a bay as its name implies, and is "the most northern spot of earth where any Christian people live."*

Kingitoke is a small island settlement about 12 miles to the northward and westward of Upernivik.†

Tessuisak.—At Tessuisak there is a large bay and a number of islands in front of it, on one of these is the small settlement of that name, consisting of a few native huts of stone and a wooden house for the governor. Tessuisak is in lat. $73^{\circ} 21' N.$, long. $56^{\circ} 6' W.$ †

SMITH SOUND AND THENCE NORTHWARD TO LATITUDE $83^{\circ} N.$

Hakluyt island.—A tall spire, probably of gneiss in this island rises 600 feet above the sea, and is a valuable landmark for many miles round.‡

Harstene Bay.—**Port Foulke.**—The exploring schooner *United States* passed the winter of 1860–1 in port Foulke; this anchorage is situated inshore of a cluster of ragged looking islands near the coast at the head of Harstene bay. The anchorage is well sheltered except from the south-west, towards which quarter it is quite exposed; some shelter, however, was afforded to the vessel by a cluster of icebergs which were grounded off the harbour. The ice in mid-winter was nine feet thick, and although the coldest weather came in March yet the thickness of the ice was not increased more than two inches after the middle of February.

Approximate position of Port Foulke, lat. $78^{\circ} 15' N.$, long $73^{\circ} 5' W.$ §

* Dr. I. J. Hayes, United States Navy, 1869.

† Commander C. F. Hall, 1871.

‡ Dr. E. K. Kane (in command of second Grinnel Expedition) 1853–55.

§ Dr. I. J. Hayes, 1861. See plan on Admiralty Chart, No. 275.

Refuge harbour, in which the *Advance*, Dr. Kane's exploring vessel, anchored in 1853, is a snug little cove accessible only from the north, and landlocked from east to west. The vessel was moored to the rocks by hawsers.*

Rensselaer harbour, in which the same vessel wintered (and here finally abandoned), combines many of the requisites of a good winter harbour, and is considered to be the best in the neighbourhood. Near its south-western corner the wide streams of ice on the shore promised the earliest chances of liberation in the coming summer. The harbour was secure against moving ice, lofty headlands wall it to seaward enclosing an anchorage with 7 fathoms water, land protected from winds, eddies, and drift.*

It is high water full and change at 11 h. 43 m.; springs rise $10\frac{3}{4}$ feet, neaps $7\frac{3}{4}$ feet.

*Information derived from Official Report by the Secretary of the United States Navy on the Voyage of U.S.S. Polaris, Commander C. F. Hall, 1871–3. Also from the Narrative of Mr. G. E. Tyson, when serving in the Polaris, published in ARCTIC EXPERIENCES. London, 1874.**

The United States steam vessel *Polaris* in this exploratory voyage towards the North pole has attained the highest north latitude yet reached by ship. She left Disko on the 17th August 1871, arriving at Upernivik the next day; there took on board dogs, seal skins, and a small quantity of coal. Leaving Upernivik the vessel touched at Tessuisak where more dogs and a small quantity of ready-made skin clothing were procured.

Quitting Tessuisak on the 24th August the *Polaris* proceeded northward under steam and passed through Smith sound and Kennedy channel with very little delay or obstruction from the ice. Pressing on to the northward the vessel entered Robeson channel, which was found to be from 25 to 30 miles in width, with high land on either side, and on the 30th of August attained the highest latitude reached by the expedition, namely, $82^{\circ} 11' N.$ † Here she was met by heavy floating ice extending entirely across the strait. After making several unsuccessful attempts to find a way through the ice, Commander Hall, in a boat, examined a small harbour on the eastern side of Robeson channel for winter quarters. This, being unsuitable for the purpose, was named Repulse harbour:

The vessel now beset in Robeson channel drifted with the ice to the southward to latitude $81^{\circ} 30' N.$, when the pack opening on the 3rd of September, she steamed to the eastward and found on the eastern

* See Admiralty chart Smith sound, Kennedy and Robeson channels, No. 275.

† Commander Hall thought they could see land as far north as $83^{\circ} 5' N.$, but they could not be sure of anything at that distance, unless it were some high mountain or a familiar landmark.—*Mr. G. E. Tyson.*

side of the channel winter quarters in a small sheltered cove (protected by a stranded iceberg) in Polaris bay. To this cove Captain Hall gave the name of Thank God harbour, and gives its position in lat. $81^{\circ} 38' N.$, long. $61^{\circ} 44' W.$ Polaris bay is about 12 miles long and 9 miles deep.

In the voyage from Disko to Thank God harbour, light winds, mostly from North, were experienced.

In August the mountains on either side of Kennedy and Robeson channels were found to be entirely bare of snow and ice, with the exception of a glacier on the east side of the strait in lat. $80^{\circ} 30' N.$, and this glacier extended in an E.N.E. direction as far as could be seen from the mountains near Polaris bay.

A transcript of the proceedings of the *Polaris* expedition up to the 20th of October 1871 was deposited in a cairn on the side of the mountain at cape Breevoort, 26 miles to the northward of Thank God harbour, and in lat. $82^{\circ} 2' N.$, long $61^{\circ} 20' W.$

The climate in the neighbourhood of Polaris bay was found to be warmer than was expected, the thermometer being often above zero, seldom 15° below. On one occasion, in the month of January 1872, the temperature fell to 48 below zero. March proved to be the coldest month. In the absence of the sun the weather was chiefly cloudy and very tempestuous. The prevailing winds were from the north-east although occasionally there were violent gales from the south-west.

Seals, geese, ducks, musk-oxen, rabbits, wolves, foxes, bears, ptarmigan, lemmings, &c., were found near Polaris bay. And of insects,—butterflies, large blue flies, and a small species very similar to the common house fly.

At Thank God harbour, many species of beautiful flowers, highly variegated, brilliant but odorless, were seen.

Tides.—The highest spring tide observed in Thank God harbour was $7\frac{1}{2}$ feet, neaps rise 2 feet. See also p. 50.

Currents.—The existence of a constant southerly current in Robeson channel, Kennedy channel, and Smith sound, was noted by the expedition, the rapidity varying with the season and locality; but the average rate of the current uninfluenced by winds or freshets was about a knot an hour.

Mr. G. E. Tyson observed, while on some stationary ice in the mouth of Newman bay east side of Robeson channel, in the fall of 1871 and winter of 1871-2, ice drifting to the southward at the rate of 4 miles an hour, driven by strong N.E. gales, supplementing the natural velocity of the current. But on re-entering Smith sound from the north in August 1872, he found little or no current in its centre, the truth of which observation was confirmed on the *Polaris* getting beset in the ice about 25 miles E.N.E. from cape Frazer; her drift then averaged from one

to 4 miles daily, in a nearly due South (*true*) direction. A stronger current was detected near the shore than in the middle of the sound.

Ice.—Another feature which attracted Mr. Tyson's attention was the total absence of large icebergs in Smith sound, and thence as far as $82^{\circ} 11' N.$ (the highest point reached), the bergs in this region were few and small, while in Baffin and Melville bays, and along the shores of north Greenland, huge bergs abound, especially between Disko island and Rensselaer harbour. But north of the latter place the ice formations should be called hummocks rather than bergs.

Smith sound, remarks the same authority, is open nearly all the winter, seldom closing until February or March. He knew it to be so by the strong North and N.E. gales which prevail all the winter. These gales blow with indescribable fury, and he has seen Robeson channel, Polaris bay, and as far as the eye could see, north and south, with the ice cleaned out from shore to shore, during the months of November, December, 1871, January and February, 1872. In March following, during a long period of quiet and very cold weather, the ice formed rapidly.

In June 1872, the *Polaris* broke out of her winter quarters and several attempts were made to proceed to the northward to pick up the travelling parties, but the ice was found to be impassable. The expedition started homeward on the 12th of August, the vessel slowly making her way along the western shore, the next day when having got nearer mid-channel the vessel was badly beset by ice in latitude $80^{\circ} 40' N.$ Secured to a large floe of ice in lat. $80^{\circ} 2' N.$, long. $68^{\circ} W.$, the vessel drifted through Smith sound nearly as far as Lyttelton island, and was run aground on the 16th October, 1872, in Lifeboat cove, in lat. $78^{\circ} 23' N.$, long. $73^{\circ} 21' W.$ On the previous day while preparations were being made to abandon the vessel, in consequence of a tremendous pressure of ice, a part of the crew was accidentally separated from the vessel and being left on the ice drifted to the southward on a floe until the 30th April 1873, when they were picked up near the coast of Labrador, in lat. $53^{\circ} 35' N.$ During this period (196 days) they endured great privations.

On July 14th, 1873, the United States steam vessel *Tigress* left New York in search of the *Polaris* and remaining crew, and on August 14th reached the place where that vessel was finally abandoned. In crossing Melville bay there were bergs in sight, but no pack ice. The remains of the *Polaris* winter camp were seen, but the Esquimaux stated that the party had in their boats made their way south, and that the vessel had sunk in deep water near the camp. The boat parties were picked up on the 23rd June 1873 by the whaling vessel *Ravenscraig* in lat. $75^{\circ} 38' N.$, long. $65^{\circ} 32' W.$

TIDES.

	H. W. F. & C.		Rise.		Authority.
			Spring.	Neap.	
	h.	m.	ft.	ft.	
GREENLAND, WEST COAST.					
Julianeshaab - - -	5	6	7	5	Danish Admiralty chart, corrected to 1873.
Arsuk - - - - -	6	25	12	9	Lieut. C. Normann, Danish Royal Navy, 1869.
Frederikshaab - -	6	22	9	5	Danish Admiralty chart, corrected to 1873.
Holsteinborg - - -	6	30	10	—	Inglefield, 1853.
Whale fish islands -	8	15	7½	—	Parry, 1824-5.
Godthavn - - - -	9	0	7½	—	Kane, 1850.
Upernivik - - - -	11	0	8	—	Inglefield, 1854.
Wolstenholme sound -	11	8	7½	—	Saunders, 1849-50. H.M.S. <i>North Star</i> .
SMITH SOUND.					
Port Foulke - - -	11	14	10	5	Hayes, 1860-1. <i>Smithsonian Contributions to Knowledge</i> , vol. xv.
Rensselaer harbour -	11	52	10¾	4¾	Kane, 1853-4. <i>Smithsonian Contributions to Knowledge</i> , vol. xiii.
Thank God harbour -	12	13	5½	1¾	Hall, 1872-3. U. S. chart.

At Northumberland island, Smith sound, the night tide was observed to rise more than the day tide, a similar inequality has been noticed also on the coast of Greenland.

At port Foulke and Rensselaer harbour, the diurnal inequality of the tides is very marked and identical, the range also is nearly the same in both places.

It is recorded by Commander Markham,* on the authority of the officers of the U.S.S. *Polaris*, "that the tidal waves from the north and south meet at cape Frazer (Grinnell land). This was fully demonstrated by the drift of the ship and by tidal observations. To the south of cape Frazer the flood tide makes to the north, whilst to the north it flows south. The rise and fall during spring tides was about five and a half feet, and during the neaps about two feet. No agitation of the water was noticed off cape Frazer caused by the meeting of the two waves, for the ice would effectually prevent anything of the sort. But to the south of cape Frazer the tide rose to a greater height during the night, as is the case along the coast of Greenland; whereas to the north of cape Frazer there was no perceptible difference between the day and night tides."

The following extract in reference to the tides in Kennedy channel near cape Constitution is from Mr. W. Morton's report: † "The tides in-shore

* *A Whaling Cruise to Baffin's Bay*, by Commander A. H. Markham, R.N., 1873.

† *Arctic Explorations*, by Dr. Kane, vol. ii., app. v., p. 379. 1854.

seemed to make both north and south; but the tide from the northward ran seven hours, and there was no slack water." "The wind blew heavily down the channel from the open water, and had been freshening since yesterday nearly to a gale; but it brought no ice with it."

TABLE of VARIATIONS of the COMPASS.

Places.	Variation, W.°	Date.	Observer.
Julianeshaab - - - -	54 27	1860	McClintock.
Frederikshaab - - - -	57 13	1860	Davis.
Godthaab - - - - -	62 2	1860	McClintock.
On ice (65° 57' N., 55° 56' W.) - -	58 0	1852	Allen.
On ice (66° 26' N., 58° 30' W.) - -	69 55	1858	McClintock.
On ice (66° 39' N., 58° 20' W.) - -	71 38	1858	McClintock.
On ice (66° 50' N., 58° 51' W.) - -	71 32	1858	McClintock.
Holsteinborg - - - -	66 54	1853	Inglefield.
On ice (67° 18' N., 58° 35' W.) - -	72 0	1858	McClintock.
On ice (68° 17' N., 58° 32' W.) - -	73 31	1858	McClintock.
Whalefish islands - - - -	70 47	1852	Belcher.
Whalefish islands - - - -	73 28	1858	McClintock.
On ice (69° 24' N., 51° 46' W.) - -	72 0	1852	Allen.
Proven - - - - -	83 24	1860	Sonntag.
Upernivik - - - - -	72 12	1861	Hayes.
On ice (74° 14' N., 58° 30' W.) - -	87 0	1852	McDougall.
On ice (74° 52' N., 65° 45' W.) - -	91 58	1857	McClintock.
On ice (75° 4' N., 60° 9' W.) - - -	87 8	1852	Belcher.
On ice (75° 18' N., 61° 19' W.) - -	88 42	1852	Kellett.
On ice (75° 22' N., 61° 5' W.) - - -	89 12	1852	Kellett and Allen.
On ice (75° 22' N., 61° 10' W.) - -	89 20	1850	Ommaney.
On ice (75° 23' N., 61° 41' W.) - -	89 24	1852	Belcher.
On shore (lat. 75° 23' N., 65° 20' W.) -	94 40	1857	McClintock.
On ice (75° 24' N., 61° 44' W.) - -	88 51	1850	Ommaney.
On ice (75° 46' N., 75° 49' W.) - -	106 35	1850	Ommaney.
At sea (76° 13' N., 74° 56' W.) - - -	101 50	1850	Ommaney.
On ice (76° 19' N., 61° 30' W.) - -	101 14	1850	Ommaney.
Netlik (77° 8' N., 71° 22' W.) - - -	106 49	1861	Hayes.
Northumberland island (77° 11' N., 72° 20' W.)	106 0	1861	Hayes.
Starr island (78° 18' N., 73° 6' W.) - -	109 45	1861	Hayes.
Port Foulke (78° 18' N., 73° 0' W.) - -	111 40	1861	Hayes.
Cairn point (78° 31' N., 72° 59' W.) -	110 9	1861	Hayes.
Rensselaer harbour observatory - - -	108 12	1854	Kane.
Last Camp (78° 38' N., 72° 8' W.) - -	108 36	1861	Hayes.
Camp Separation (78° 53' N., 72° 8' W.) -	105 4	1861	Hayes.
Potato Camp (79° 4' N., 72° 30' W.) - -	105 34	1861	Hayes.
Scouse Camp (79° 30' N., 72° 53' W.) -	113 0	1861	Hayes.
Camp Hawks (79° 44' N., 73° 6' W.) - -	115 38	1861	Hayes.
Foggy Camp (79° 55' N., 71° 28' W.) -	106 53	1861	Hayes.
Thank God harbour - - - - -	96 0	1871	Hall.

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LONDON:

Printed by GEORGE E. EYRE and WILLIAM SPOTTISWOODE,
 Printers to the Queen's most Excellent Majesty.
 For Her Majesty's Stationery Office.

[1145.—150.—4/75.]
 [1174.—100.—4/75.]

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