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Diag. Ct. No. 3102-1

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

J. C. Mendenhall
Superintendent.

State: *Calif.*

DESCRIPTIVE REPORT.

Hyd. C. Sheet No. *207-12*

LOCALITY:
Behm Canal and Vicinity

1891
190

CHIEF OF PARTY:
A. B. Mansfield

2108

U.S. AND G. SURVEY
LIBRARY AND ARCHIVES

83
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2108
1891

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Sheet No.

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

J C Mendenhall
Superintendent.

State: *Calif*

DESCRIPTIVE REPORT.

Hyd. C Sheet No. *2108*

LOCALITY:

Behm Canal & vicinity

See SHA 2107

1891
190

CHIEF OF PARTY:

A B Mansfield

2108

2109

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Department of Commerce and Labor
COAST AND GEODETIC SURVEY

J C Mendenhall
Superintendent.

State: *Calif*

DESCRIPTIVE REPORT.

Hyd^c Sheet No. *2109*

LOCALITY:

Behm Canal Vicinity

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1891
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CHIEF OF PARTY:

A B Mansfield

2109⁹

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COAST AND GEODETIC SURVEY
LIBRARY AND ARCHIVES

Diag. Ckt. No. 8102-1

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Department of Commerce and Labor
COAST AND GEODETIC SURVEY

J C Mendenhall
Superintendent.

State: Calif

DESCRIPTIVE REPORT.

Hyd. Sheet No. 2110

LOCALITY:

Behm Canal +

Vicinity

See SHS 2107

1891
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CHIEF OF PARTY:

H B Mansfield

2110
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Diag. Cht. No. 3102-1

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

J C Mendenhall
Superintendent.

State: *Calif*

DESCRIPTIVE REPORT.

Hyd C Sheet No. *2111*

LOCALITY:

*Behm Canal &
Vicinity*

1891
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CHIEF OF PARTY:

H B Mansfield

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Diag. Lht. No. 8102-1

Department of Commerce and Labor
COAST AND GEODETIC SURVEY

J C Mendenhall
Superintendent.

State: Calif

DESCRIPTIVE REPORT.

Hyd. Sheet No. 2112

LOCALITY:

Behm Canal and
Vicinity
See SHA 2107

1891
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CHIEF OF PARTY:

H B Mansfield

2112

FEB 19 1892 002054

Assistant in Charge

Report - 1892

Division of Alaska

83 SHA
2107-12

H. S. C. J. B. S. D.
Steamer Patterson

Report of Season's Work

Sailing Directions

Hyd. Sheets Nos. - 2107-2108-2109-2110-2111²

1891.

Topog. Sheets Nos.

L. C. ...
St. ...
Capt. H. B. Mansfield

FEB 20 1892
ARCHIVED

Write me at:

Telegraph me at:

My Express Office is:

U. S. Coast and Geodetic Survey, *Stmr. "Patterson"*

Vallejo, Calif.

January 15, 1892

9-547

Dr. J. C. Mendenhall,
Superintendent U. S. C. + G. Survey,
Washington, D. C.

Sir:

I have the honor to submit the following report of the season's work in Behm Canal and Vicinity during 1891.

My arrival on the field, the movements of the "Patterson" under your personal direction, and the general progress of the work was noted in my report to June 30th.

The list of officers remained the same during the entire season, as mentioned in my previous report.

The "Patterson" anchored in Burroughs Bay off the Point Rees Salmon Cannery on the evening of April 30th.

May 1st. sent out party in "Vixen" to select site for measurement of primary base-line. Discharged 20000 feet of lumber in two rafts - towed one on shore and piled the lumber above high-water mark - moored the other raft. Commenced work on the machinery of the "Cosmos", having left Port Simpson with her machinery disconnected.

May 2d. The watchman of the cannery giving permission, we launched one of the Company's lighters and discharged into her 13 tons of coal. Erected tide-gauge and commenced the lunar month's observations.

May 3d. and 4th. we experienced a very heavy gale from the Northeast with squalls of hail and snow - something unusual at this season.

May 5th. made measurements of my primary base between two points on the mainland to the westward of Burroughs Bay. The mean of five measurements with an average pressure of 35 lbs. I found to be 3054.263 metres. This measurement

I adopted for my primary base.

The computation of the triangulation, using the above mean, taken up and down the Canal, proved very satisfactory - the check bases agreeing closely with the corresponding computed lengths, as will be seen from the following table, viz:

Base and Checks.	Locality	Mean of Measurements metres.	No. of Mean	Mean of Computations metres	No. of Comp	Diff.
△ North Base to △ South Base	Behm Canal	3054.263	5			
△ Fox to △ Jaw	" "	2903.934	10	2904.05	2	.116
△ Peg to △ Rud	" "	2205.005	7	2904.80 ²	2	.205
○ Scribe to ○ Queen	Rudyard Bay	676.55	6			
<u>Other Base Measurements.</u>						
△ Ruff to △ Yes	Revilla Giedo Blannel	3737.16	9			
○ S.W. Base to ○ N.E. Base	Gnat Cove	372.53	2			
○ Ken to ○ Lin	Tea Cove	281.92	2			

The entire Triangulation, with the exception of Carroll Inlet and George Inlet, covering a distance of 162 Statute Miles was computed from the original Base line, using 3054.26 metres as the true length, no change in the computation being made by the check measurements, with the preceding most gratifying results. In addition to this sextant triangulation was carried on in inlets and through narrow passages covering a distance of 204 statute miles.

May 6th. I landed a party consisting of Ensigns W. L. Howard and W. H. Faust, Draughtsman H. L. Ford, and sixteen Petty officers and seaman. This party was placed in charge of Ensign W. L. Howard. They were provided with stores for one month and took up their quarters in the cannery.

I left with Mr. Howard the "Cosmos", "Vixen", "Pirate", Whaleboat, Dinghy, and several skiffs, with a full surveying outfit.

At 1:30 P.M., the "Patterson" under your direction, got under way from Burroughs Bay to make the tour of the Inland passages.

5.

arriving in Burroughs Bay on her return,
on the evening of June 3d.

June 4th. Commenced reloading lumber and
stores. The survey party having moved their
camp to Walker Cove.

Monday, June 8th., anchored in Walker Cove
and the shore party took up their quarters
on the "Patterson".

On Saturday, June 13th. sent the three
steam launches and party to Rudyerd Bay
and on Sunday, June 14th. the "Patterson"
went to Loring to communicate with the
P. S. Co's Steer. "City of Topeka". The "Topeka",
in which you took passage, left Loring.

June 17th. The "Patterson" anchored in
Rudyerd Bay June 18th. and from that
time until the close of the season, moved
from anchorage to anchorage as the work
progressed.

Tidal observations were carried on night
and day from May 5th. to June 3d inclusive,
at Burroughs Bay. The computation of
the Tidal data, by Lieutenant Dorn, gave
the following results, viz: -

Burroughs Bay, Behm Canal, S.E. Alaska.
 Observations extending from May 5th. to June 3d.
 1891, inclusive.

Corrected Establishment .	0 ⁿ .	20.3 ^m .
Common Establishment .	0 ⁿ .	36. ^m .
Height of Plane of Reference above 0 of gauge.		14.8
Rise, mean H.W. above Plane of Reference.		14.9
Rise, Spring Tides H.W. above Plane of Reference.		18.4
Fall, do. do. L.W. below do. do.		3.7
Rise, Neap Tides H.W. above do. do.		11.7
Height do. do. L.W. do. do. do.		6.2
Highest observed H.W. above 0 of gauge.		33.2
Lowest observed L.W. do. do.		11.1
Greatest observed Rise and Fall		22.1
Mean Rise and Fall.		13.3
Mean duration of Rise	6 ⁿ .	19 ^m .
do. do. do. Fall	6 ⁿ .	06 ^m .
do. do. do. Stand		31 ^m .

Tide staffs were also erected during the season, at the following anchorages of the "Patterson", viz:

Walker Cove	connected with	Burroughs Bay.
Rudyard Bay	"	" Walker Cove.
Shoalwater Pass	"	" Rudyard Bay.
Bell Pass (Anchor Pass)	"	" Burroughs Bay.
Convenient Cove	"	" Bell Pass (Anchor Pass)

The connection of the gauges lasted through a period of three low and two high waters and the result of observations showed the data obtained in Burroughs Bay were practically the same as at the other stations, viz:

Comparison of Tidal data of Transfer
observations.

Walker Cove as compared with Burroughs Bay.

Mean of High Waters above P. R. +.09 ft.

" " Low Waters " P. R. -.01

Bell Pass (Anchor Pass) as compared with Burroughs Bay.

Mean of High Waters above P. R. +.16

" " Low Waters " " +.17

Rudyard Bay as compared with Walker Cove.

Mean of High Waters above P. R. -.02

" " Low Waters " " .00

Shoalwater Pass as compared with Rudyard Bay.

Mean of High Waters above P. R. -.22

" " Low Waters " " +.18

Convenient Cove as compared with Bell Pass (Anchor Pass).

Mean of High Waters above P. R. -.22

" " Low Waters " " +.28

Tide staffs were also erected in Mc. Donald Bay, Quat Cove (Carroll Inlet), Isa Cove (George Inlet), and Thorne Arm, as below:

The Plane of Reference for Mc. Donald Bay was determined by simultaneous readings, at intervals of five minutes, from the convenient Cove Gauge, distant about five miles.

The Plane of Reference for Carroll Inlet, George Inlet and Thorne Arm, was determined from the data given in "The Tide Tables of the Pacific Coast, 1891." by comparing the mean of the High Waters on successive days as noted below, with the tabulated ones of Kessler Harbor, using the Ratio 1.79.

	Days of observed H. W. for comparison.
Carroll Inlet (Quat Cove)	August 22 to 28 - 7.
George Inlet (Isa Cove)	Sept. 5 to 10 - 6.
Thorne Arm	Sept. 13 to 16 - 4.

June 8th. established the 1st. Astronomical Station at Walker Cove \odot a point in Behm Canal just below Walker Cove - near Δ Bit.

Astronomical stations were also established during the remainder of the season at Mary Island \odot , near North Base Δ of Nichols, and at Point Francis \odot , near Point Francis Δ of Clover. The following table gives the result of the computation of the observed data, viz: -

Name	Locality	Latitude	Longitude
Walker Cove \odot	Behm Canal	N. $55^{\circ}41'03''.69$	W. $8^{\circ}43^m40.34^s$
Mary Island \odot	Mary Island	$55^{\circ}05'49''.96$	W. $8^{\circ}44^m49.13^s$
Pt. Francis \odot	Pt. Francis	$55^{\circ}39'42''.14$	W. $8^{\circ}47^m17.71^s$

Name	Locality	Azimuth of	Azimuth
Δ Bit	Behm Canal	Δ Male	S. $18^{\circ}11'45''$ W.
Δ N. B., Mary Island.	Mary Island	Δ Tow	N. $12^{\circ}46'12''$ W.
Δ Francis	Pt. Francis	Δ Pug	N. $114^{\circ}40'27''$ E.

11.

The descriptions of astronomical stations, sketches, and bearings and distances from points in the main triangulation will be found in "Summary of Work and Description of Stations", Season of 1891.

Each station was occupied long enough for a rate and, upon the conclusion of the occupation, the station at Port Simpson was occupied for at least one night for the correction of chronometers, giving but a short period for the accumulation of error.

The azimuth of Δ Francis to Δ Coy does not agree with the bearing of that line as brought from Δ Bit to Δ Male, by plotting the Triangulation. This difference will undoubtedly be reconciled when the D. P.'s and D. M.'s are worked up and the points are plotted independently, as unavoidable errors were bound to result from plotting through such a narrow, tortuous passage as Behm Narrows.

Magnetic observations were not taken this season, no instruments having been supplied.

The manner of conducting the survey has been practically the same for the last three seasons.

This season developed more sextant work than formerly.

It was with the greatest difficulty that place to build signals and set up theodolites could be found, and the ingenuity of the signal builders and observers was taxed to the utmost to carry the main triangulation through Behm Canal.

The work at the lower end of the sheet connects with the North Base Δ [of Nichols] on Mary Island.

The work of the upper end connects with the Pt. Francis Δ [of Glover].

Carroll Inlet and George Inlet connect with Δ Open, Δ Race, and Δ View [of Glover] - supplied on projection sheet this season -

These signals were the only ones that could be recovered in the vicinity.

As no distances were furnished from the Office, I measured a base of 3737.16 metres between Δ Ruff and Δ Yes, in

Revilla Gigedo Channel for the work in Carroll Inlet - using the azimuth from signals supplied on projection sheet.

The following Harbor and large scale sheets were made of the general work falling on the projection sheet of Behm Canal and Vicinity, viz: -

Inlet and Harbor sheets.

Locality	Scale
Carroll Inlet + George Inlet	1:40000
Thorne Arm	do.
Walker Cove	1:20000
Rudyard Bay	do.
Shoalwater Pass	do.
Smeaton Bay anchorage	do.
Bell Arm	do.
Convenient Cove	do.
McDonald Bay	do.
Fitzgibbon Cove	1:10000
Saks Cove	do.
Quat Cove	do.
Isa Cove	do.

"Behm Canal, named by Vancouver, is one of the most singular and extensive of the remarkable fiords characteristic of this coast.

With the Revilla-gigedo channel, it encircles the large island to which Vancouver gave the name of Revilla-gigedo."

The direction of the canal from the entrance at Point Sykes is about N. by E. eight and three-quarter miles to Point Nelson, named by Vancouver, in $55^{\circ}18' N.$

The canal, which, at its entrance, has a width of two and one-fourth miles, increases to four and one-fourth, but abreast of Point Nelson, the main channel is diminished to one and one-fourth in width by islands.

This stretch of continental shore has a few small islets and rocks lying about one-eighth of a mile from it and is slightly indented.

The Revilla-gigedo shore from Point Alava has a general trend of N. by E. for six miles to Fox Point, and is more deeply indented than the continental shore.

About three miles from Point Alava, in a bight about one and a half miles long and half a mile deep, are the Bass Islands, three small, narrow, wooded islets with foul shores, and detached rocks and ledges between the eastern island and Ape Point.

There is no anchorage in this bight, the water is deep, the bottom foul, and the locality exposed to the strong southerly winds.

From Fox Point, the Revilla-gigedo shore trends N. by W. for six miles to Sharp Point.

Two miles N. by E. from Fox Point and separated from the Revilla-gigedo shore by a passage an eighth of a mile wide is Rudyard Island, one and one-quarter miles long, half a mile wide, high and wooded.

A small wooded islet lies about one-eighth of a mile off the eastern shore of Rudyard Island, with ledges and foul ground for one-eighth of a mile around it. There is also foul ground for the same distance off the S.W. corner of Rudyard Island, but Narrow Pass, separating

Rudyard Island from Revilla-gigedo Island, is clear and deep and often used by steamers.

Immediately around Point Nelson, Smeaton Bay penetrates the coast curving to the N.E. and North, being about twelve miles in length and terminating in Lat. $59^{\circ} 23' N.$, Long. $130^{\circ} 37' 30'' W.$

Smeaton Bay has an average width of about half a mile with a bay, or cove, two miles long, in its eastern shore about seven miles from its mouth.

The surrounding country consists of steep, rocky mountains. These mountains rise abruptly from the water's edge, and, when not too steep, are covered with trees. The depth of water precludes any anchorage in Smeaton Bay, but at the entrance, between Carp Island, and Short Point on the continental shore, a vessel can lie in summer in nineteen fathoms water, hard bottom, protected from the summer winds.

Smeaton Island, eleven hundred feet high, wooded, four miles long, and one and a half miles broad lies with its southeastern end

one and a half miles West of Point Nelson; its northwestern end is separated from Revilla-gigedo Island by Short Pass, three-eighths of a mile wide.

A sunken rock, awash at low-water springs lies three-eighths of a mile off the southeastern shore of Smeaton Island, between Whale Point and Stag Island and one half a mile from the latter.

Between Sharp Point and Wasp Point, makes a cove two and three-quarters of a mile deep with flats at the head; - water too deep for anchorage.

N. E. $\frac{1}{2}$ N. from Point Nelson, a little more than two miles and on the opposite shore of entrance to Smeaton Bay lies Point Trollop.

The width of the canal here is about six miles, inclusive of islands. From here, to the Northward, it contracts in width.

The general direction of the mainland shore is N. N. W. $\frac{1}{2}$ W.

The southern end of Candle Island lies about five miles to the Northward of

Point Trollop, between these two points, the continental coast is somewhat indented, with a few small islands and ledges, and should not be approached nearer than one-fourth of a mile.

From Candle Island to Point New Eddystone, the continental coast is guarded by several large and small islands, and sunken rocks.

Candle Island, the southernmost of these, is three-eighths of a mile long and about one-eighth broad and wooded, - and between it and the mainland, is the southern end of Shoalwater Pass - The remainder of whose southwestern shore is formed by Winstanley Island, nine hundred feet high and wooded, four miles long and a mile in its greatest width.

Beyond the northern extreme of Winstanley Island, are a number of rocks and islets, which have been called the New Eddystone Islands.

One mile and a half to northward of Candle Island, Shoalwater Pass widens

to one half a mile, forming a protected cove but the bottom is hard and the water from twenty five to thirty fathoms deep, with the island shores quite foul.

Two and a half miles above Bundle Island, the pass contracts to less than one hundred yards, with foul shores and only nine feet of water. Half a mile further the pass again widens and forms a perfectly land-locked, sheltered basin, where excellent anchorage may be had in seven to seventeen fathoms of water, soft bottom, and good holding ground. This unfortunately, is a tidal harbor and has a bar between it and its northern entrance, with nine feet at mean low water.

The "Patterson" found this an excellent harbor.

To enter, pass one-fourth of a mile to the northward of Entrance Island, and pass in mid-channel between the small high-water island that makes out from Winstanley Island, and Slag Point; favor the continental shore until up with the

wooded island off the Winstanley shore, when pick out the anchorage desired.

The New Eddystone Islands, which lie to the northward of Entrance Island, consist of eleven small islands, ledges and sunken rocks.

Strangers should not attempt to pass to the Eastward of New Eddystone Rock.

The Channel between the New Eddystone Rock and the Revilla-gigedo shore, is a mile and a half wide and clear.

Do not approach the rock nearer than one fourth of a mile.

At a distance of seven and a quarter miles N. N. W. of Smeaton Island and a little to the westward of mid-channel, lies the New Eddystone Rock. It rises from a sand bar covering a rocky ledge and strewn with occasional boulders, to a height of two hundred and thirty feet.

Its diameter at the base is about seventy yards and it irregularly decreases towards the apex, which appears flat. It sustains a few large trees and shrubs in various

crevices which extend quite up to the summit.

The bar, at the base of the rock, is composed of sand. The ten fathom curve runs at a distance of about five hundred yards from the rock, and it should not be approached any closer.

New-Eddystone Rock is in Lat. $55^{\circ} 30' N.$,
Long. $130^{\circ} 57' W.$

The Revilla-gigedo shore from Wasp Point to Cactus Point has a general direction of N. N. W. $\frac{1}{2}$ W. for two miles.

The shore is somewhat indented, but quite clear and can be approached to two hundred yards.

Three miles above Wasp Point is a small cove, about two hundred yards wide and one-half a mile deep, - a good anchorage for small vessels in seven to nine fathoms.

There is a fair summer anchorage in the bight formed Tramp Point and the southernmost of the Mice Islands. Favor the Mice Island shore to avoid the ledges off Tramp Point, and anchor in seventeen fathoms.

The water in the bight between the Mice Islands and Cactus Point is too deep for an anchorage.

About three miles and a half N. by E. $\frac{1}{2}$ E. from New Eddystone Rock, and directly opposite Cactus Point, is situated

Point New Eddystone forming the southern headland of Rudyard Bay, a F-shaped inlet half a mile wide and about eleven miles in extent. Its general direction is about N. N. E. between high, bare, granite cliffs, snow-capped.

Two miles from the entrance, an arm about three-quarters of a mile wide runs to the S. W. about two miles.

At seven miles from the entrance, the south arm of the T runs to the S. W. for three miles, ending in a small stream with flats. About three-fourths of a mile from the head, and opposite a prominent landslide on the N. E. shore, is an excellent anchorage in twenty fathoms, soft bottom. This is the only anchorage in Rudyard Bay.

The unexplored opening on the shore of Revilla-gigedo Island, opposite Point New Eddystone, indicated by Vancouver, does not exist, and Carroll Inlet does not enter Behm Canal in this vicinity or any other. Hassler Island, of the charts, has no existence, and the name has been given to an island developed this season, but in another locality.

N. W. $\frac{3}{4}$ N. from Point New Eddystone, nine and a half miles, is Ledge Point, the southern headland of Walker Cove, another of the small inlets so frequent on this coast, having a width of about half a mile, a length of seven and a half miles and a general direction of N. E. by N.

Off its Northern headland, Hut Point, close to the shore, are some small rocks and islets, covered with trees.

Between Hut and Ledge Points, the bottom is irregular but shoal and a summer anchorage can be taken here on the inside edge of the ledge - clear of the winds which usually blow up through Behm Canal

every afternoon in a stiff squall.

Anchor in mid-channel. A rock, with nine feet of water ^{at low water, spring tide} N. E. one-fourth of a mile from Ledge Point and one-eighth of a mile from shore, and is the only known danger.

There is no other anchorage in Walker Cove, which has the same general appearance as Ruddyard Bay, - lofty granite walls, almost perpendicular, snow-capped mountains, split asunder, with trees and shrubs growing in every crevice, streams of water falling in spray from the cliffs, and marks of glacial action everywhere apparent.

One mile north of Lactus Point lies Manzanita Island, one mile long, one-fourth of a mile broad, wooded, with a shoal passage one-fourth of a mile wide, between it and the Revilla-gigedo shore.

Two miles N. N. W. of Manzanita Island is Skirt Point. The coast between them recedes forming a cove over a mile deep, there is an anchorage in the southeastern corner of this cove, but it is open to the

Northward and the winter winds draw through across the low land to the Southward, making a lee shore and bringing in a strong chop sea. The western side of this cove has ledges and extensive flats, which bare at low water.

From Skirt Point, the Revilla-gigedo shore has a general direction of N. W. by N. for four and a half miles, to the Snip Islands, a number of islets and ledges, the principal one connected with the shore at low water, and all lying about one-fourth of a mile from the Revilla-gigedo coast.

From Hut Point, N. W. by W. $\frac{1}{2}$ W. for twenty miles, the Canal preserves an average width of about one and a half miles to Point Fitzgibbon, the shores on either hand being somewhat indented with coves - small islets and detached rocks, and should not be approached nearer than one-eighth of a mile.

Trap Point, is five miles north of Hut Point, forms the southern headland of the mouth of the Chickamin River.

Between the above points and three-quarters

of a mile from the continental shore, are the Channel Islands. Two small, wooded islands narrow, with foul ground making from the southern one for a quarter of a mile ending in a detached ledge which covers at high water.

Fish Point, one and a quarter miles from Trap Point forms the northern headland of the mouth of the Chickamin River. The waters of this river are discolored, showing their glacial origin, and have brought down an immense alluvial deposit, forming extensive flats at the mouth of the river.

Prospectors say that the river is navigable by skiffs for a number of miles, but that it is very tortuous and that the portages are numerous.

There is no anchorage in the bight at the mouth.

Under Trap Point, a fish pound was established this season by the manager of the McDonald or Yes Bay Cannery.

Ten miles north of the mouth of the Chickamin River, on the continental shore,

is Fire Point, which forms the northern headland of Saks Cove, which is a mile and a half long, three eighths of a mile broad, and has a direction of about North, with extensive flats and a small stream at the head.

There is good anchorage, twenty-eight fathoms and no known danger.

Two and a half miles above Fire Point, and a mile and a half below Point Fitzgibbon, is Hose Point, between which and Sew Point, is the entrance to Fitzgibbon Cove, a small, but excellent harbor, with anchorage in ten fathoms, soft bottom. In entering give the small islands, off Hose Point, a berth of an eighth of a mile, pass in mid-channel between Center Islands and the Eastern shore, then haul over to pass midway between the western shore and Gibbs Rock, and anchor where you please.

Point Fitzgibbon, a sloping, rocky point, sparsely wooded, is at the entrance to Burroughs Bay, which runs N. E. $\frac{1}{2}$ E. five and a half miles, with a width of one mile

and a quarter. At the head of the bay are extensive flats.

The Unuk River, the largest stream flowing into Behm Canal, enters on the left, and a smaller river, the Klaheena enters on the right.

There has been considerable prospecting up the Unuk and a large amount of gold, it is said, has been taken out. It is said to be navigable for a long distance by means of flat skiffs. The waters of the Unuk show a glacial origin and discolor Behm Canal, at times, for many miles.

A salmon cannery was established in this bay in 1890, but was not in operation this year.

There is no secure anchorage in Burroughs Bay, and at present, the place has no importance.

Point Whaley is distant about one mile and a half from Point Fitzgibbon, and forms the northern end of Revilla-gigedo Island. Lat. $55^{\circ}58'15''$ N. From this point, Behm Canal takes a S. W. by S. direction.

Four and a half miles from Point Whaley, S. W. $\frac{1}{2}$ S. is Point Lees, where the channel is contracted by blaude Point to five-eighths of a mile.

blaude Point forms two coves, but no anchorage in either.

From this point the canal continues to the Southwestward through Behm Narrows in the same direction as previously, but gives off an arm, Anchor Pass, extending two and a half miles in a N. W. $\frac{1}{2}$ W. direction from Point Lees.

From this branch Bell Arm penetrates S. S. W. $\frac{1}{2}$ W. rejoining the main channel of Behm Canal at a distance of seven and five-eighths miles.

There is excellent anchorage in Anchor Pass - stand in until you find the depth of water you want. The holding ground is good.

Anchor Pass, just before it joins Bell Arm, is shoal and rocky, and is only navigable in small vessels, by persons familiar with the locality.

The shores of Bell Arm are high, steep, rocky, in some places not more than an eighth of

a mile apart, and covered with trees to the water's edge. There is good anchorage at the head of Bell Arm.

About midway of Bell Arm, Short Bay penetrates to the northward and westward, about one and three quarters miles, with a stream (glacial) and flats at the head. Here is located a fish pound, operated by the McDonald Bay Cannery. This bay has a width of one-fourth to one-eighth of a mile and affords an excellent anchorage.

Opposite Snipe Point, where Bell Arm and Behm Narrows join, Baily Bay runs N. N. W. for three miles. There is no anchorage in this bay, which has a width of one-fourth of a mile.

The land cut off between Behm Narrows, Anchor Pass and Bell Arm forms Bell Island. It has the usual broken topography of this region, is about twenty-five hundred feet high, wooded, seven and a half miles long, and two and a half miles wide.

Behm Narrows are perfectly clear.
From Snipe Point, the canal takes a

nearly S. S. W. direction for eight miles, opening out, off Bluff Point, to a width of two miles.

Four miles from Snipe Point, on the western or continental shore, Mc. Donald Bay, a narrow arm, extends to the westward five miles. There are no rocks at the entrance.

Mc. Donald Bay - locally called Yes Bay - is easily navigable by slightly favoring the northern shore, as the southern shore has some detached rocks and ledges near it.

Two and a half miles from the entrance, on the northern shore, is the Yes Bay Salmon Cannery, which was in full operation this season, packing some 27,000 cases of all kinds of salmon.

The mail steamers drop an anchor before reaching the cannery in twelve to fifteen fathoms of water, rocky bottom, - when taking in freight in good weather. - But by passing beyond the cannery, keeping the cannery shore close aboard, to avoid the rocks in mid channel, the bay opens out into a fine basin, in which

anchorage in seventeen to thirty fathoms can be taken - good holding ground - secure from all winds.

McDonald Bay is separated by a peninsula from a large and Spacious Bay, directly south of it, with an entrance over three miles wide - N.N.W. and S.S.E. The Northern point is situated in Lat. $55^{\circ}53'N.$, whence the N.W. side of the bay takes a S.W. by W. direction about five miles, forming, in that space, several indentations and coves, and rounding somewhat irregularly to its southern point of entrance within which is Square Island, about three-fourths of a mile in extent. The water shoals in the upper part of Spacious Bay - and the bottom is soft. The flats and shoals make well out from the head. The passage to the southward of Square Island, is not recommended. There is a sunken rock in mid-channel, southeast of Square Island.

The shores of the bay are moderately elevated, thickly wooded, with a sandy beach nearly all around. Low woodlands extend to the westward

as far as the eye can reach.

From Snail Point, to the southward, the continental shoreline, joins with that surveyed by Riut. Glover, - heavily wooded, indented, - with small islands and ledges near the shore.

From Curlew Point, at the western end of Behm Narrows, Hassler Pass runs in a general Southeast direction - it is three and a half miles long, with an increasing width from a half mile to a mile where it joins Gedney Pass, which runs four miles to the eastward and enters the main channel, opposite Snail Point. In the bight, thus formed, lies Hassler Island, shaped almost like an equilateral triangle, with three mile sides. Hassler Island is about fifteen hundred feet high and densely wooded. On the northwestern side, separated by a narrow Blind Pass, whose southwestern end is dry at low water, lies Blake Island, two and a half miles long, three-quarters of a mile broad, six hundred feet high, and wooded.

Off the southwestern end of Hassler Island, separated by a narrow navigable channel, contracted at its eastern end by small islets, lies Gedney Island, five hundred feet high, wooded, a mile and three-quarters long and a little over half a mile wide.

Convenient Cove, an indentation in the southwestern end of Hassler Island, is protected by Gedney Island. This cove was used by the Hassler, as it was convenient to her working ground, but the water is too deep for ordinary anchorage and M. C. Donald Bay is a much better harbor.

From Dress Point, on the Revilla-gigedo shore, at the junction of Hassler Pass and Gedney Pass, Shrimp Bay, which is a continuation of Gedney Pass, runs to the E. N. E. three and a quarter miles, with a varying width. At the extreme end it widens into a land-locked basin, with excellent anchorage in seventeen fathoms, soft bottom.

From Brow Point, at the junction of Gedney Pass and Behm Canal, the

Revilla-gigedo shore runs about S. E. by S. three miles to Chin Point, with a small indentation between them, below Nose Point.

Chin Point, which is high and narrow, is the northern headland of Neets Bay, which has a general direction of N. E. by E. for seven and a quarter miles, with an average width of one mile. At one and a half and at three miles respectively, from the entrance are two small, wooded islands, nearly in mid-channel. Clam Island, the inner one, has foul ground off the W. N. W. and E. S. E. ends, and should be given a good berth.

There is no good anchorage in Neets Bay, and at present, it is of no importance.

An indentation in the northwestern arm of Neets Bay approaches within five eighths of a mile of Shrimp Bay, with comparatively low land between them.

Three and a half miles S. by E. of Chin Point is Bushy Point, covered with trees, and a conspicuous land-mark.

East Southeast of Bushy Point lies the entrance

to Traitors Cove of Vancouver.

Traitors Cove has a general direction of N. N. E. for three and one-half miles, with an average width of three quarters of a mile, where it narrows to about eighty yards, with only fifteen feet of water, and a rock in mid-channel. It then opens out and runs for about three miles, E. N. E. with an average width of half a mile. Small boats can pass the rapids at slack water - At other times, there are heavy overfalls, with a seven to nine knot current.

Traitors Cove has a ledge of rocks in mid-channel at the entrance - Strong currents and eddies, and should not be entered by a stranger. There is an anchorage in the first light on the Eastern shore, two miles from the entrance.

South of Traitors Cove, the shoreline joins with the work of Lieut. Glover.

Revilla-gigedo Channel.

Carroll Point is the southeastern point of entrance to Carroll Inlet, whose opposite point of entrance is the northeastern angle of Mountain Point, from which Carroll Point is distant about a mile and a half N.E.

The depth of water at the entrance to Carroll Inlet is over one hundred and eighty fathoms, soft mud, in mid-channel.

The water shoals southward and midway between Mountain Point and Cutter Rocks, the depths average about twenty-seven fathoms over a hard bottom.

Carroll Inlet is twenty-three miles long and has a width of from one-fourth of a mile to one mile; its general direction for the first eleven miles is N. by E. $\frac{1}{2}$ E., when it makes a curve and runs N. W. $\frac{1}{2}$ N. for the remaining twelve miles.

For three and a half miles from California Head, the inlet has an average width of three-quarters of a mile and a depth of more than one hundred fathoms. Here it contracts

to one-eighth of a mile, turns sharply to the left, and, at a distance of one mile and a half, resumes its original course. In the next six miles, the inlet broadens to over a mile, is obstructed by numerous islands and ledges, and shoals to twenty to fifty fathoms in mid-channel.

At Island Point, eleven miles from the head, the islands disappear, the water deepens to eighty fathoms, and the shores gradually approach each other to the head, which ends as is usual with these inlets, in an extensive flat with a small stream flowing through it.

An anchorage can be taken nearly anywhere in the inlet between Spit Point and Island Point, and Gnat Cove, about a mile above Spit Point, on the eastern shore, affords an excellent anchorage for small vessels.

About two miles above the Butter Rocks, California Head separates the waters of Carroll Inlet from George Inlet.

George Inlet has a length of fourteen miles from California Head, and a width of from

one-half to three-fourths of a mile. General direction N. for four miles, N. W. $\frac{1}{2}$ W. six and a quarter miles, then N. by E. four miles to the head which ends in a tidal basin and small stream.

The eastern shore is obstructed by islands for four miles from the head.

There is fair anchorage off the Indian Huts west of Bat Point, and a good anchorage N. E. of Bull Island in Isa Cove.

About six miles to the westward of Point Alava, in Revilla-gigedo Channel, is Cone Island, ^{forming the southern entrance to Thome Arm} with several other islands, much smaller, near it and the shore.

Thome Arm is eleven miles long, one mile wide at the entrance, opening out, at the head, to three miles. Its general direction is from N. N. E. with a gentle curve to N. N. W. There are a number of small, wooded islands near the head, on the western shore. And, in a cove at the N. W. end, is an excellent anchorage.

Anchorage can also be had anywhere between Snipe Island and Mop Point in twenty-five to thirty fathoms.

The Natural history of that portion of S. E. Alaska falling on the projection sheets surveyed by the party under my command, during the past season, is the same in general characteristics as that surveyed for the last five years, and so well described by Lieut. Comdr. Thomas in his report in 1887.

September 18th. finished the survey of Thorne Arm and closed the Hydrographic work up to Mary Island, completing the season's work.

September 20th. sent the "Cosmos" to Port Simpson and went in "Patterson" to Loring for the mail. Left Loring at 10:20 P.M. same day, arriving at Port Simpson at 9:40 a.m. September 21st.

2 P.M., September 25th. The "Cosmos" on the ways and secured for the winter. Got under way, anchoring in Custom House Cove at 7 P.M.

September 26th. Made a thorough

reconnaissance and hydrographic survey of the cove, the result of which, and my report on same, is already forwarded to the office.

September 27th. Got under way at 3 a.m.

September 28th. Anchored, weather-bound, in Safety Cove, B.C.

September 29th. Got under way at 5 a.m. crossed Queen Charlotte Sound, and made fast to wharf in Departure Bay at Noon of 30th.

October 1st. at 10:30 P.M. left Departure Bay.

October 2d. 9:30 a.m. anchored off Victoria, discharged pilot, and, at 11 a.m. left Victoria. 3:20 P.M. anchored off Port Townsend - received mail and fresh provisions, and at 4:30 P.M. left the harbor, arriving at San Francisco, October 7th.

It gives me great pleasure to state that, in the work executed this season, I have been most ably supported by every member of my Party.

Taking into consideration that few, if any, of the Junior members of the Party volunteer for service in the Coast Survey and that the work is not agreeable to many, I cannot commend too highly the zeal and intelligence displayed by all, and particularly the cheerfulness and good humor of young gentlemen, who have worked every day, in all weathers - and long hours.

Behm Canal presents a poor field for photographic work, but I submit with my records some excellent views of Alaskan scenery.

During the season the "Patterson" anchored
at the following places -

Port Townsend

Port Hadlock

Victoria, B.C.

Departure Bay, B.C.

Chalmers Harbor, B.C.

Port Simpson, B.C.

Burroughs Bay, S.E. Alaska.

Loring, " "

Port Chester, " "

Kassan Bay, " "

Juneau, " "

William Henry Harbor, " "

Pyramid Harbor, " "

Hoonah, " "

Glacier Bay, " "

Bartlett Bay, " "

Yakutat Bay, " "

Sitka, " "

Kilisnoo, " "

Wrangell, " "

Walker Cove, " "

Rudyard Bay,	S. E. Alaska.
Shoalwater Pass,	" "
Imeaton Bay,	" "
Bell arm,	" "
Convenient Cove,	" "
Mc Donald Bay,	" "
Rock-fish Cove,	" "
Wards Cove,	" "
Carroll Inlet,	" "
George Inlet,	" "
Thorne Arm,	" "
Custom House Cove,	" "
Safety Cove,	B. C.

I submit the following summary of work done during the season. viz: -

Signal Construction.

Number of days engaged in building signals.	62.
" " Δ s built	327.
" " Os built	774.

Triangulation.

Number of days when angles were observed.	66.
" " " " observations were prevented by bad weather.	None.
" " " " " " " " by other causes.	None.
" " Stations occupied with theodolite	224.
" " angles observed " "	4960.
" " stations occupied with sextant	646.
" " angles observed " "	13927.

Topography.

Number of days when work was done.	53.
" " " " prevented by bad weather.	None.
" " " " " " other causes.	None.
" " stations occupied with sextant.	1852.
" " angles observed " "	5866.
" " miles of shoreline run in - (Nautical)	741.24
Approximate area of country surveyed - square miles -	1100.
Character of Topography -	Mountainous and wooded.

Hydrography -

Number of days when work was done	72.
" " " " work was prevented by bad weather.	None.
" " " " " " " " by other causes.	None.
" " Miles of sounding lines run.	1601.13
" " soundings taken.	11348.
" " angles observed	10465.
" " specimens of bottom obtained.	59.
" " occasions when current velocity was obtained.	57.
" " Tide Stations.	10.

Peaks.

Number of Peaks observed.	249.
" " positions occupied	98.
" " theodolite angles taken.	437.
" " sextant angles taken.	412.
" " Peaks located.	73.

Miles covered by ship and boats -

Ship { From San Francisco, Calif. to working ground. 2600.
 Shifting anchorage on working ground. 784.
 From working ground to San Francisco. 1400.

"Cosmos".	General work in Field.	4321.
"Vixen".	" " " "	2796.
"Pirate".	" " " "	2236.
Whaleboat.	" " " "	476.
Gig.	" " " "	88.
Dinghy.	" " " "	589.
Total between April 12th. and October 7, 1891.		<u>15290.</u>

Working periods.

Date of leaving San Francisco, Calif.	April 12th.
" " returning to " " "	October 7th.
" " Commencing work on ground.	May 5th.
" " Completing " " "	September 18th.
" " Commencing astronomical work at } Port Simpson -	} April 28th.
" " Completing astronomical work at } Port Simpson -	} September 23d.
Number of days in season, including Sundays.	137.
" " " " " , excluding Sundays.	114.
" " " " " which no field work was done.	None.

No field work on Sundays nor July 4th.
Astronomical work was done on Sundays -
weather permitting.

11/22/92

Number of Persons in Party, exclusive of Chief -

Naval Officers	8.
Petty Officers	17.
Enlisted Men	34.

Expenses for the season on
Coast and Geodetic Survey Account.
 April 1st. to September 31st. inclusive. \$7655.68

Respectfully yours
 G. B. Manderson
 Lieut. Commander
 asst. ns. co. survey
 Washington D.C.