3204, 3205, & 3206.

Diag. Cht. No. 8554-1 & 8502-1

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

Superintendent.

State: Alaska

DESCRIPTIVE REPORT.

Sheet No.

LOCALITY:

Cook Inlet

1901

CHIEF OF PARTY:

W. E. Parker

R. I.
Library and Archives.

Hyd. 3204, 3205, 3206

3204, 3205, & 3206.

Descriptive Report of Cook Inlet, Alaska.

Season 1910.

U.S.S. Patterson.

W.E. Parker, Asst. C. & G.S.

Com'd'g.

3204,5,& 6

Descriptive Report to accompany hydrographic sheets of eastern side of Cook Inlet from Port Graham to Kalgin Island and Kachemak Bay to Coal Bay. Hyd. Sheet Nos ~~1, 2, & 3.~~ 3204, 3205, 3206.

On the northern side of the entrance to Port Graham is Dangerous Cape a rocky tree covered point inconspicuous from the seaward. Detached rocks, bare at all stages of the tide stand a few yards off the point to the westward and southward beyond which are rocks awash at low and half tides. 5/8 of a mile W X N 1/2 N from this point is a sunken rock on which moderate seas break and between this rock and the point is foul ground.

From Dangerous Cape the coast trends northward for 2 miles to a prominent, bold, grass covered point about 50 feet high and comparatively flat nearly to its extremity where it drops abruptly to the water. A detached grass covered rock stands just clear of the extremity of the point and rises to nearly the height of the point. Submerged rocks extend not over 1/8 of a mile outside this rock. This point with its detached rock is a prominent land mark from Kachemak Bay and to a some what less extent from Cook Inlet off Port Graham.

From this point the coast trends northeasterly for 5 miles to Chesloknu Bay, the usual name for which is Seldovia Bay. The coast here is decided irregular in outline, is broken by five indentations between which are more or less conspicuous points, and is rather less bold than on the other side of the point. The shore is wooded nearly to Seldovia Bay. This coast is free from danger beyond 1/4 of a mile off the point. In the second bight west of Seldovia Bay, at the head of which is hydrographic signal "Pole", the kelp grows so thickly that the launch could not get inside of 1/2 a mile from the shore.

Naskowhak Point on the west side of the entrance to Seldovia Bay is a conspicuous landmark on approaching from the westward. It is a low, sandy, grass covered spit terminating in a rocky knoll 117 feet high overgrown with fir trees and other vegitation. Approaching from the westward the town of Seldovia is seen first over this sand spit between the knoll and the main land; later it is cut out by the knoll. A rocky ledge covered at high water extends a hundred yards beyond the knoll.

Gray C liff on the eastern side of the entrance is easily recognized by the grey color of its rocky face, and is a leading mark for entering the harbor. From here the coast trends northward one mile to Seldovia Point and then northeasterly 2 miles to the next point. Seldovia Point terminates in a high rocky cliff tree covered nearly to the end and is not prominent from off shore. Kelp grows thickly along this coast and is so heavy about Seldovia Point and northeastward that the sounding launch could not get inside of 5 fathoms. Above Seldovia shallower water was found but the bottom appeared smooth and no indications of dangers were found. The last named point is low and sandy and is prominent comming up from the westward.

From this point on which is signal "T ed" the coast trends eastward 1-3/4 miles and then turns sharply N. N . E. for one mile to the extermity of Nubble Point.

Nubble Point is a long sand spit terminating in a rocky knoll, cover ed with vegitation. Seen from the northwestward it resembles some what Naskowhak Point especially at night, and is liable to be mistaken for it in attempting to make Seldovia at night from up the Inlet unless careful attention is paid to the currents.

The Patterson bound from up the Inlet to Seldovia in a dark night was set so far to the eastward of her course, due to the fact that the

currents this side of Kachemak are at times exactly opposite in direction to those on the other side, that Nubble Point was picked up only a little on the port bow and, mistaken for Nashowhak Point, the course was altered to the eastward. The Point was close aboard before the error was detected and then only by the appearance of the land to the eastward. From Nubble Point a narrow tongue of low land, densely wooded projects to the eastward forming nearly a right angle at the Point. The eastern part of the Point and tongue of land are bold and free from dangers close to the shore.

From the vicinity of Nubble Point the coast curves easterly and northerly and is fringed by many small islands. The shore line is winding and tortuous forming many bights and points and two arms of considerable length. Deep water was found between the islands and nearly to the heads of the two large arms.

Kahsitsnah Bay, a small, well protected cove inside Nubble Point offers excellent anchorage for vessels of any size. The holding ground is good in 15 fathoms. The upper half of the bay is closed by a sand bar that covers only at high tide, and on the southern side the water shoals rapidly at 300 yards from the shore.

A rock uncovered at extreme low water, 1/2 mile N. N. E. 3/4 E from Nubble Point is marked by thick kelp, and can be passed on either side. Coming into Kahsitsnah Bay from the westward especially at night the better plan is to pass between this rock and Nubble Point keeping the point close aboard, 100 to 150 yards. Some kelp will be passed through but there is good water close to the shore.

Hesketh, Yukon and Cohen Island lie in the order named in a general N X Ely direction from Nubble Point, the first 1-5/8 miles distant and the more distant part of the farthest 4-1/2 miles. All three are high

and heavily wooded. Rocks awash or uncovered at low water extend over half a mile in a westerly and northwesterly direction from the western end of Hesketh Island. Northwest from the middle of the western side of Yukon Island at a distance of 100 yards is a rock uncovered at low water and Cohen Island is foul to a distance of 350 yards off its western and northern points. A bright yellow cliff below △ Cohen, western end Cohen Island, is conspicuous at a considerable distance to the westward, and was used to indentify △ Cohen when too distant to make out the signal. A rock 60 feet high lies 1/2 mile north of Cohen Island.

Eldred Passage, between these islands and the mainland, is deep and free from dangers in the mid channel, but is of no importance to navigation. The passages between the islands are not safe on account of ledges of rocks projecting off the islands.

Lancashire Rocks.---- 1-3/4 miles northeasterly from Cohen Island there are several rocks covered at high water the outer of which lies a little over half a mile off the point on which is signal "Lost". Between the above mentioned rocks and the shore to the eastward about half way on line to signal "Pat" are two more rocks awash at certain stages of the tide. The first of these rocks, those lying farthest off shore, are here called Lancashire Rocks for the reason that chart # 8651, Kachemak Bay, shows rocks of that name in this general vicinity. However the rocks shown under this name on the chart appears as two islets rather than as rocks awash and are farther from Cohen Island than those described above, but there are no other rocks and no islets in this vicinity to which this name could apply and if there is any authority at all for the rocks figured on the chart of this bay as Lancashire Rocks they must be one and the same with the rocks awash described above. The chart also shows an area of foul ground and sunken rocks one mile from Cohen Island in this direction and

in some respects these rocks correspond more closely to those found by us than the Lancashire Rocks do, but this is due largely to erroneous sketching of the shore line and those two clusters of rocks are evidently the same repor ted at different times.

Gull Island 5-1/8 miles N.E.XN from Cohen Island is a pile of bare rocks feet high. It is a prominent landmark at a distance of ten miles or less. A line from Gull Island to △ C oal, on the other side, marks the upper limit of the present survey of Kachemak Bay.

Homer Spit a low gravel and shingle point a little over 3-1/2 miles long extends in a E X S direction from the northern side of Kachemak Bay westward of Gull Island. Between the end of the spit called Coal Point on same charts and Gull Island is a clear channel 2-1/2 miles wide. T he spit varies in width from 1/4 of a mile near its end to less than a hundred yards near the north shore and is covered with rank grass and some trees. At the extreme end of the spit is the town of Homer a practically abon doned village of about twenty buildings including a post office and several shops and a store. On the north side of the spit near its end is a large, well built wharf all of which dries at low spring tides. All the property belongs to a coal mining company which on account of difficulties with its patents has suspended opperations. From the wharf a single tract railroad traverses the spit to a coal shaft and plant in the interior. Deep water is found close up to the end of the spit and with in fifty yards of the end of the whar f.

T here is excellent anchorage in eight to ten fathoms 3/4 of a mile northwest from the end of the wharf with good holding ground and shelter from all but northerly to northeasterly winds. Near the wharf greater depths are found close to the shore with abrupt shoaling and it is not safe to anchor in less than 18 fathoms here. T he bight northwest of Homer, called Coal Bay on chart # 8651, is shoal but free from dangers.

Archimandretof Rocks shown on some of the earlier prints of chart # 8651 as two sunken P.D.rocks lying southwesterly from Coal Point, do not exist, nor are there any off shore danger s in this vicinity.

From Homer Spit the coast trends a little south of west to Bluff Point and then westerly and northwesterly to Anchor Point, the northern side of the entrance to Kachemak Bay. This whole coast line of about 15 miles is a series of erroded gravel and sand banks from two to seven hundred feet high and very steep. The greatest elevation is at Bluff Point, at about the position of △ Bluff, and from here the elevations of the top of the bluffs decrease in both directions. In front of the bluffs is a narrow shelf of rocky and shingle beach. T here are no charactertstic land marks on this coast but the position of △ Bluff can generally be recognized as the highest part of the erroded bank.

Comparatively shoal water is found along this stretch of the coast but depths usually decrease gradually as the shore is approached. T he coast is foul to a distance of half a mile off shore beyond which only one danger was found. Kelp grows along most of this coast west of Bluff Point and is especially thick in the vicinity of △ N ew where it is found nearly two miles off shore.

A rock over which a least depth of 17 feet was found lies 1-5/8 miles S X W 1/2W from △ New.

The latest copies of chart # 8651 show a sunken rock about2-1/2 miles off shore upwards of 3 miles westward of Bluff Point and another sunken rock between a mile and a mile and a half off shore between △ N ew and Anchor Point a little eastward of the prolongation of the shore line of C ook Inlet. T he former evidently does not exist as shown for the bottom here is uniform with depths of 15 to 17 fathoms. It is not certain that the latter

does not exist although no indication of it was found by this party. However depths of three to five fathoms were found in this vicinity and it ~~was~~ not at all improbable that detached boulders lie between the sounding lines. It is recommended that vessels keep at least two miles off shore, between Bluff and Anchor Point.

Anchor Point seen from the southward appears as a low, bare, sandy and rocky strip of land projecting clear of the shore line to the northward. Seen from the southwestward to northwestward it is not readily recognizable and it is only when close inshore to the northward that the point can be distinguished from the general shore line. The bluff line receeds from the shore about a third of a mile at this point. Rocks uncovered at low tide project a quarter of a mile from the shore in a southwesterly direction and appear quite prominently at low tide from close inshore to the northward.

About 2/3 of a mile southward of Anchor Point and 100 yards from the shore is a prominent red house on a low grassy knoll. This building shows conspicuously over a wide angle at a distance of several miles off shore. From Anchor Point the coast trends N 1/4 W for 6-3/4 miles to Cape Starichkof then, turning slightly eastward, makes a long, smooth, flat curve to Cape Ninilchik 9 miles N 5/8 W from Starichkof.

The bluff line approaches the coast again a mile north of Anchor Point and continues close to the shore up to Cape Starichkof. AT Anchor Point △, 2-3/4 miles northward of the point, the bank attains an elevation of 270 feet and then gradually descends to the northward. At Cape Starichkof the bluff receeds again from the shore, is less steep and is covered with vegitation. Northward of Starichkof the bluff follows closely the shore, varying in elevation from 100 to 200 feet and is erroded nearly to Cape Ninilchik.

This sketch of the coast is believed to be free from all dangers.

A hard sandy bottom farely smooth rises gradually as the shore is approached and affords fair anchorage in any depth.

The "Patterson" anchored frequently close inshore just north of Cape Starichkof in six to seven fathoms at low water. The holding ground is fair and there is more shelter from southerly water than the appearance of the land indicates.

Chart # 8502 shows a shoal 1-1/2 miles from shore 2-1/2 miles northward of Cape Starichkof and the Coast Pilot Notes speaks of broken water here indicating a probable shaol. A careful examination here by this party showed depths of 7 to 8 fathoms but no indication of a dangerous shaol nor was the broken water at the spot any more marked than at many other places along this coast where no shaols were found.

The same chart shows a rock awash off Cape Ninilchik and the Coast Pilot Notes refer to it as a rock bare at low water one mile from shore a little northward of the fish house. A careful examination of this place by the launch party failed to show any rock here. Further more the "Patterson" was anchored about 3/4 of a mile off this fish house during several low spring tides and had there been a rock there bare or near the surface it would have been seen from the vessel as we were on the look out for it. As an extra precaution the party returned to this spot at an extremily low tide and searched for it with vessel, launch and pulling boat. Finally the ship dragged the marine sentry over the spot at low water.

From Cape Ninilchik to a blunt point five miles N 7/8 E from the former the coast curves to the eastward forming a bight 400 yards deep. Beyond this blunt point the coast trends in practically straight line N X E 7/8 E for 4 miles, then N 7/8 E for 6 miles or more.

On the north side of Cape Ninilchik is a narrow, grassy valley through which a small stream flows to the sea. Beyond this is a low bluff to the village of Ninilchik, one mile north of the point, and then continuous

errroded bluffs to the northern limit of this party's survey.

Ninilchik Village consists of a dozen or so Indian huts and a Greek Church on the right bank of a small stream about a mile northward of the cape of that name. The church and part of the village are on an elevated grassy shelf and show conspicuously from off shore.

North of Cape Ninilchik the coast is very foul and should not be approached closer than two miles. Immense boulders, on which no kelp grow, were found along this entire stretch of the coast from one half to one mile from the shore. These boulders are generally of small area and rest apparently on comparatively flat bottom, so that soundings in the near vicinity give no indication of their presence. From the appearance of those found, and from the soundings taken alongside of them it seems probable that there are many more in the deeper water than this party found.

A rock bare at low water lies 2/3 of a mile from the shore just north of C ape Ninilchik, and abreast of it on the shore is a fisher man's hut simular to the hut on the south side of the cape. It seems evident that this rock and hut are those spoken of in the Coast Pilot Notes and the simularity of the huts has lead to the error in placing this rock too far south.

Plotted on Hyd 3205

Westerly from Ninilchik Village nearly 3 miles from the shore there is a large shoal over which a least depths of 27 feet was found. This is evidently the 5 fath (P.D.) of the chart.

Northward of the village 1-2/5 miles and the same distance from the shore is a smaller reef of rocks and sand uncovered at low water.

Northward of this reef no rocks were found more than half a mile from the shore until nearly up to the limit of this work where two rocks uncovered at low water, were found nearly a mile from the shore between signals "F ish" and "Stanford".

Plotted on Hyd 3205

A rock that just bared at the lowest spring tide of Aug.21st was

found by Asst.Quillian 2 miles from shore W 1/4 S of △ Stanford. His description of it is " a large smooth gray granite boulder about 15 feet long awash 6 inches at time of location (9:52 a.m.Aug.21st.) lies in 3 fathom water L.W. Spring." This rock is plotted on the sheet by transfer from a tracing furnished by Asst.Quillian as the signals from which he located it fall off this sheet. The following angles were taken by him at the rock, Stanford 46° 43' Clam 5 2 03' Sis and Fish 80° 50' Clam. The positions of Sis and C lam.from his topographic sheet are respectively Lat. 60° 17'- 1633 meters, Long.151° 24'--658 meters and Lat.60° 14'-- 460 meters, Long.151° 24'--485 meter s. The launch party passed within less than 200 meters of this rock getting depths that reduce 31 feet and saw no indications of it.

Plotted on Hyd # 3205

A long narrow tapering shoal extends 17 miles southward from the southern end of Kalgin Island. For seven or eight miles from the Island the shoal bares at low water beyond which depths increase gradually up to 5 fathoms at 13-1/2 miles from the Island. Beyond this point depths increase more rapidly until the shoal disappears about 3-1/2 miles father south. The eastern and west-sides of the shoal are quite steep and in places the transition from deep water to dangerous depths is so abrupt that this locality should be ap proached cautiously. The shoal appears to be composed of sand and smooth rocky ledges; no large ragged rocks nor boulders were found.

Except for this shoal just described and the rocks and reefs along the east shore already described there are no dangerous in C ook Inlet nor Kachemak Bay so far as this party has surveyed.

Anchorages

Port Graham, Seldovia Har bor, Kahsitsnak Bay and Tuxedni Harbor arethe only perfectly shelter ed anchorages in this vicinity.

Port Graham and Seldovia Harbor were surveyed by another party at an earlier date and require no further description and Kahsitsnah Bay is describ-

ed earlier in this report. No special directions for entering the Bay are necessary.

Tuxedni Harbor has not been surveyed but the Patterson was anchored there several times during the season. The entrance south of Chisik Island was approached on various courses from W.S.W. to N.W.X W and no dangers encountered The southern end of Chisik Island was given a berth of about 1/4 of a mile to avoid the reported rocks off that point and a mid channel course steered to the anchorage near the northern end of Chisik Id. The vessel usually anchored just below a hut on the island in 18 fathoms, mud bottom. No sea come into the anchorage.

The next best anchorage is in Kachemak Bay above Homer Spit where the holding ground is good and there is shelter from all but northeasterly winds. It is doubtful if even a strong northeast wind would raise much sea there.

Temporary anchorage in any depths may be had anywhere along the north shore of Kachemak Bay below Homer and along the east shore of Cook Inlet to Cape Ninilchik. The bottom is hard sand but holds well. Considerable swell comes in with southwesterly winds and at times the tide rips are heavy about Anchor Point. The smoothest water north of Anchor Point during southerly winds will be found close inshore where the currents are weakest and some shelter is afforded by the land. The coast north of Cape Ninilchik should be approached cautiously.

Currents.

Tidal currents of from one to six knots velocity are found below Kalgin Island. Below Anchor Point the currents rarely exceed two knots but increase rapidly in velocity as the Inlet is ascended and at the northern end of Kalgin Island a current of over seven knots was found. Both flood and ebb currents set practically fair with the channel, except as they are diverged by

Kachemak Bay, and no difference was noticed between the strength of the flood or ebb currents.

A strong flood and ebb current reaching a maximum of nearly three knots on sp ring tides sets across Dangerous Cape causing heavy tide rips and overfalls from one half to nearly a mile off that point. Rounding Dangerous Cape the flood currents set up Kachemak Bay with a velocity of from one to two knots. The strongest current is found at a distance of two or three miles from the south shore, decreasing towards the shore. The flood here runs northeasterly approximately parallel to the southern shore and the ebb in the opposite direction. F arther from the shore the flood current appears to take a mpre northerly direction and at Bluff Point is deflected to the westward during part of the flood. The ebb here runs continually to westward and southwestward.

Eastward of Bluff close to the northern shore there is very little current on either flood or ebb. The currents in the mouth of Kachenak Bay are extremely baffling due to the fact that both their directions and strength varies from place to place and it is difficult to make the correct allowance for set in crossing as from Anchor Point to Seldovia Harbor.

Around Anchor Point and within a mile ot two of the eastern shore of Cook Inlet the strength of the tidal currents is much less than further off shore and rarely exceeds two or three knots.

The strongest currents both on flood and ebb are found in the deep channel over towards Kalgin Island where they probably are twice as strong as those nearer the eastern shore. The currents over toward the western side of the Inlet appear to turn later than on the eastern side but there is not enough data to show positively that this is true. In steaming across the Inlet on east and west (magnetic) lines, it was at times necessary, when holding up 2 points for set just before crossing the deep channel, to increase this allowance for set to 4 or even 5 points in order to make good the same course.

Near the time of change in currents the direction of the currents or the sides of the channel is opposite fromthe direction of the current through the deep channel. Currents run from one to two ~~knots~~ hours after the change of tides.

Over the shoal south of Kalgin Island tidal currents set westerly with flood and eastrely with ebb tide and the northerly and southerly currents occuring between the strong easterly and westerly are weak. These easterly and westerly sets were notices as far as the 5 and 6 fathom depths eastward of the shoal.

Strong swirls and over falls with at times pronounced wakes occur along the eastern side of the Inlet where careful examination showed no less than eight fathoms of water.

Patches of strongly discolored water surrounded by clearer water are frequently encountered southward of Kalgin Island below the shoal described earlier in this report. These are so indicative of shoals that when first seen they were approached cautiously and carefully examined with the lead and sounding machine, but no indications of sheals were found in this vicinity. Fifteen fathoms and more were found in the most dangerous looking of these patches and it was evident that they were not caused by shaols in their immediate vicinity.

Why the water in these places held sediment longer in suspension that at other places is not apparent for there were frequently no indications of swirls nor eddies about the discolored patches.

Current observations were made at eleven stations between △ Kasilof and Port Graham but no station was occupied long enough to get complete data regarding the currents at that place. These observations were made with the current pole and line while the vessel was at anchor on account of weather unfavorable for surveying or while waiting for triangulation parties and the

observations sometimes covered only one phase of the tide. Besides the stations were necessarily too close to the shore to get records of the strongest tides.

Weather .

The prevailing winds were from southeast to southwest with frequent periods of calm and light shifting breezes from all points. There were no severe storms and no long periods ofrainy weather. Southwesterly winds usually brought clear weather while southeastrely and easterly winds were nearly always followed by rain.

F ogs were frequent during the late summer and early fall and occured ocassionally earlier in the season, but r ar ely lasted more than a few hours. The fogs of the latter part of the season were denser and lasted longer.

Much clearer weather prevailed above Anchor Point than below and in the vicinity of Port Graham there was much rain and cloudy weather.

The mountains back of Seldovia were frequently in the clouds and those on the western side of Cook Inlet to a less extent.

Haze and mist frequently obscured the distant mountains and often the entire shore at a distance of ten miles.

Landmarks.

In addition to those landmarks visable at short distances from the shore, which have been treated under the descriptions of the coast, there are the following prominent landmar ks,easily recognized at a considerable distance during clear weather.

Augustine Volcano, visable from all parts of the Cook Inlet below Ninilchik and Kachemak Bay to Homer Spit, is a symetrical cone nearly to the top which is cut off leaving a broken edge crater the north-eastern rim of which rises to an apparantly sharp peak as seen from the northeastward. This peak has been determined by triangulation and was used frequently in off shore

hydrography. In the sounding books"Augustine" refers to this peak rather than the triangulation signal on the shoulder of the mountain. The top of the mountain is fr equently obscured by clouds. Snow leaves the summit late in summer.

Iliamna and Redoubt Volcanoes west of Cook Inlet are visable during clearcweather from nearly all parts of the lower Inlet. Both are snow capped through out the year and ar e easily identified as the highest peaks south of the Forelands. They are determined by triangulat ion and have been used under the names "Iliamna" and " Redoubt" for sextant fixes.

Two some what lower peaks rising from the southern shoulder of Iliamna were used for hydrographic objects in preferance to the volcana as when seen clear of the later their summits appear shar per and hence give better fixes. They are called in the records North Peak and South Peak respectively and are often visable when the summit of the volcana is in the clouds. A photograph of Iliamna is attached.

Bede Mountain southward from the entrance to Port Graham is an excellant landmark from the Inlet and is easil y identified when clear of the clouds. It appears when viewed from the northward as a slightly concave plateau with steep eastern and western sides (see photograp attached). The western edge of the plateau was used as object for angling on under the name of"Mt.Bede."

High Mountain, eastward from Seldovia, was determined by this party and used considerably by the hydrographic parties. It is the highest peak in this vicinity, feet, and is easily recognized but is often in the clouds. The object observed on is the sharp peak at the south-eastern edge of the ridge which lies northwest and southeast. Seen from Cook Inlet west of Dangerous C ape the peak lies to the right of the flat ridge but from Kachemak Bay it is in the reverse order as shown on the attached photograph.

"Nob" is the only prominent object on the eastern side of the Inlet

below Kasilof. It is the norther n edge of the summit of a hill, about 1900 feet high, that rises in a steep slightly concave sweep from the lower rollin-g country to the northward. The top of this hill slopes down gradually to the southward for a short distance and then drops rapidly. South of this hill is another that resembles k t in appearance somewhat but there is nothing northward of "Nob" at all like it in appearance. "Nob" was located by sextant angles frm the vessel and used considerable by the hydrographic party. It is bare of trees and stands out shraply against the skyline when seen from the westward.

The outline and contours of this hill and those near it are sketched on the large hydrographic sheet of Cook Inlet and are only approximately correct as they could not be seen from the land near the coast.

Other landmarks as Chinitna Mt. Slope Mt., Chisik, Triple Pk., Peak A., and Sharp Pk., were determined by planetable or sextant and used by the hydrographic parties but a description of them would be of little use to a stranger and they ar e not important as landmarks. W e were able to identify some of them for our use only by careful study of their appearances from differ ent directions assisted at times by angles taken off the sheet.

Ports.

Port Graham--

The Alaska Commercial C o. established a station here last year, consisting of a substantial whar f, with a least depths of 13 feet alongside, ware houses and quarters for the Agent and employees. Water is piped to the wharf and coal can be had by arrangements with the Agent. No regular supply is kept on hand and very little stores can be obtained here. The station is left in charge of a watchman during the winter.

The Alaska Coast C o. maintained a semimonthly schedule of steamers

from Seattle and in addition a monthly boat from Valdez to the westward stopped west and east bound during the season. Freight for the upper Inlet and Susitna River was transhipped here to the Alaska Commercial Co's boat which called weekly and sometimes oftener.

There is no town here and no accomodations for passengers bound up the Inlet.

A small post lantern has been established on the north point of Passage Island and a black can buoy on the south end of the shoal eastward of Passage Island but this was not in place during the summer nor fall.

Seldovia.

Seldovia is a permanent town of twenty or thirty houses, a Greek Church, two stores and a post office and two hotels, one of which was open part of the season. The inhabitants are natives and creoles and a few whites. There is a wharf with a least depths of eleven feet at low spring tides and a warehouse. Water is piped to the wharf. Provisions and native coal can be obtained in small quanities.

All commercial boats stopping at Port Graham call here also leaving mail for Inlet and Susitna region and passengers bound up the Inlet. Several launches, transfer passengers, mail and light freight from Seldovia to Inlet stations.

Homer.

The commercial vessels occasionally call at Homer to deliver freight and mail. Homer while practically deserted still retains its post office from which during the winter month the mails for Kenai are dispatched by messenger overland.

Iliamna.

Vessels occasionally call at Iliamna Bay to discharge freight for the region about Iliamna Lake.

T There is at present no shipping in Cook Inlet above these parts except the vessels of the Cannery companies during the fishing season and one small steam boat and a few launches, handling passengers, freight and mail between Graham and Seldovia and villages up the Inlet during the open months. Two large sailing vessels bring up the crews and outfit for the salmon canneries at Kasilof and Kenai, remain anchor ed off the canneries during the summer and return south in the fall with the crews and catch. The canneries also have a fleet of tugs and launches in operation during the fishing season.

Survey Methods.

The controll is a system of very large triangulation figures observed over by Asst.Rhodes the previous seasons. The triangulation of Kachemak Bay was executed by this party from a base line on Homer Spit and is independent of the large scheme except that the geographic positions and azimuths are from "Bluff Point" of the large scheme. Stations "Stanford" and "Weid" were determined by triangulation from the main stations. "Ford" and "Star" intermediate between △ Ninilchik and △ Anchor Point were determined from these stations by cuts to them and to the vessel anchored off "Ford" and by cuts from "Ford" to "Ninilchik" to "Star" and the vessel. All other stations were located by p line table traverse checked by sextant cuts from the vessel at anchor close to the shore.

Hydrography was by hand lead and cosmos machine from the launches and deep sea lead line and Bassnett pressure tube from the vessel. The Bassnett tube was seized to the strap line 3 or 4 fathoms above the lead, the mount in ever y case being sytated in the notes, and with those sounding were taken simultaneous casts with the deep sead lead (trolley rig) until the vessel had reached depths too great for vertical casts. The difference between the depths obtained by simultaneous casts were used in correcting pressure tube soundings on the assumption that the error of the tube was constant at all depths. The

mean difference between the soundings obtained by the two methods equalled the length of strap line below the tube and differ ed from that amount only when the bottom was so uneven as to cause the simultaneous soundings to be taken in different depths or when the deep sea lead line was not vertical.

Tide staffs were set up at Homer, Anchor Point, Cape Starichkoff and Cape N inilchik and read for a few days each but most of the tide reducers were obtained from the records of the automatic ~~tauge~~ gauge in opperation st Port Graham during the entire field season.

From sim ultaneous observations it appeared that high water occured forty nine minutes later at Cape Ninilchik and twenty two minutes later at Anchor Point than at Port Graham; while low water occured respectively one hour and nine minutes and thirty six minutes later at these stations. The ranges at Ninilchik and Graham were 15.8 and 13.7 and the range at Anchor Point worked ~~one~~ out higher than either, probably due to the incomplete data.

For the purpose of reducing soundings, taken when there were no staff reading near, the large hydrographic sheet (1:120,000) was divided into five sections by four lines drawn perpendicular to the axes of the Inlet and spaced in proportion to the differences in time of the means of the high and low water at the three tidal stations mentioned above (see sheet #1). Soundings falling above the highest line (A) had 1 hr 15 min subtracted from time of soundings and corresponding heights of tide at Graham, increased in the ratio of 15.8/13.7, subtracted from soundings to reduce them to plane of lower low water. Between lines A and B one hour was allowed for difference of time, between B and C forty five minutes and between C and D thirty minutes, and the same ratio used in increasing the r educer on account of the greater range. Below line D, the lowest, in and in Kachemak Bay the Port Graham tides were used direct without time or range correction except for the launch sounding near Homer for which the staff reading at Homer are used. Bassnett tube soundings have an additional correction of the distance from tube to lead as recor ded in notes applied.

All bearings given in this report are magnetic and distancesaare in geographical miles.

W E Carlin Asst C&GS
Chief of Party
Dec, 1910

3205

T I T L E F O R S H E E T NO.2.

Cook Inlet ---------- Alaska

Eastern Coast from Latitude 59° 49' to Latitude 60° 12'

By Party on Str.Patterson

W. E. Parker, Asst. C. & G. Survey

Chief of Party

Hydrography by W. H. Staaford,W. C. C. & G. Survey,

in Launches Alpha and Reynard

Date of beginning June 21,1910

Scale 1: 40,000

Date of ending July 28,1910

V.S.C.
Jan.30,1911.

HYDROGRAPHIC SHEET 3305.

Cook Inlet, Alaska, eastern coast from Latitude 59°49' N. to Latitide 60°12' N., by party of Asst. W. E. Parker in 1910.

TIDES.

	Seldovia ft.	Cape Ninilchik ft.
Mean lower low water, or plane of reference on staff	5.4	10.8
Lowest tide observed " "	-0.3	8.8
Highest " " " "	27.9	30.6
Mean range of tide	15.4	16.5

3205

STATISTIC SHEET NO. 2.

Date 1910.	Letter	Vols.	Positions.	Soundings.	Miles Statute	Vessel.
June 21	a	1	53	244	16.5	Reynard
22	b	1	52	205	20.5[4]	"
23	c	1	34	154	13.5	"
24	d	1&2	81	321	25.7	"
25	e	2	39	205	13.5	"
27	f	2&3	106	524	37.5	"
28	g	3	52	249	19.1	"
29	h	3	94	417	32.4	"
July 6	a a	1	26	103	9.3	Alpha
7	b b	1	80	408	28.9	"
8	c c	1&2	98	590	32.8	"
9	d d	2	79	544	17.8	"
11	e e	2&3	107	482	42.9	"
12	f f	3	78	405	24.4	"
18	g g	3&4	83	353	31.3	"
22	h h	4	85	322	33.0	"
23	i i	4	7	31	3.3	"
25	j j	4	47	175	13.5	"
26	k k	5	56	202	20.5	"
28	l l	5	86	346	29.7	"
			1335	6280	466.0	

Soundings Plotted in feet.

Plotted & inked by H.L.S.
Verified by R.L.J.

Field Sheet No 3205 Dec 5, 1911.

This area is not well covered. Many boulders exist along this coast and to get a satisfactory survey the area should be dragged. Soundings in the close vicinity of these boulders give no indication of their presence.

The uncovers on this sheet indicate errors either in the soundings or in the tide reduction.

H L Simons

Verified; May 1st, 1911.

R. L. Johnston

In the records of Hydrographic Sheet 3206, Vol #1, page 29, a point is located by angles and marked "shoal", but no sounding was taken. This point protracts off shore between Δ Ninilchik and Δ Reid and is shown in pencil.

R.L.J.

3204

T I T L E F O R S H E E T NO.3.

Kachemak Bay ---------- Alaska

From Dangerous Cape and Anchor Point to Coal Bay

By Party on Str.Patterson

W.E.Parker, Asst. C. & G. Survey

Chief of Party

Hydrography from

Str.Patterson W.E.Parker, Asst.C.& G.Survey in charge

Launch Alpha W.H.Stanford,D.C.C.& G. Survey in charge

Date of beginning July 29,1910

Scale 1: 40,000

Date of ending Sept 29,1910

Kachemak Bay

STATISTIC SHEET NO.3.

Date 1910	Letter	Vols.	Positions	Soundings	Miles sounding	Vessel
Sept. 6	A	1	89	66	29.2	Patterson
7	B	1	120	193	71.6	"
8	C	1	145	225	82.5	"
9	D	1	123	185	69.00	"
10	E	2	110	168	59.8	"
12	F	2	57	95	32.8	"
17	G	2	58	99	36.0	"
19	H	2	99	147	48.5	"
			751	1178	429.4	
July.29	a	1	15	60	4.8	Alpha
Aug 4	b	1	64	254	20.5	"
5	c	1	64	263	21.5	"
6	d	1	45	294	13.6	"
8	e	2	80	401	28.4	"
10	f	2	90	478	31.7	"
11	g	2&3	114	520	43.0	"
12	h	3	94	330	24.2	"
13	i	3	73	237	23.8	"
16	j	4	25	50	8.6	"
17	k	4	17	28	4.0	"
18	l	4	58	120	18.4	"
20	m	4	75	157	20.7	"
22	n	4&5	64	121	19.4	"
23	o	5	69	187	11.8	"
24	p	5	75	176	23.6	"
26	q	5	44	92	13.1	"
27	r	5&6	53	144	14.4	"
29	s	6	95	234	30.0	"
30	t	6	55	140	16.5	"
31	u	6	29	79	8.6	"
Carried forward			1268	4265	400.1	

Date 1910	Letter	Vols.	Positions	Soundings	Miles sounding	Vessels ~~Patterson~~
brought forward			1268	4265	400.1	Alpha
Sept. 8	vV	6&7	46	107	13?8	"
5	wW	7	107	292	30.4	"
6	xX	7	88	178	30.0	"
7	yy	8	68	133	20.1	"
8	zz	8	78	155	19.0	"
9	aa aa	8	17	37	4.0	"
10	bb bb	8&9	105	288	27.7	"
12	cc cc	9	61	255	17.0	"
17	dd dd	9	80	422	25.7	"
19	ee ee	10	99	514	32.5	"
20	ff ff	10	83	245	20.3	"
21	gg gg	11	87	184	21.3	"
22	hh hh	11	52	169	25.1	"
23	ii ii	11	16	60	13.8	"
24	jj jj	11&12	90	211	22.9	"
26	kk kk	12	97	308	34.8	"
27	ll ll	12	69	267	27.5	"
28	mm mm	13	68	296	27.6	"
29	nn nn	13	90	497	29.3	"
			2669	8883	842.9	

Soundings expressed in feet.

Plotted & inked by H.L.S.
Verified by R.L.J.

VEC
Feb. 3, 1911.

HYDROGRAPHIC SHEET 3204.

Kachemak Bay, and Vicinity, Cook Inlet, Alaska,

by Asst. W. E. Parker in 1910.

TIDES.

	Seldovia ft.
Mean lower low water, or plane of reference on staff	5.4
Lowest tide observed " "	-0.3
Highest " " " "	27.9
Mean range of tide	15.4

Hyd. Sheet No 3204 Oct 7 1911

The area within the limits of survey is well covered.

The records were kept in a satisfactory manner

A. T. Simons

Verified May 11th, 1911.

R. L. Johnston.

3206

TITLE FOR SHEET NO. 1.

Cook Inlet ---------- Alaska

Eastern half from Port Graham to Kalgin Island

By Party on Str.Patterson

W.E.Parker, Asst. C. & G. Survey

Chief of Party

Hydrography from
Str.Patterson (W. E. Parker,Asst.C.& G.S.) in charge
(F. H. Hardy " " " ")

Launch Alpha W.H.Stanford,W.C. C.& G.S. in charge

Date of beginning June 13,1910

Scale 1: 120,000

Date of ending Sept 21,1910

STATISTIC SHEET NO. 1.

DEC - 1910
Acc. No.

3208

Date 1910.	Letter.	Vols.	Positions.	Soundings.	Miles Statute.	Vessel.
June 13	A A	1	23	61	30	Patterson
14	B B	1	101	230	71	
16	C C	1	14	60	8	
17	D D	1	117	264	86	
18	E E	1&2	95	171	58	
22	F F	2	62	146	44	
24	G G	2	101	202	65	
27	H H	2	67	153	39	
29	K K	2	44	83	31.5	
July 7	L L	2	34	67	25	
8	M M	3	78	124	50.5	
9	N N	3	38	73	27	
11	P P	3	65	129	45.5	
12	Q Q	3	97	188	75.3	
13	R R	3	123	245	91.4	
14	S S	4	104	206	94	
15	T T	4	83	228	55.5	
16	U U	4	65	251	40.5	
22	V V	4	119	233	91	
23	W W	4&5	84	161	54	
25	X X	5	123	233	92	
26	Y Y	5	114	211	84	
28	Z Z	5	89	172	80	
29	AA AA	6	90	170	72.5	
30	BB BB	6	85	166	66.5	
Aug 5	CC CC	6	81	152	57	
6	DD DD	6	45	89	25.6	
8	EE EE	6	77	149	59.2	
9	FF FF	6	11	21	6.3	
10	GG GG	6&7	107	230	62.7	
11	HH HH	7	98	184	71.3	
13	JJ JJ	7	95	178	72	
16	KK KK	7	62	101	35.9	
19	LL LL	7&8	107	205	59.8	
26	MM MM	8	96	186	71.7	
27	NN NN	8	63	119	46	
29	PP PP	8	91	169	73.6	
30	QQ QQ	8	59	113	46.6	
Sept 5	RR RR	8&9	91	158	60.4	
6	SS SS	9	78	125	46.6	
21	TT TT	9	33	168	6.7	
			3204	6564	2273.6	
July 13	a a	1	44	457	25	Alpha
14	b b	1&2	74	850	42.6	
15	c c	2	83	757	44.7	
16	d d	2	28	163	16.1	
			229	2227	128.4	

All soundings plotted in feet.

Plotted & inked by H.L.S.
Verified by R.L.J.

.E.C.
Feb.8,1911.

HYDROGRAPHIC SHEET 3206.

Southern part of Cook Inlet, Alaska, by party of Asst. W. E. Parker in 1910.

TIDES.

	Seldovia ft.	Cape Starichkof ft.	Cape Ninilchik ft.
Mean lower low water, or plane of reference on staff	5.4	1.2	10.8
Lowest tide observed " "	-0.3	-1.2	8.8
Highest " " " "	27.9	20.7	30.6
Mean range of tide	15.4	16.4	16.5

Hyd Sheet No 3206

The work on the shoal south of Kalgin Id is not close enough for good development. With the exception of this shoal the area within the limits of the survey is well covered.

H L Simons

Verified ; May 22, 1911.

R. L. Johnston

In the records of this sheet Vol # 1, page 29, a point is located by angles and marked "shoal", but no sounding is given. This point falls off shore from a "Church" and is shown in pencil. R.L.J.

Additional work by H. A. Seran on June 30, 1923
(1 vol. Soundings included)

3206

Soundings — Anchor Point — Cook Inlet

Position	Sdg.		Character
1	22.2	22.6	U + D.
	20.0	19.4	Underway
2	22.9	22.3	"
	22.7	22.2	"
3	21.7	22.1	"
	20.0	19.6	"
4	23.5	23.5	U + D.
5	23.0	23.9	Underway
	23.5	22.9	"
6	22.5		"
7	21.7	20.2	"
8	21.5	21.7	U + D.
9	21.0	21.4	Underway
	21.4	21.1	"
10	21.8	22.0	"
11	30.5	30.0	"
12	27.5	30.0	U + D.
13	29.3	29.2	Underway
	22.8	25.4	"
14	24.0	23.0	"
	18.5	19.9	"
15	19.8	19.7	U + D.
16	19.4	18.6	Underway
	17.8	18.0	"
17	18.3	18.3	"
	18.0	18.0	"
18	18.7	18.0	U + D.
	18.7	18.0	U + D.
19	17.7	17.3	Underway
	18.0	18.0	"
20	15.0	17.0	"
	18.3	18.5	"
21	19.3	19.1	"
	18.9	18.8	"
			"

Pos.	Edg.		Character.
22	21.0	20.9	Underway
	22.5	24.4	"
23	19.6	19.6	U-D.
24	17.6	17.2	Underway
	16.6	16.3	"
25	16.6	16.6	"
	16.4	16.3	"
26	15.5	16.2	"
	16.0	15.7	"
27	15.4	15.9	"
28	17.6	17.4	"
29	20.2	19.6	U-D.
30	18.1	18.8	Underway
	21.2	22.5	"
31	23.6	24.0	"
	22.9	24.0	"
32	23.0	23.4	"
	23.0	22.9	"
33	22.0	22.0	"
	21.4	22.1	"
34	23.5	23.4	U-D.
35	22.5	22.2	Underway
	22.1	22.1	"
36	21.0	21.3	"
37	21.2	19.5	"
	22.1	22.3	"
38	20.0	22.2	"
	21.5	21.6	"
39	22.5	22.2	U-D.
40	24.2	26.2	Underway
	23.0	24.0	"
41	22.4	23.0	"
	21.3	20.5	"
42	22.4	23.1	"
	20.1	20.1	"
43	20.3		"
	20.1	20.3	"
44	24.2	23.8	U-D.

Pos.	Rdg.		Character
45	20.1,	20.2	Underway.
	20.9	19.0	"
46	20.0	19.1	"
	20.3	20.5	"
47	20.6	20.1	"
	20.0	20.0	"
48	19.0	19.6	"
49	21.0	20.6	"
50	20.5	21.0	4 - D.
51	21.2	21.4	Underway
	23.1	23.1	"
52	26.0	26.0	"
	22.8	23.3	"
53	22.0	21.8	"
54	19.1	18.5	"
55	28.0	28.0	"
56	30.6	31.5	4 - D.
57	32.0	31.1	Underway
	29.5	30.2	"
58	27.7	27.3	"
	25.9	26.8	"
	25.7	25.0	"
59	21.4	23.0	"
	24.3	23.3	"
60	22.7	23.1	"
61	21.6	21.7	4 - D.
62	~~21.6~~ 19.5	~~21.7~~ 20.5	Underway
	21.0	21.0	"
63	20.7	20.7	"
	20.9	21.0	"
64	19.1	19.1	"

POST-OFFICE ADDRESS: 202 Burke Building, Seattle, Washington.

TELEGRAPH ADDRESS: Do.

EXPRESS OFFICE: Do.

JUL 18 1923

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

U.S.S. Discoverer,
Kachemak Bay, Alaska,
July 1st, 1923.

To : The Director.
Through : Inspector, Seattle.
From : Commanding Officer.

Subject : Reported shoal off Anchor Point, Cook Inlet.
Reference Par. 15, Instructions Feby. 21, 1923.

1. In the letter from Capt. A. O. Johansen, accompanying my istructions of February 21st, 1923, a report is made of a rock or shoal off Anchor Point on the following bearings:

Point Bede -- Southeast by South ¼ South, Magnetic
Anchor Point- Northwest ½ North, Magnetic.

Capt. Johansen at present is the Master of the SS Starr running between Seward and Southwestern Alaska. In conversation with him in Uyak on May 15th his attention was called to the fact that these bearings were evidently wrong inasmuch as they did not intersect at the point mentioned in his letter. He then stated that the bearing to Anchor Point should be Northeast ¼ North instead of Northwest ½ North. This change will give an intersection about 7 miles off Anchor Point as stated in his letter.

2. In a radio received from him on April 28th he mentions the ripple in the water, and in his statement on May 15th he stated that there might be lots of water over the rock.

3. An examination of this vicinity was made on June 30th. The bottom is very uneven and rocky. No soundings less than the charted depths were obtained. We noticed several ripples such as described by him and sounded directly in some of them. They were evidently tide rips caused by the uneven bottom. The Discoverer anchored in this vicinity about 7pm June 29th and sounded from 8am until 3:30 pm June 30th. Thus we were in the vicinity through two complete tides,(springs).

4. Chart 8554 was used as a boat sheet and the following points were used to determine the positions by three point fixes: Mt. Illiamna, Mt. Bede., Anchor Point Light house, Tangent to

Plot on H. 3206
Send in records & boat sheet (chart 8554)

Bluff Point, Kachemak Bay; and the highest point on Chisik Island. Do you wish a projection made for this work and the work plotted thereon. If so please forward me the best geographic positions of those five points.

5. A tracing showing the lines of soundings run is forwarded herewith.

6. Copy of radio message from Capt. Johansen dated April 28th is forwarded herewith.

H. A. Seran,
Lieut-Comdr., C&GS.,
Commanding.

- -

Copy to Inspector, Seattle for file.

251

U.S.C.&G.SURVEY

SEP 10 1923 9 19 AM

CHARTS

POST-OFFICE ADDRESS: 202 Burke Building, Seattle, Washington.

TELEGRAPH ADDRESS:

EXPRESS OFFICE:

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

U.S.S. Discoverer,
Uyak, Alaska.
August,18, 1923.

To : The Director.
Through : Inspector, Seattle.
From : Commanding Officer.

Subject : Shoal off Anchor Point, Cook Inlet.
Reference : Director letter 9-DRM, July 18th.

1. The records requested in above reference have been forwarded by mail and will go out by the next steamer.

2. After my conversation with the one who reported this shoal or rock I was confident that what he had seen was merely tide rips and the investigation showed this to be the case. Consequently no attempt has been made to reduce the soundings for tide. The soundings were tube soundings. Had any evidence been obtained of soundings shoaler than the original survey showed the regular procedure would have been followed.

H. A. Seran
H. A. Seran,
Lt.Comdr.,C&GS.,
Commanding.

- -

COPY.

From SS Starr April 28th.

To Lieut*Comdr H. A. Seran
U.S.S. Discoverer.

Your letter regarding a rock or shoal off Anchor Point Cook Inlet dated March eighth reached me last trip at Seward period I forwarded my chart at the time that I made the report with the bearings worked on it period As far as I can remember now it was about seven miles off and on bearings given in your letter period I laid close to this heavy ripple or overfall that resembled Ripple Rock in Seymour Narrows comma on a spring tide for two days but had no chance of taking soundings at slack water as I soon after started fishing period The ripple was visible two or three miles.

O. A. Johansen,
Master Steamship Starr.

ADDRESS THE DIRECTOR
U. S. COAST AND GEODETIC SURVEY

AND REFER TO No. 4-DRM

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

WASHINGTON June 13, 1924

SECTION OF FIELD RECORDS

Report on Hydrographic Sheet No. 3206 (Additional work)

Off Anchor Pt., Cook Inlet, Alaska

Surveyed in 1923

Instructions dated February 21, 1923

Chief of Party, H. A. Seran.

Surveyed by party of Steamer Discoverer.

Portracted and soundings plotted by J. C. MacNab.

1. The records conform to the requirements except for the omission of a sounding tube graph. The soundings as reduced are incorrect because no allowance was made for the usual error of the sounding tubes.

2. The plan and character of development conform to the requirements of the General Instructions.

3. The plan and extent of development satisfy the specific instructions. The purpose of this examination was to determine the location of a rock reported by Capt. A. O. Johansen on Dec. 20, 1920.

4. The work was plotted on chart 8554 by the field party and re-plotted on smooth sheet 3206 in the office.

5. This examination shows conclusively that there is no rock nor indications of a shoal in the locality indicated by Capt. Johansen.

6. As the examination contains no information of value to the charts, it has not been inked on the sheet by order of the Chief of the Field Records Section.

7. The rock is evidently non-existent and no further surveying is required.

8. The character and scope of the surveying are excellent.

9. Reviewed by E. P. Ellis, June, 1924.

C.1.c.

January 28, 1924.

Division of Hydrography and Topography:

Division of Charts:

Tide reducers are approved in
1 volumes of sounding records for

HYDROGRAPHIC SHEET 3206

Locality: Cook Inlet, S. W. Alaska.

Chief of Party: H. A. Seran, in 1923.
Plane of reference is Mean lower low water reading.
6.4 ft. on tide staff at Halibut Cove.

For reduction of soundings, condition of records satisfactory
except as checked below:

1. Locality and sublocality of survey omitted.
2. Month and day of month omitted.
3. Time meridian not given at beginning of day's work.
4. Time (whether A.M. or P.M.) not given at beginning of day's work.
5. Soundings (whether in feet or fathoms) not clearly shown in record.
6. Leadline correction entered in wrong column.
7. Field reductions entered in "Office" column.
8. Location of tide gauge not given at beginning of each day's work.
9. Leadline corrections not clearly stated.
10. Kind of sounding tube used not stated.
11. Sounding tube No. entered in column of "Soundings" instead of "Remarks".
12. Legibility of record could be improved.
13. Remarks.

G V Rude

Chief, Division of Tides and Currents.