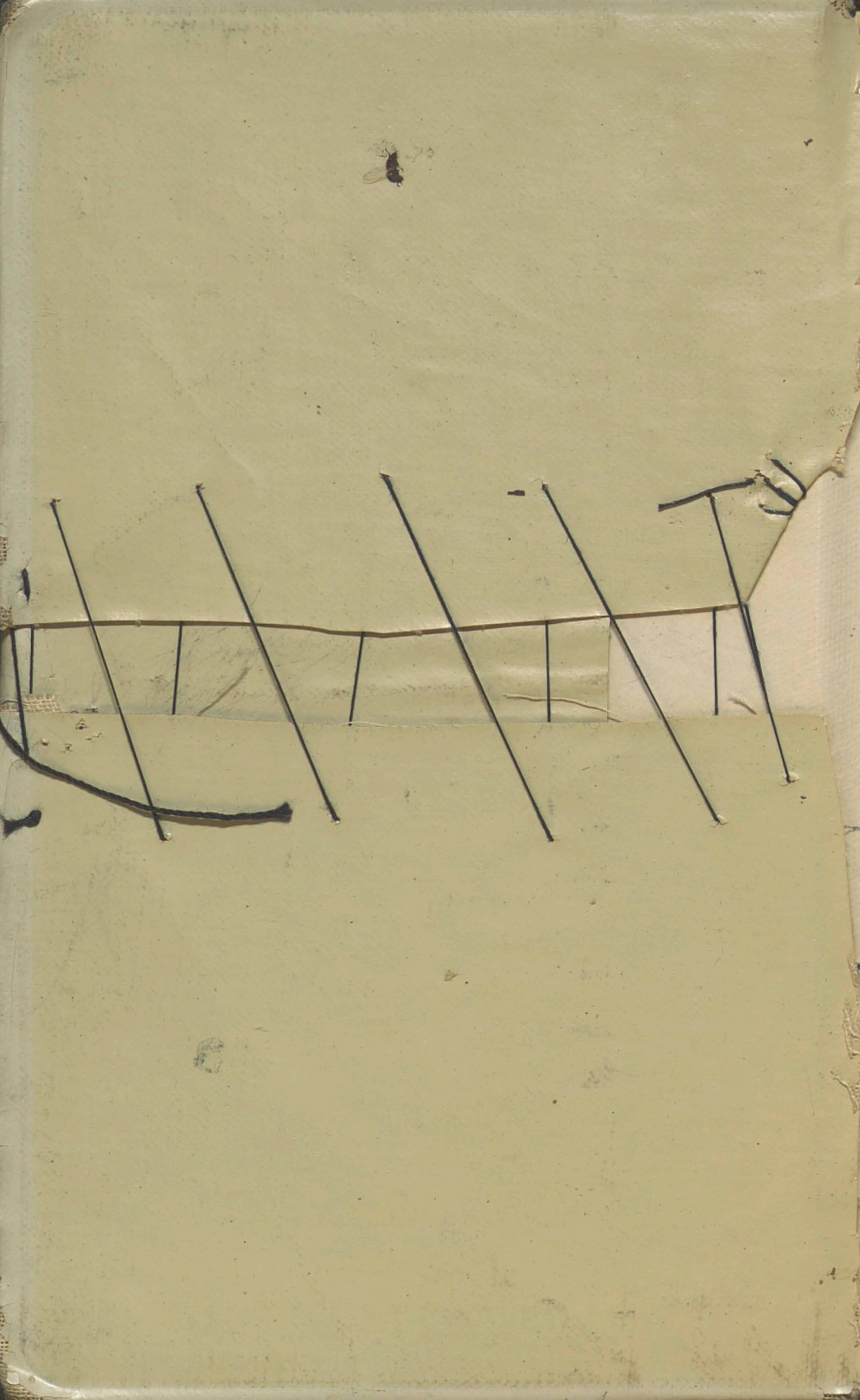

44° 5'

University of Michigan

Greenland Expedition

Director Dr. Wm H. Hobbs

1926 – 27.

z. 6

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15. 6

Preliminary Trip.

Summer of 1926.

Members

1. Dr. William H. Hobbs, Geophysicist and Director
2. Lawrence M. Gould, Geologist and asst. Director
3. S.P. Fergusson, Aerologist
4. Ralph Belknap, Surveyor and Glaciologist
5. J.E. Church Jr., Snowman.
6. Paul Ascangan, Radio.

Reflections

Tu.
June 15, 1926.

High time to travel. First time in 25 years out of the Basin. No! but Pullman.

Tried to go to bed feet first like corpse? but couldn't get in. Laid out my ticket for conductor but couldn't find it in dark. Didn't know I had an individual upper berth lamp. At conductor's request tried to light up, but rang call bell like Uncle Josh rang fire alarm when trying to open mail box.

Reno quite dead still. The departing divorcée, when shadowed with rice protested to porter that she was bride only in name. Is she the exception? And by her side my old comrades of the road, all home-grown, all true. I shall ever remember their clasp and their heart beat helping me on.

How I wish I could carry them all like brownies in my pocket. They are in my spirit like elixir.

I'll soon get accustomed to the formality of travel. The aloofness is quite in the vein of the parties, yet not all. The children are natural and so responsive like "Tom" or is he "Harry" in "Thunder on the Left". I dread the "protective" formality and love the hills. You can spear your heart on them.

Humboldt Basin: The low rims of distant mountains at the end of mountain valleys seem to have a more subtle appeal than the Sierras. They are so soft, so dreamy, so far, yet so open that they beckon you to follow.

Wed.
June 16. Wyoming: The long vistas bordered by low buttes and touched by heliotrope last evening made Wyoming (west of Green River) take its place in scenic masterpieces.

Nebraska: And today the rolling hills of western Nebraska with green expanses of trees and fleecy clouds make a pleasing daily landscape. The plain toiler calls it "God's country", for it bears everything.

The Platte at N. Platte is muddy and seems to be at high stage. Is the season wetter east of the Divide? It looks like the Amazon after seeing our mountain streams.

Humanity: And humanity? Mostly normal and delightful.

Little Philippine girl, so quick yet reserved but appreciative. Mongolian in face yet ancestrally Philippine. In Honolulo 3 years, in U.S. mainland 2½, is going to Cincinnatti to study music. A happy blend of races. Yet she is isolated by her American

fellows.

A scholar at heart. Sorority pin and Phi Beta Kappa key. Yet let trivial failure in table service spoil her meal, for she was obliged to reach over to another table for a spoon. Steward later inquired about her opinion of the meal. Answer: "Your waiters are fine. You have spoiled my meal." I had been placed opposite her at table, tho too late to have shaved and changed soiled collar and shirt. Wonder how much was meant for me? Hers must be Canova education. Refinement and simplicity in dress, intellectuality and decision, but irritable in the harmony of her life. Her horizon must be narrow as she lives where the pulse-beat is stilled.

used the curtain rods for a trapeeze. Will the Railway put in a gymnasium or charge me for extra service? The barber shop and tub are here. Lets call for the "daily dozen".

Fri. June 25, Eight days have passed. Michigan hills and trees becoming more beautiful. Houses bungalow in type. Barns rolling. Signs for sale. Suburban change everywhere. Best for people. But Ohio much as 40 years ago. Still rural and unprogressive.

Father much as always. But little older. How old Church has shrunk. I can now put my hand on the spire; once it reached the sky, esp. when I climbed to paint it. And the trees almost overarch the streets.

Krauss took me back to Germany. How vivid the

experience. Temperance in Germany: "America has used — liters petrol, me — liters Bier".

Four minutes' visit by long distance with Charlie, Hattie, Daisie. Have good, but hard unsatisfying.

Weather Bureau at Washington slowly losing its "It can't be done". The change seems manifest in their faces.

Philadelphia, esp. suburban hills very attractive. Ride to Bryn Athyn. The two towers and iron work. William expert in color rendering. His plans & buildings explic. good. He and Anne have made good beyond criticism. Close of day at Wanamakers. Maxfield Parrish & Curtis Pub. Co.

New York - a day of autocy. Dealt with the angels at Harbor en in barn with Prof. Helden. Traversing the Palisades to Poughkeepsie & see Frank Jones, then across by railroad

? declivity

~~declivity~~ to Long Island Sound
Jim would be ideal companion
for Donald.

Mrs Harrington: How tragedy
and hardships have drawn both
face and heart of Mrs Harrington.
But old grace and dignity remain.
A sad memory of former years.

Stanley Pargellis, still a boy
but with the English accent just
disappearing. As unassuming as
ever. His course of life mapped
out as a teacher, Instructor at
present at Yale.

Sat. June 26, Boston, city of stores closed, much
May and worry to get baggage
in or across city. S.P. and
Doctor H. and Mr Canyan and
I reunited. Mr. Clayton and
Prof. McAdie came to see us off.
McAdie still young but too old
for arctic stunts. Clayton believes
that a high dewpoint in Greenland
sufficiently persistent to affect
weather.

Sun. June 27. Riding thru the birch and low evergreens of New Brunswick and Nova Scotia with occasional clearings. The Bras d'Or, with foothill rim, a lure of tourist appeal near Sydney.

Afloat. The Effie Morrissey, an oak fishing schooner from St. Johns, N.F., made over for arctic cruising. 165 feet over all. Room for all among packing boxes and tanks of oil and boxes of provisions on deck.

Company a fine clean bunch of men, all specialists or with achievements behind them. Robert Bartlett and brother Will with Peary. Tom and the cook also with Peary and long-time sailors of northern seas.

Robert Peary, Engineer, son and namesake of the father, a viking in sight and complexion and a Peter Pan in spirit. All old sea-dogs, brief of speech but masters

of their craft.

Mr Putnam refinement and adventure blended.

Doctor Hobbs - growing ever dearer to all his men. Energetic, meeting success from defeat, faithful to every promise, thoughtful of his men, and physically their superior. Our best is inevitably at his service.

Mon. June 28.

Sailing along the eastern side of Newfoundland. The sea and the land remind one of Tahoe when the eastern shore is low and somewhat dim.

In March when the Bartletts were sealing, the Gulf was like a millpond frozen over.

The Bay of Islands midway the length of Newfoundland looks like San Francisco Bay from the Heads. Some day I should like to traverse the islands.

Sun-set, a Maxfield Parrish in its golds and blues like the Argonauts without its cliffs.

It contained the glory of the West with the vapour fires of the sea. Blue smells touched with a path of gold. Cloud serpent.

Meantime the southern sky was covered with a curtain of black, riven by lightning flashes. Sails of passing ships were flopping in the wind. Bugle calls broke the evening stillness.

At 8, when sun sank, rain began to fall. Mata Will: "Sky opened".

Midnight scene: Captain in yellow oilskins and radio operator beneath the cabin light. "Message just received from Belle Island. Ice ahead, but Belle Isle clear. Only growlers ahead."

*Insert on prev. page:

Radio man stringing new aerial. Peary riding on foremast head. Slides down rope while carrying camera in one hand — a cupcake cut bland viking with the heart of Peter Pan. "Robert,"

not "Bob." a tribute to his father or his mother's maiden?

Snow patches on Newfoundland hills. Getting gradually colder and twilights later as we go north.

→ Lightning plays thru skylight. Water runs down. Battening light.

Tues. June 29:

Fog all around. Wind astern, ship leaping and smells dipping her bowsprit brace. Schooner crossing our bows.

Newfoundland again visible. Point Norman lighthouse and several Gone hamlets visible off beam. Entering Straits of Belle Isle. White caps racing with us.

Our first growler, looking like a light brown white cap ahead on Newfoundland shore. Labrador shows thru murk.

Sun bright, wind fresh. Ideal viking day as we rush along. Straits 60 mi. long, Newfoundland coast fairly low and wooded →

Evening: Old scenes of Belle Isle. Florence; our youth. 27 years ago next week. Lights on Belle Isle. Sue & boys in night on our starboard bow as we leave the west channel. Battle Harbor only 16 miles NW of head of island. All hands on watch. Foremast on outer end of bowsprit. At midnight outer or north light is abeam.

Are the bergs just outside waiting for us as before? This is Florence's day.

Wed. June 20.

Ice 6 a.m. cleared for a moment. 35 bergs in line. Missed seeing

Labrador now near at hand, a long line of bare ridges like our desert hills. Snow drifts run nearly horizontal as if remnant bars on old shoreline terraces.

---

then as in '99. Fog. Standing on ropes. At breakfast little berg with splashy harbor in center came sailing by. Big berg or rather two just loom thru the fog and towers above the spars of the ship. How high? 50 ft or 300 ft.?

Getting cold. Breath shows, hoar frost on eyebrows and caps of crew.

At noon cleared. Bergs of all kinds increased to 67, then

to 105 as counted by Newton Hobbs. One tabular iceberg, to judge by height of water line erosion (est. at 10 ft or prob. more), must have been 70 ft. high and 500 ft. long. Two others showed sail marks, acquired when glaciers on aft. port side. Battle Islands

Captain is running N-NE, but this means little, for declination of needle to west is great. He is seeking to cross the line of bergs, borne by the arctic current, and make the more open sea.

Raining again. Every day fog, then sun, then rain. Ice now almost entirely on port side. "Last week", Mate Will says, "this whole area was covered by flat ice. Now the wind is blowing it out. But it may be in any direction".

We are now steering directly for Greenland, 6 & days to Holsteinborg 900 mi. distant (?). Steamers from

Battle Harbor to NW, NE coasts of Newfoundland and to St. Johns. May thus succeed in getting out home, if Morrissey delays long along the coasts. But her delay will probably be to the north.

Coloring: Deep blue above in hollows and deep green blue water. Flat surfaces white, sometimes dazzling.

Types: See Natl Geog. Mag. July 1926.

Seasickness: Over for all. S.P.F. had brief spell. Went to bed and came out smiling. Had had clam chowder and being a New Englander by residence and thrifty and long away from clam chowder, he was determined not to lose it. He succeeded.

Sun-set: Last streak of light and color over sea ice visible at 9:50 p.m. Sunset now lies apparently to south of us. Three days at this rate will bring us to Arctic circle and continuous daylight.

Thurs. July 1:- A clear sunrise. Ice everywhere around us. Only a

few bergs but ice pans thick.
This is Belle Isle day as in '99.
Calls from crow's nest, "port,"
"starboard," steady (sounding like "stay")
come constantly with quick answering
cry from the helmsman and ~~wheel~~
turning of the wheel. Ice fragments
grate along the keel.

At first it was a "day in
May" on Tahoe, almost balmy,
but now sky is becoming overcast
and the wind is chilling. Fires
in cabin stoves, overcoats and
mufflers on deck.

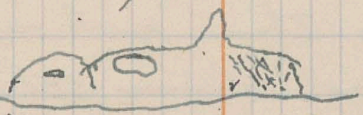
Type of ice: To-day flat ice, or more
exactly "thin bay ice" from the fiords
Only occasional arctic ice. Some
floes earth-stained. Gulls occasionally.
Watchman said gulls fed from the
earth on the floes. More probably
from life in saturated steam.

11 p.m.! Pitching and rolling in the
open Atlantic after a day of
zigzagging and pounding our
way thru flat ice.

Temp. this morning in shade
36° F. Some fog and some sunshine

during day. But everyone chilled -

Bergs: A few bergs among the floes.
One an upturned berg with natural arch. Matterhorn; bridges and pinnacles N. with



striations over one end. In grey sky and fog very impressive. Camera had last film had been used. Far to east was one looking like an Alpine mountain.

Colors: Off Bay of Islands, sea indigo at sunset. Today and yesterday sea dark viridescent or black, due, they say, to presence of Labrador current filled with animal life.

Sunset: Streaks of purple and gold in the clouds cast a pinkish-purple hue over the faces of the ice floes. A wonderful pastelle effect in blues: a blue sky relieved by purple and gold, a fleet of countless icebergs pale blue riding in a sparkling sea. Possibly a photo taken by Gould can be

colored

Snowshoeing on water: Thus the whole day has seemed. Ice in hummocks, lanes between. Boat breaking thru and over. Peary climbed down the bowsprit guy to one and threw snow balls at us. He was also up the main truck with the movie-man photographing Capt. Bob in crow's nest where he had climbed to extricate us.

Out of Ice:

Day was calm. Great field of floes had damped the ocean swell. But toward evening, Capt. Bob noticed the ice slowly heaving in swells much longer than the ship. He never predicts, but thought that we were on the edge of the pack.

? lecture
Call to lecture was answered by him: Damn the lecture; our job is to get out of the ice-pack. During lecture

a crash thru ice, then bell full ahead. We hastened out to find ourselves free.

All for all-hands raise sails transformed scene into hilarious ant-like activity with twasty men hauling at ropes.

Boat headed NE on her course toward Greenland. Will shoot the sun tomorrow. Boat even on dead reckoning threading the ice.

Warmer now. But ship is creaking in the wide Atlantic smells. The Labrador shore ice has been passed.

Tomorrow the "trough" will be placed on the table again.

"How slight a word gives complete change to the meaning" - Mr. Putnam.

Sat. July 3:

The leap of the ship so attractive Thursday evening after imprisonment in the ice-fields has become a burden.

All day yesterday the great Atlantic smells left our stomachs swinging in mid-air as our

ladies followed the lurching of the ship. [Query: Will more guy lines on this organ reduce this melody to a pleasure?]

Ferguson smiling but white at breakfast left suddenly to rescue a pair of glasses left on the stand. He returned for breakfast this morning. Gould has fasted since the ice and is spending today in his bunk. Aldrich can now eat again. Doctor Hobbs and Ascaygan are invulnerable. I spent three delightful hours in my bunk, and passed lunch only to eat candy and make my unannounced exit at supper. But how beautiful the sea looked, with its sheep like our classroom picture, after my stomach had found peace. [This my first total attack of seasickness, to the great amusement and consolation of Gould who was lying on a

call of rifle near by.]

But I was back to have a share of the birthday cake in honor of Doctor Hobbs 62nd birthday. Our wedding anniversary — and on the sea, where Florence found life troubled.

Today cloud and fog are around us. The rolling is less pronounced. However, it is growing colder in the cabin.

We are on the NE course, just enough out from Labrador to keep us clear of the ice fields. Kate Wick says that the mist are not more than 25 miles & the mist as shown by the presence of birdlife and the light in the western sky caused by reflection from the ice. To go farther to the east would bring us into the "middle ice".

Captain Bob and Wife Question:

"Hell no, I wouldn't marry even the Virgin Mary"

Again: Every good citizen should marry just to stabilize himself".

Halstenberg: approaching 60° at point of Greenland.

Too cloudy & short the sun today. Expect

It reach Hakatenbaug Monday evening. Passed Belle Isle Tues. night. Six days expectancy or Monday evening, but we were in the ice two days with at least one-half day delay then low speed and zigzag course.

Quit

Read

Yes; this evening Mr Putnam announced that 60°N. had been reached. Strangely just previously an inflated young caribou was seen by Eskimos when hanging walrus was passed floating on the sea. How like Columbus' experience! Some suggested that it may have been torn loose by walrus diving + swimming under ice.

Light: At 11 p.m. still twilight. All objects on deck are visible, but printing can not be read.

Sunday, July 4: Karl, our Ranger from Yellowstone Park, welcomed the day with three shots thru the open skylight. Fortunately he cleared before the deck hand lowered down. He and the bullets might have met. Our wet fire crackers merely fizzed. Soda pop was our beverage. A fine group, many ices non-smokers and

non-drinkers of tea or coffee. Liquor is entirely lacking. Mr Putnam has gathered a fine group: scientists, hunters, sportsmen but men, lovers of music, wonderfully well balanced. Art young ideal, one should read Pope's Hunting with the Bow and Arrow (Putnam) for a description of him.

All day sailing under a dome of cloud in a sea ever more tranquil and becoming blue again. Gulls seeking food over the waters; are not following us. 62°30' at noon dead reckoning. In evening land seen under the clouds on horizon; but later decided the vision deceptive. David Putnam was suspicious all the time. He was right.

10:30 pm. Sky overcast; still deck perfectly visible and even printing on boxes and boats legible. Night now is only 2 hrs long.

Have read much on glaciers today. How many problems there are. Mr Putnam now plans to call for us Sept. 18 and then return by the coast of Labrador. He is quite

willing to let us climb some of the mountains there to study glacial markings. How fortunate for us.

Florence: 34 years ago today our comradeship first really began. 27 years ago we were preparing our departure at Montreal.

Monday, July 5:

Fog all day. Temp. this morning 55°F, this afternoon 38°. Cold. Were we coming to ice again or to the ice cap? at 8 p.m. Captain noticed some pigeons, who never fly more than 20 miles from land.

Gulls and noddies and mudhens (i.e. hellidivers) seen. A noddy is a gull with shorter tail and smaller wings and consequently faster wing action. The mudhens done when the prow of the ships was nearly over them.

After evening talk, call of land thru fog. A snowy landscape plainly a great glacier from mountain summits to the sea.

with blue coast line either side. The fog rose in a long cloud serpent such as was seen over Labrador. To the south lenticular clouds were forming. Later the coast stretching far to north came into view, a wild jumble of bald mountain peaks and short ranges with deep furrows between. So different from the continuous Sierra Nevada.

So this is Greenland and Eric the Reds wild realestate venture!

The ship is rosing slightly in and should reach Davis Straits and Holsteinsborg 90 mi. away in early morning. The Pilot warns a long active day ahead.

Radio: Last night radio from McMillan at Battle Harbor to Saco, a millionaire's steam yacht following, was intercepted, saying, "I have some fine furs for the girls". Captain Bob: "~~Hell~~, The Arctic is now what to Hell". He evidently feels like the old mountaineer in tourist season. cf. when chain-mail girls appear.

Fri. Thule. July 8: And I think that we have called Greenland cold. Today I have sought shelter from both heat and sun

and longed for soda pop and ice cream for dinner and am eager to take a swim in the fiord.

Eric the Red, the much maligned, is justified in calling this "greenland". The mountains for 2000 ft. elev. are covered by tundra (almost heather) so deep and so and so variegated with bluebells, daisies, dwarf evergreens (4" high), and a hundred dainty flowers that a man without a glimmer of "realestate" imagination would call it green and delectable especially if he came from somber Iceland. Eric was evidently far ahead of Stefansson in coining the term "the friendly arctic". Yet just beneath the tundra are the eternal ice (at least July 7)

Diptera: There are no snakes in Greenland, but of the Diptera. The term bug or rather insect is not long and impressive enough, nor can French, even when wielded by the long-suffering Marcantonio ("incroyable") do justice to the "culex-irritans" (S.P.F.) and the black fly. Like Baldwin: "The only way to get more mosquitoes in Alaska is to move them southward."

only heat or wind can drive them temporarily from sight. Athemina a swarm like a running bee makes a halo as big as a washtub around the head of one canoeing as the go to and fro at their duties.

The poisoning is a personal matter. Some are afflicted and some not. But all are tormented and seek protection beneath bee-veils on tight tents at night. This morning I felt like Alice in Wonderland over my veil, as I lay in my cot-down sleeping bag, rested a swarm of long legged, long-billed gnats and blue flies, whose pendulous forms as seen from below gave me an attack of "shakes" and nausea.

We may gradually grow accustomed to them, but when even the gas line on the motor boat becomes clogged with them to say nothing of our own throats, it is evident that Ocanyan is behind when he places them far above the New Jersey and Texas mosquitoes for their viciousness. One feels impelled to place a netting over the lens of his camera to keep the bugs from shaming

his pictures, even if the idea is
an intellectual "fetal head". Back to present
Tu. Wed. July 5 6 chronology
First day in Greenland: Wed. July 6 the mind was
fresh, so fresh that the ship heeled far
over and ran free as the mild North.
The engines could not keep pace with
the sails and so were cut out.
Snow clad peaks lined the shore.

To think that Captain Bob had been
running all the way from the ice-
fields and practically from Belle Isle
by dead reckoning and at times without
it and yet had estimated his position
within a few miles.

Then the foam on our starboard bow
appeared a tiny village and men
signaling with a cloath. Putnam
and Nate Will, and Robert Peary engineer,
who can make a motor boat run
even against its will, set out
for the shore to see "where in
Hell we were". Soon three
tiny spots appeared making for
the ship. Kayaks so diminutive
that they were scarcely ship wide
and could be carried on one's

yet they rode the waves like gulls.
shoulder. One was picked up by the
motor boat and brought out. An
eskimo milling and able to steer an
wheel and pilot an ship into
Holstenburg lying 20 to 30 miles ahead
behind a barrier of islands. It did
me good to see an inferior race
play the white man's game on the
white man's ships. He was undemonstrative
but there was quiet pride in his eyes.
Capt. Bob stood by his side and by sign language
they pointed out to each other the proposed
course on the chart.

Holstenburg: About 3 p.m. we entered a secluded
bay and found a tiny, quaint town
perched on the hillside. Highest up, was
the church and below it the Governor's
House of three stories. Near the shore
and on one side of the harbor,
quite apart like a powder magazine
was the jail. The cannery or factory
stood on the waterfront. Smaller
buildings, mostly the eskimo houses,
made the bulk of the town.

Color rather than form was the characteristic
Two buildings had same color and

Take Panorama of Holstenburg
harbor from the ship

each had several and these often primary. The church was red, the Governor's house was blue or purple and the jail white. Yet the green hills gave all proper setting, while the feather-headed boats of the natives furnished delicate hues. Here is a chance for the artist. Slides at least should be colored.

Dinner to Governor Bishop, Mrs. B. — Miss Jessen, Nurse, Mr. Barnsted, companion of Knud Rasmussen in exploration, Miss Brinch (Brink) engaged to Mr. B., Mr. Bishop, son of Governor. Secretary

Miss Brinch learned idiomatic English in New York in four years, meeting Americans mainly in evenings; for she worked at Daniel Comstock during days. Had with Hawaiian language was our chief entertainer.

Dance for three couples on board. Trading with natives on board by giving them credit at Government store. Miss Brinch kept the account and acted as interpreter.

Wf for Head of Fiord:

9:30 pm weighed anchor for all night trip up fiord. Narrows are too narrow where fjord main fiord. So under

guidance of another Esquimaux, who handled the wheel the entire night, we proceeded down the coast to the mainland, which stretched inland with occasional turns until the next noon. A great cañon stream, placid and deep. One felt like Henrick Hudson, when he passed by the Palisades and the Highlands of the Hudson — a voyage of discovery for me across Greenland, and in this mood I sat up practically the entire night that I might miss nothing.

Doctor Hobbs and I kept our record of dates by sitting up. (See last letter home). So little difference in arctic between the two halves of the day. The colors of the cliffs, the stillness of nature, the mist and cold. Jim's regard for tradition against mixing at wheel. So pumpkin at wheel was denied comfort of smoke but given chew of tobacco by Jim as consolation until Mate Will came on duty and permitted leaving the wheel.

Rookery of tern — channel of birds, awakened by rifle shots in night.

Sanfanguak: at narrows. Ship swinging in narrow cañon with swift current at her stern forming tide rapids around

island rock above which perched the
esquimo's village and agent's house.
Shanó canoes on the beach, sleds, a umiack,
kyacks, but particularly timber boats obtained
from the Danes. Barter conducted mainly
and by rule thru the store. Tobacco,
cigarettes, pipes, chocolate, shirts, pants, etc.
preferred. Team sled sledded and two packers
arranged for.
Wed. July 7. Anchorage Station: reached about noon. 6 mi. from
head of fiord.
High mountains, rugged, steep arose
from shore. Evidently not even a beach
adapted for camp. Pilot refused to go further.
So reconnaissance boat sped forward
to a revelation of scenic beauty — a
Rubicon Point coast with the addition
of rock textures, heather colors, rock colors,
talus slopes relieving polished rocks —
that should be the artist or colored-photographer's
paradise.
Camp Little: Tiny rivulets appeared at
intervals and occasional beaches. But
about a mile from Anchorage on the
southeastern side of the fiord was a
glacial cirque with cascades tumbling
over the rim, with long descending
meadows, and protected crescent bay,

do was an ideal base station quite beyond our hopes. Here by evening our entire equipment was transferred from the Morning on a lighter made of three dories lashed together and manned by the crew, esquimaux, and friends who stayed to start our "Swiss Family Robinson" in their inland way. Jim got most sick out of the white caps and I tried to drench all including even the equipment. He nearly succeeded and got his own pants wet.

Thurs. Fri. Sat. Sun. Mon. Tues. Wed. Thurs. Fri. July 8-9: Building of permanent base camp. Thurs.: Privations have been the life of the camp and the source of its wit. Box of dishes and cooking utensils failed to appear. But the Cutlery Company Inc. and Unlimited, produced shell spoons, then spoons of tin, forms of wire, until camp was agog with expectancy. It was also an example of quick reversion to type and a rapid ascent from palaeolithic to iron age. But in the evening our first eskimo visitor appeared and by sign language was communicated by Dutton N. to bring an outfit from Akuna at Savungnas with 1 dz. tins of Plumrogan.

A Day of Exploration and Discovery:

Friday: The long portage to the ice had filled me with foreboding. The tundra was easy and

the outfit was clearing for its height. So Larry, Ak Eskayan, and I set forth in canoe after days work on Friday on high tide. Found tide arm penetrating country far beyond head of fiord. Sailed up left arm to head where mountain retreat full height. White rabbit loped leisurely down to stream and as slowly away as we chugged by. Ducks in multitudes overhead. The rising water and falling tide turned us back.

Outfit edge, while carburetor and fuel pipe were being cleared of mosquitoes, I climbed the wall on south side of a natural outlook and gazed forward along the left arm. We were in an emerged fiord (or a nearly submerged glacial valley) filled with bogs and tidal pools, with a stream meandering from the direction of a distant lake, whose blue waters could just be discerned between two hills which made a natural portal to the lake - our Tasersuaq, which I feared all our equipment must be "backed". The tundra was soft as pillows or feather bed and so deep, and would have been killing.

The shoft water transportation made us buoyant. And the lake seemed more like a pond among precipitous hills and the plain from which Pingo was to rise was not evident. The only move was toward the coast.

Saturday, July 10: a day of Near Tragedy.

The clouds had gathered that evening and Saturday the white ogs in the main pond sent their muffled surf but even down here. In a council of war, it was decided to penetrate to the Lake that evening and arrange for moving camp on the fourth day as set in sign language with one of the enquiring Eskimos, brother of one of the men employed.

At evening, wind was apparently going down and Gould and Aldrich went out to try out the motor. Previously the Eskimo, commissioned to get the table mate, appeared in kayak followed by whale-boat of family & friends to spend the day. As they were departing, Eskimo suddenly pointed his hand out to the main pond — a half mile away. Doctor also noticed that the canoe was last down in waves. Then came a faint and distant call for "Help". All paddled out to aid. Eskimo, already afloat, Doctor H. and Roemyon in canoe

8

Ferguson and I in dory, F. gazing ahead and reporting while I rowed with only pair of oars on board. Next like a wharf that day seemed. "Was the canoe sunk?" "Had the engine merely stalled?" "At least the boys' heads were still above water." "Could they hold out or up until help arrived?" Greenland waters are cold. "Yes, they were safe".

Soon the canoe passed us going in - getting kids and dry clothes ready.
Then the great whale boat came alongside, children and women looking at the heavy oars. Yes, there was Gould next but smiling, also pulling at an oar with the children and, when I called for strength, he too was seen at an oar. The engine men were endeavoring to empty the canoe which rolled and danced like a porpoise. Finally, it was hauled aboard and across the gunwales of the whale boat.

The setting sun lighted up a scene, I wish could be made permanent in picture. A heavy lumbering whale boat with furled sail, a kyack trailing from the gunwale, a burnished blue canoe resting crosswise the stern, large and small, brown and white faces looking at the oars toward

~~the~~ land and warmth. Gould refused to be transferred to the day because he wished the esquimo to come in and receive a gift.

all are human, all are brothers

In hoisting in one of the women lost her headdress, a pretty kerchief, overboard, but refused to have the boat turn back for it. The day rescued it and returned it to its owner. The men eagerly and proudly took off the cut-bound water and carried it to their shore. The canoe was carefully beached.

A side of bacon was given, first to their disbelief, then to their joy. Then a sack of the oiled sugar, which they were glad to have. Even Gould being cook by intuit suggested "oiled"; for the fresh untainted was scanty.

As the party left, two children kept a hunter each of water aboard their boat, while the father, waving his arms as in rowing, and panting to his tongue, indicated by mime in explanation that the children had become very thirsty by their hard rowing at the rescue.

Lifted hats and hearty bade them farewell, and Aleanyan our detailer of esquimo, remarked: "The Esquimo can

hang around all the time if they wish"
and from the distant point of our
bay returned our friend in his kyack
to bring the starting cord of the outboard
motor of the canoe, a tiny object found
on the water & in the hold of the whole
boat or floating on the surface of the bay.
End.
Weather - Fog and mist at Haldenbang on
Tuesday. Sunshine Wednesday to Friday
with temp. max. of 80°F. and both by Fergusson.
Regular land and sea breeze each day
oriented by the canon. Friday evening
with make starling turn pipes.
suggestion of cloud. Saturday July 10.
wind with distant moaning of surf,
and not the veil.
Sky overcast. Min. temp. 42°F. but no
rainfall, yes, we are probably in a
"steppe" region. Narlungjäll seems to
be covered at every point. Sunday and
July 12: today (Monday) sky still overcast. This evening
wind falling nearly to calm. Wind and
cold not unfavorable to work and very
unfavorable for diptera.
Optimum conditions for freedom from "flies".
In Sun with shade temp. of 80°F., but flies still
active in shade. Wind and cold, such
as prevailed Sat. and Sunday nights, esp. the cold

of approx. 40° as lowest. Strong wind in their face. Out at light buoys and temp. of 50°F. as has prevailed this afternoon; they have returned in moderate numbers and activity.

Thurs. July 15: (Too busy to write daily).

Cloudy weather still prevailing. July 14 precip. .02 in.; July 15 (2 a.m.) approx. .01 in. Today clouds at time ride down passes or touch peaks

Tide-gage: after searching harbor have finally erected tide-gage on port side (as enter) of boat landing. Tide here approx. 12 ft. depth of water at low tide, a ledge to support box, and presence of rocks for ballast determined selection. Swaying harvester starts at head of fiord. Set it up at 4 a.m. today. Seems strange to get up day or night or start on trip in afternoon. Planned to set recorder at 11 a.m. at high tide, but found this tide 4 ft. approx. lower than other high tide of day. So are waiting until top of box can more easily be reached.

Scouting for Permanent Camp.

Tues. July 13 dory was adapted for motor and set out in evening with Mr. H., Gault and two Eskimos for base. Reached only , where tide effect ceases and rapids were found. Returned same night but set out Wed. evening in canoe

in order to pentage, engine to be left at ——
Esquimos dismissed temporarily.

We were left to erect tide gage and then with Belcnap and dog to prospect lakes at head of central arm of fiord and possibly go up south arm. Hammer, since we should return tonight to meet Lt. If his party returns, we shall attempt only central arm and see if there is a umiak at ——.

Esquimos:

Friendly, honest, quick in intelligence, ready to smile and even joke. No race has ever solved its economic adjustment so well and on so little. For speed, lightness, and use of materials from the sea, the kyack is unexcelled. The Esquimo is even more part of his kayack than the cowboy of his horse. He represents the "spirit of the waves" and is as buoyant and ridden as lightly as the foam. So far north in South Greenland in a boat 14 in. wider than his hips. Acrobatic stunts in water. His gumarak (around his hatch) comes to his armpits or forms a water tight jacket and hood, leaving only face and hands exposed. Lines, spears, rack of bone on stern,

bone rimmed double paddle. Seal skin boots. Fur clothing, except in summer. Always sealskin boots. Igloos are light almost and little fire. Birds, fish, bear, caribou, seals.

Missions: Denmark helps natives to self development but does not try to nationalize them. Found newspaper in possession of Esquimo printed in both Danish and Esquimo. Ideal missionary effort should be to aid such development, but not to impose beliefs not understood or habits that weaken their adaptability to their environment. The "Golden Rule" should be preached first & then or the attainment of the greatest happiness. (The introduction of the chamber vault in place of the common skin receptacle has value only in forcing emptying women, for all still use it in common and public (cf. Belgium).

Vegetation:

Verdure is only ankle high or deep as one sinks into its carpet. and roots penetrate little deeper than sod. Exception is occasional bush in tiny clumps, being max. height of 3 or possibly 4 feet. Beneath the tundra at probe depth of 4 inches ice or frozen soil was found when clearing space for store house. Flowers are

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Eskimo

delicate as in desert and the tiny brush are very aromatic. Birds sleep in nooks of the hillside or in the tundras. Gulls have roaring and their faint cries at a distance sound like the Tahoe pigs when supper is nearing. Wish we had a botanist. Strange: The beach has no drift of any kind, drift-wood is prima facia evidence of importation by sea or man. Result is cleanliness, which emphasizes any debris left by our camp.

Names of First Camp: In this land bilingual and even trilingual names abound. So we have gained a supply, as follows: Camp Little (after President Little); Camp Little-pichiganeat-coak (the coak for ouk, because of the overturn of the canoe); and Camp Dauntheflixa. The basis is emotional (1) formality, (2) tradition, (3) explosion.

P.S.: Clem just has just added a fourth:

Rainy Camp, September, 1927.

Temp. 10.7°
Humid. 70°
Diaromfort 91.28.

Personnel (new classification based on fortnight's experience)

Doctor Hobbs: Director and Speedwriter (Guide)

Larry Gould: Asst. Dir., Photographer, Cook (Ballast)

S.P. Fergusson: Met., Designer, Wag (Uplift or yeast)

Bellie Ellsworth: Glaciologist, Surveyor (Patient Endurance & Brute) Called "little Ana".

Paul Ascanyan: Radio, Radiostate (Cheerful Salesman)

J.E. Church Jr: Sugar (Incorrigible.)

Pictures I didn't get but Can Never Can't Forget:

1. Iceberg in Fog.
2. The Trieme lighter returning in surf from Camp to Marisay. (Uncle Tom on rudder).
3. The Umiack with family of Fifteen Paddling to Camp in Evening Sun.
4. The Rescuers (Whale Boat).
5. The Cliffs to south of Bay. (Cf "Far West Coast")
6. A Umiack under sail. a time Viking ship with aged master at the helm. a "Farewell" greeting. (Cathy and Ray).

Rainfall: In dishes with square shoulders "catch as catch can". July 14: .02 in.; July 15 (Dish 6 1/4 in. diam.) 10/32 in., (4 1/4 in. diam.) 7/32 in.; July 16 (Both gages) 0.13 in

Evap. July 14 - Almost total prec. was evap despite cloudiness and high rel. humidity.

Saturday, July 17: Every day rain and today it is sprinkling. Hereafter start trips at midnight and stop at 10 a.m. to avoid rain.
To 45 m. erected tide gage; then in afternoon
Jellyfish: July 15. started for middle arm of fiord and shells.

——, just beyond saw Medusa or jellyfish
* ↘ as wide as paddles, and a smaller one in
canoe
action. A thousand gulls or noddies fishing and having good luck. Evolution: Winner for big fish and gulls. How can nature maintain the round? Dinner here by high tide and then went to Itivnek To look for Dr. Hobbs and Gould.
Low Tide Access? —: Can take dory on low tide within ½ mile. Stream banks as deep and narrow relatively as Missouri. Called it little Missouri. Bitt picture. Bitter start from camp just following low tide and ride up on rising tide and return on ebb tide. Both Itivnek only summer village. No good in winter.
Flowers July 16 rained all day. But in evening climbed
Tahlus Mount to head of harbor. Humble patches exquisite. Flowers
here Typical of all stages from lichens on rocks to grand masses. Plant life in its primitive stage as jellyfish in the sea. Paradise for botanist and color artist. Greens & grays with bluebells. Are Scotch bluebells the same?

Gulls going to bed on ledges of cliff. Of many bad wings, what a master of gliding, side sliding upswinging. Marvellous adaptability to air with infinite grace and ease.

Talus blocks with brush and holes everywhere afford numerous crevices for bird shelter and some overhang for human. Lots Ferguson on tip of Cape on north side of crest.

July 17. 7 a.m. Dr. H. and S. returned to camp after being held at Fiord Head by tide, storm, and baby motor. No boat transportation possible between and Tasermiut. But have magnificent. Trail to Pingo possible from head of Valley on N. Fork. Belknap and self delegated to explore route. Leave after lunch.

* [The Cliffs South of Harbor in rough sea and in storm The Cliffs are magnificent beyond our dreams of wierd sea cliffs. Must resemble Iceland or Norway. Like "The Far West Coast" except for green color in sea.]

Colors of tundra and cliffs just like colors in autumn of Scotland No overcoloring.

Clear Skies at Tasermiut. Fierce, so fierce that Master H. wanted Captain Bob. to ~~swear~~ fittingly "damn the savage fjords".

Monday July 19. colors almost simultaneously

An all-Night Trip Exploring. Sunset in West, North, East as we walked the mountain tops. Suddenly found that we had passed from Sat. July 17 & Sunday July 18. It was 12:30. We ate our supper breakfast of a can of cold beans. Here it is not night and day

but a.m. and p.m. The sun sets but you scarcely realize it, it is so slow in dipping and soon in returning. Sun shining again at 2:30 a.m. Darkest i.e. dullest perhaps at 11 p.m., coldest at 1 p.m. But could look for needle in the tundra all night and see it if there. Stars have never been seen since we came to Greenland.

Canoeing thru the Mountains of Greenland.

Greenland is a wonderland of mountains gouged and planed by a huge ice cap that cast its way by long arms to the sea. Practically all mountain tops to 1500 ft and probably higher are rounded. In the lap of these immense gouges are chains of lakes "Paternoster lakes" like pearls or beads on the string. Our fiord was deepest just here and rose gradually to the large lake above us. On either side the fiords are dry except for their chains of lakes. In fact these parallel gouges may never have reached the sea, for they are now 1000 feet above the level of our ocean fiord. But the lakes invite to paddle and to portage from near the base of the high Pingo to the west and north toward a massive snow-capped peak on the edge of the Nördliche Stromfjord. A portage of 3 miles with simultaneous climb of 1000 feet beneath three gibraltar cliffs up a green gorge (grassy glen) well place canvas on a natural

bay in an untried and unnamed country. What an adventure, what a tale of the Summer North. Scientific Problem: Reaching the air. and the Ice.

Trip toward Pingo scouting for an Advance Station for air and radio by Dr Hobbs and Gould Wed-Sat. July 14-17 In rain most of time and met to rivers all the time Stream toward Tasiussarsiar traversable to Ilivnek but mile portage necessary at that place. Other two portages probably necessary near Tasiussarsiar. Plateau with lakes near Pingo not satisfactory for balloons.

So self and Behrman sent to scout plateau west of Pingo and try ascents along watercourses into fiord head and up Cascade Arm near Ilivnek. Trip continues

Sat-Sun. July 17-18. 18hrs. Wide V shaped valley at 1000ft. elev. with rims of 1700 ft. on south and est. 2500 on west may possibly serve. accessible by climb up Cascade Creek and canoe trips up chain of lakes Balloons may not be carried beyond the rim and should be visible within it. Lakes more isolated and hemmed closer by ranges. Flat top of rim south of V shaped valley 1700ft. elev. would be nearer the 3000 level to be fractured but is narrow. Much like plateau south of Pingo. visible to east with lake [illegible] filling the floor. Descent by stream east of Ilivnek very precipitous and unfeasible. For map, see sketch by Behrman.

On our return Mr. H. Ferguson and Gould set out to make decision a Quaint Custom. They are still out. Why so long?

Evening of Sunday July 18 Off Hunter appeared on misses

under square sail. driving up fiord under stay
sail mast mind. Dropped sail, rowed to island and
waited in lee while one of Eskimo women got out
and went into seclusion at other end of island.
(Then are taboos communistic or least outside
of family?). Umiack then rowed to our camp.
A visit for tobacco. A perfect example of native
craftmanship. Only wood sufficient to make
keel and transverses, gunwales and very few horizontal
stripes. Walrus hide hull. Bow hung in center of thongs
load line gunwale
drawn taut horizontally. Narrow thwarts only seats.
Gunwales protected against wear & rain by hide.
Hull high high. At starboard side kyack was
lashed close water to gunwale. Round stakes used
as rollers to draw umiack up beach. Umiack as
heavy as any dory but immensely longer; could
carry 20 to 30 people. One lone Eskimo aboard,
naked with crutch and cane. Dressed as if city bred.
Said he was "Wenster". But old man sat in
stern as steersman and pilot. Men and women
both rowed incl. the lame man. I helped them push
off. A smile was our common language, except that
they parted with waving of caps and hands. So
Western, so human, if you but look
Straphs. after 3 or 4 days of storm flaw west, Sat-Sunday while
we on trip mind veered to east with driving and
swirling of clouds over or near peaks with higher

ranges veiled in clouds. East of Cascade Range clouds surged and billowed upward as if the creatures of some great conflagration until they overtopped the stratus cloud with which however they soon blended. Night moderately quiet in its mind and very clear, but heavy still along the ranges and a towering pyramid of cloud over Pingo. In eastern sky perfect bi-plane of lenticular cloud with tips feathering out, illumined with pink. Other lenticular forms in northwest. A gale was blowing meantime at Base Camp. and extra guy-lines were necessary on the tent. Sunday the mind veered again however as in other days since we have been here.

Wed. July 21 :-

The mind is still from the west, the movement is slow. Stratus clouds prevail and have veiled highest peaks esp. those above 2500 ft. elev.

Another all-night Trip Exploring Mon. - Tues, July 19-20

Science Searching for aerological Ground : The V-shaped valley was so inaccessible that Dr. Hobbs and Schmidt ask me to go directly across fiord from our harbor and get a view from the highest mountains. This trip again consumed 15 hours. It was a night of scientific interest. The area from the main arm of the fiord and up the north arm past the harbor had been more gently planed by the ice, leaving shallower valleys and lower intervening ridges

with tiny lakes and small water courses - The grade gradually rose from 600 ft to 1500 feet. The valleys were several and parallel extending directly westerly 10 mi. to a twin peak 2400 ft. which barred the valleys and was the apex of the region. Beyond this twin peak toward Baffin Bay the glaciers had cut far more deeply and one canon on the northwest was a Yosemite. We gained our Twin Peak at 2:25 a.m. To north and east clouds veiled the higher peaks but settled on our Twin only after we had left it. This area was ideal for balloons and our night trip was fully fruitful. But the hypsometer were greater.

Animal and Bird life: No auks, only one worm or caterpillar. Three half or sides of Caribou found on prior trip. This trip the Caribou trail was still visible tho somewhat overgrown and large bog meadows of grass (not tundra) were found but practically no traces of caribou were found. Have they all been killed off? Ptarmigan or Arctic grouse plentiful and trustful except mothers. One little mother uttered a startled call of pity for her young and fluttered round them. We comforted her at once. I wanted to feed her but she would not have understood. Near the finish on our return, I met an older

and more experienced mother. She warned me to keep off. I did, but she glanced me closely all the way, like a threating house dog, and then went before me some minutes more, when she suddenly turned and whirled back to her brood. Mother love, the beauty and appeal of the madonna.

Scenery: The sun was down from 10 to 2 o'clock, when it shot a long slanting beam over the stratus clouds upon the mouth of the fiord and Baffins Bay which stretched calm and blue beyond vision. The colors of the sunset appeared even in the south, so shallow was the sun behind the mountains to the north. The moon at half was in the sky low down to south but was pale almost to invisibility. The numerous islands and reefs and the wide strait of our fiord claimed the dangers and shelters of ships. Flanking them on south was high mountain wall capped by continuous and perennial snow of rounded contours and glistening whiteness. Northward along horizon were the [illegible] roofs marking the approaches to Holsteinborg. Further north was a deep yosemite gorge leading to alpine ranges now veiled in cloud. But in the sunset like the radiant glow of a great picture had appeared a sharp matterhorn with snow at its point and a field at its base. As we climbed the base became

a prolonged ridge and an radiant peak a mountain which once rose like some volcanic island from the sea of ice. To the east we could look up the long SE arm of our fiord to Lake at its head, and also into the main arm and up the entire length of the NW arm upon Tasermiut. Our waterfall and lake above it could be seen, but our camp was disappointingly below line of vision. But southward our Norwegian Cliff still frowned upon the waters.

Glaciation: Twin Peaks was planed to its very summit which was flattened in the process. all peaks except our mutterhorn appear rounded. Was not then continental ice caps mass? Ice covered this area and was apparently 1000 ft deeper to judge from a higher mountain to the north. also rounded. We shall climb this soon and determine. The problem is one of pressure and water and ice seem to have the common trait of flow. Ice tongues with less depth and consequently pressure have made deep cuts in the ranges, as were these made by the pressure of the ice cap when it overlay the region? Problem: Trace direction of movement of ice over mountain peaks and relation of direction to position of probable apex of ice cap. On Twin Peaks two large tongues existed starting down east face but going north and south. Twin Peaks has its axis north and

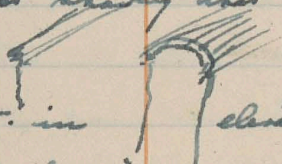
south. It seems to be the rule of this region. But to the east all peaks have axis east and west as if carved by an easterly moving cap. Ranges west of Twin Peaks run southwest, west, and northwest.

Age of Greenland since ice cap disappeared. Hard, clean rocks without lakes indicate recency. But these are the acid or silica rocks. All basic rocks, esp. those containing iron are as worn as in Sierra Nevada. Mud and rock flows abound. On Twin Peaks was a rock-avalanche and mud flows abanded in rocks like raisins in pudding. Frost and water effects seen in mud flows from beneath tundra and parting of rock masses and numerous holes in tundra. But with it all is the "bed rock" marked clean of glacial detritus which underlies the tundra often and marks elevated shore beds and beaches.

Wed. July 20, Radio station was moved to N. point of harbor elev. 400 ft. to reduce angle over barrier hills. The aerological flights were located across the harbor but other meteorological work was centralized at Camp Little. In afternoon Olsen came in Sorensen's motor boat from Sanfangnack with sled for ice caps. It was decided to start Monday July 26. Four sqwims

Olsen brought radiogram from Rep. Chas. L. Smith in Philadelphia, Pa. and relayed a message to him July 25 and

with umiacs were promised. Aleem is really done but takes esquimo it my envy. Our old "negroid" navigator of the umiacs was pilot on the Eveson's launch. He is to be our guide to the Ice Cap.

Strophs: The summer movement of the clouds seems from present experience to be mainly from west to east. On the last night trip Belknap called my attention to the cumulus of snow on range south of mouth of fiord, all the snow lay on the lee slopes, which here was the eastern, and where a cliff existed the overhand was on the east showing that a west wind had formed them  This snow was fully 3,000 ft. in elevation or within the elevation of strophs. Since strophs are considered violent, they should cut away these cutaways even if they blow far less frequently than the west winds. Possibly Pingo is too cloud-capped and too costly for an observatory. Can an observatory be built on the ice?

Friday July 23:

Records were made on yesterday (Thurs.)

Radio: Radio news from United Press received for first time Wed. night and now Thurs. night connection has been made with

Morrissey, now unloading Rasmussen's supplies on North Star Bay at Thule. No ice in Melville Bay and only few bergs until near Cape York. More batteries would make it possible to send radio messages directly to U.S.

Ice Cap: From cliffs east of and above Univ. Bay, Doctor Hobbs saw Pingo for once clear of cloud and all of Tasiaciuaq, and beyond them the Inland Ice extending for 25 miles along the horizon. The range south of main fiord seems to have an ice cap in places.

Charting: This far vision like Moses upon the Promised Land (may the omen result, however, in attainment), gives a splendid opportunity for triangulating entire region from Univ. Bay to Ice Cap and even including the area toward the sea.

No wonder that Dr K. returned from the heights whence he had seen these and pulling off his veil and cap, said: "Do I look as if I had seen a vision?" and later "The blot has now been removed from my eyes. I have (talked about) discussed the Ice Cap for years but today is the first time I have ever seen it".

First Balloon Up: The types of clouds and their movement have been puzzling to Fergusson. Movement from west yesterday with very strong wind at surface and esp

* Likewise no ice at all seen on occasional tiny floes off the coast of South Greenland.

Morrissey, now unloading Rasmussen's supplies on North Star Bay at Thule. No ice in Melville Bay and only few bergs until near Cape York. Marconi batteries would make it possible to send radio messages directly to U.S.

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across Radio Point. When Dr. H. returned, a pilot balloon was sent up. It went almost directly upwards for approx. 1400 meters when it began to travel westward with increasing rapidity until it approached the cloud plane at 2000 meters, where it swung northward as it disappeared in the lower layer. Query: Was a lower colder current of air descend from the Ice Cap and a higher warmer one (wind) climb to it? The barometer seems to be normal at 29.5 ins. Have we here a Greenland Low corresponding to the Aleutian Low? They are similarly located. Ferguson says that an anticyclone center can have low pressure as well as high and that "The natives will yet still sit up and pay attention". There is virgin field here for meteorology.

Photography: Took some views with Gould yesterday of Blue Cliffs and Harbor. Today is day for panoramas. Old camera is showing no diminution in excellence from the far back days in the Sierra.

Tues. July 27: An Exc. day to Inland Ice.

Sat. prepared for trip to Inland Ice.
Much discussion about instruments to be taken.
Sunday afternoon Alden with Kane-Jane,
5 Tam Cabin Chinese arrived & prepare

us for starting with flood tide Monday morning. Abraham, our old pilot of the "umiack" and one of Rasmussen's party in 1912 over the ice came with umiack and kiack and asst Nathaniel came with Abram. Tells what that evening by eskimos for food.

left mid morning by Tessuisaq Monday 6:45 a.m. Expected to start at 8 a.m. So Arcanyan had not yet come down from Radio Hill. F. had created at least "Tasermiut Trans. Co." sign to clear us off. Towed by Kane-Jane Townsend head of fiord and with dipping of Danish flag by Abram, we were on our way: Umiack with canoe and kiak towed like twins of similar origin but diverse birth at her stern. Six in party rowing slowly at the heavy oars(canoe) until met by Peter and Enoch near Itivnak who were to join our party. At Itivnak all, carried something over the portage. Then heavily laden umiack was drawn (up) over rapid even where water as less than 4 in. deep & between boulders. A great asset for transportation in the future. and another evidence of the adaptability of Greenland equipment.

Camp. 1 near lower end of Tasermiut where stream from "V-shaped Valley" enters.

Camp 2.: Head of Tasersuaq. Started 6 a.m.

Photo. Great "Gibraltar" on lower lake marking noble gateway to main length of lake. Pingo directly above lower L. and accessible by very gentle slope. Seven stages or lake benches appear. South of Gibraltar and N. of Gibraltar

Balloon Field slopes along entire lake gentle (Rumpfläche) and with addition of water surface to east and south would make ideal base for balloon flights. a boat on each arm would expedite recovery. Forenoon dead calm. and basin 10 × 20 mi. in area.

Clouds "Cirrus" clouds lace-like beyond a queen's dream. Unfortunate to have lost taking pictures of them. Plumes and tails indicated westward movement of high air i.e. 2000-3000 m. up; some of these clouds blended later into alto-cumulus? But later clouds of all types were moving eastward and were similar to the clouds over Camp Little... At noon west wind sprang up and has continued fresh all afternoon. Bar. is 29.20; so prob. this is a storm rather than a sea breeze. Winds a great problem needing careful study. [yes, Wed. bar. 29.35 in.]

Winds.

Polarimeter [illegible] sky; bright [illegible] 90° above, reflected by mirror, [illegible] sunspot [illegible]

Explosive [illegible] = Tabs. [illegible] expedition [illegible] and [illegible] [illegible] and [illegible] shore.

Engineering: Nathaniel can read and write.

Vocabulary: Has catechism and New Testament.

Is gigging us all and writing down the English names of things. Larry and Billy are leaving the Engineering works.

Sailing: To-day when breeze sprang up, sail was raised and oars poised and pastured. The water gurgled, the waves flashed, the crew sang low but melodiously some folk song possibly but based on church music of hymnal type. The headlands swung by. The crew finally fell asleep, we sleepily looked upward into the face of heaven. Dr K. studied the glaciation. Our low white caps we reached the far end of the lake at late afternoon and made a muddy landing. Lake 3 mi. wide and 20 mi. long above Gibraltar.

The peaks & the NE points are our coming days journey.

Departure of Tarragona: Water black like Michigan lakes the stone walls at base of Gibraltar are very steep. Water sometimes emerald green where mixed with glacial clays. Yet today in mid shore water temp. at 5 pm. was 49°

and at 9 p.m. was still lower (45.5°F.) So possibly quite deep. Tarns sand sandy. Small lakes in Rumpfläche very shallow and steeped in vegetation. Cf. Desolation Valley.

Wed. July 28 Wed. a.m. lake blue except in shallow water is yellow-green. Temp. in deeper water 49° as in shallow sump water last evening before too deeply stirred. Sky most clear ¼ clouds except slight band over ocean and strato-cumulus over sky for east or Inland Ice. Behrup jumped in for a swim and warmed up.

Noon Departed for Pass. Trail NE. Summit 7,950 ± 350? ft. above Tarnaroark.

Thurs. July 29: Our Depot Camp of yesterday became our night camp and dubbed "Camp Rusty & Dirty". The packs were too heavy and Abraham became exhausted, with thoughts of home. I had gone up Prospect Ridge to see Inland Ice and returned to find all hands called in to complete packing from Tarnaroark, and to reduce loads. We returned at 7 p.m. weary and chilly. Before supper: "do they miss me at home" but after hot soup and tea: "The ranges to the south in exquisite chocolate brown and the sun-set in rose in the north" A night rest on the knoll and all hands at the packs have restored the morale of the packers. Today is a short day. We have

"Camp Rusty & Dirty"

"The Gibbs Expedition always fights"

advanced all leads to the Triangular lake on Nordenskjölds maskham route and are starting at 4 p.m. Gould Camp Angmitjoint Tasiut- and Palmup have taken camp to advance the loads to head of lake and shoot route from same height. Tasiuaq we make around the lake. The flies are thicker than ever when the wind is calm but are bearable otherwise than vicious.

Prospect Ridge: E. of "Camp Ready & Quit". To West can see Pingo in middle ground and Kibuldte at Kalatdlarbing and snow clad range south of fiord. In foreground Tasiuaq. From this point Pingo looks much as in Nordenskjölds picture. To East appears N's southern route to Inland Ice with nunatak ranges in foreground and Inland Ice like narrow grey band on far horizon. Two panoramas of 90 degrees each would vividly represent this portion of Greenland (The natives call Greenland Kalaat). Two storms Storm: were bearing over the ranges, one N.N., other over Pingo. Last night at 1:30 a.m. the northern storm battened southward over us in a light shower. It was impressive against a red-streaked sunless sky. The clouds today have Clouds: been banked N. of Pingo. while we are in the sun. Is Camp little too near the sea? Possibly the balloon flights should be sent of Pingo

on Tasersuaq.

Sunset again all night: The sunsets still are seen occasionally all night as last night, tho the deepening twilight makes it difficult to read the thermometer.

Native Days: The ideal of thoughtfulness and courtesy. "Aap" = yes. Note Ger. ya', Ital. Si', Eng. yes. "I have you", "no good" in Eng. much used by them. They've been giggling me today for more American words; head, leg, hand, arm, foot, frying pan. (flying pan, like Oriental) Japanese amusing? Can understand Peary's remark: I hope that Christian missionaries may not enter them. Yet, the writing, the other prides of civilization should be theirs.

Canoe: Came five miles up the hill over Sarry's head." The most unwieldy bundle of 75# ever put up." Today it swims the lake in the heart of Greenland. Canoe and Kyack, have much the child of the primitive but how light, how well adapted for their lands and material at hand, bark and skin.

Begin

Trails: God bless the trailmakers. But why did they wear No. 6's? A narrow trail for No. 10's. Made originally by

caribau? Not here; it rises too gradually to the head of the waterfall. That's beyond the brain of caribau(?). See novice of all in line, Abraham, Enoch, Mr. Hobbs, Peter, Nathaniel, Canoe and carry, self with sampler pack. Rebuap tows the picture. This trail is worn and hardened until walking on its moss carpet is a joy compared with soft yielding tundra, wearying like fresh snow.

Blueberries: Amer. slang "the tundra is lousy with blueberries" is apt but too crude for these. Rather the Japanese thought: The blueberries look like spangles of rich modest color in a carpet of yellowgreen touched at intervals with reddish brown or copper gold. Had like the Japanese Cherry blossom against their obtrusiveness.

Eskimo apart: Seamen rather than trailmen. Legs and feet and body small. Sit in shallow kayak. Game trails not forest worn like deer. Caribou gone. Minnows in this lake, but large fish nearer the sea. Yet, how sturdy the pack bags are, and carry double loads in size and weight. Old Abraham at their head looks like Daniel Boone. This afternoon he trotted off in quest of

caribou? Not here; it rises too gradually to the head of the waterfall. That's beyond the brain of caribou(?). See novice of all in line, Abraham, Enos, Mr. Hobbs, Peter, Nathaniel, Canoe one carry, self with sample pack. Edward took the picture. This trail is worn and hardened until walking on its moss carpet is a joy compared with soft yielding tundra.

Doctor Church -

I was unable to reach Ralph Hall - there is no 40 Morton Street -

If you should want me call 2407 5 or 3034.

D.

caribou game. Mosquitoes in this lake, but large fish nearer the sea. Yet, how windy the bear bags are, and carry double loads in size and weight. Old Abraham at their head leads like Daniel Boone. This afternoon he trotted off in quest of

Gould and Belcrap gone * the head of the lake in the canoe. We live steam all. The boys were just wrestling with much giggling and grunting. They are straight mountain men with their dandy rifles and home-baked Cartridges.

Friday July 30. Head of Augusaviguant Tarint.

Belcrap and Gould are steaming camp from little A.T. by canoe about 10 mi. * Camp 5 at head of main A.T. Doctor H. came in canoe and has gone on ahead to scout out water and chance of carrying canoe further in. Rest of us incl. Belcrap (one trip) walked along shore. The lake with islands (one very large) stretches far back, down a lane of hills. The pass like Mycenae in Greece is above us. The afternoon is bright and almost hot. The bench grass about us is deep as in California but also is dry. A mountain stream rumbles in the distance. The stream bay set with brush headhigh forms the mouth of the cañon leading to the Lake, which takes the form of a circular bay before it opens thru narrow cañon into the pass between the hills.

Begin

A Vanished Caribou Town: It seems like a "ghost city"

Camp limit on Flint map.
Wind Greenland always in the Bone Age with him was important for weapons.

A: cottonwood
B: mid-ice zone
C: pine forest
1½ hours inside the ring

east West. On a rounded knoll backed by a steep ridge are numerous stone foundations of igloos or sod huts. rude houses with whalebone and musk-ox caribou horns littered about. Near the home naturally shed, but skulls, evidence of good hunting once. But near the trail the deep is becoming mushy and in many places has sloughed off into the lake, where the ice and snow have receded and torn away the tundra. one has come into deep nets where the tundra has parted. The blue bells and lemon still carpet the knolls. Feet tread it seldom now. The feed is here but the caribou (reindeer) have gone. The birds still chirp and the insects hum. We are out West once more.

Blue Bells. In large clusters or stalks here and even Birds: in wide carpets. The Ptarmigan has been uttering his note all day. The fragrant dwarf cedar? again calls the nostrils. The night note is the cry of the loon.

Color: As I lay this evening on my sleeping bag and looked thru the nodding plumed grass upon the golden brown hills and shimmering blue lake, the scene was one of exquisite color landscape, suited for the brush rather than the camera. No grass like this in Greenland, just ripening with stalks knee-high and plumes of reddish brown. What a "Greenland Knee-deep in June".

End

Chinese: schlêna = Good night

Anta: No anta here, but the "flies", eh.! Here is a chance for some Danish St. Patrick.

July 31 - Camp 6. Foot of "Lava Cliffs".

"The Steppe Region". We have climbed three a long pass today and are the lower end of the upper series of lakes leading toward the Inland Ice where it penetrates into Isortok. We are on the northern arm of our old friend which has now retreated to Itivnek below Tasserenak. The dry region of yesterday is gradually changing to one of deep tundra even to the top of the ridges. The hills are golden brown. The lakes are narrow but beautiful in their windings and gibraltar promontories. The trail up was wide. The stream flowed beneath the watermore rocks and tundra. The pass was a gorge of shattered debris-footed cliffs, quite unusual. The lichens, rather some grey ones, left the chaos dusty.

The hills are still wooded and the scenery comparable to Scotland.

A storm developed again today west of Pingo, but clouds finally covered the entire sky. There seems to be a

distinct sea zone, and a semi-arid zone. But the moisture seems to be increasing farther inland. Is this due to drifting snow from ice cap or to its own precipitation? Some snow measurements might settle this.

A fog was seen, today descending from Isortoq Ice tongue. Was it outgoing cold air condensing an incoming moist current? and reversing it?

The Inland Ice: We climbed Outlook Ridge south of camp today. Here we could see how the ice tongues had carved their way to the sea. Far east lay the Inland Ice, which looked like a level stratus cloud on the horizon, until we more clearly distinguished its corrugated face retreating from view. The corrugations seemed parallel and vertical to its face like stream lines. Farther east at Südlichal Strömfjord it seemed fissured.

On the northern horizon stretched the Isortoq in its deep gorge toward the sea; on the southern, the Südliche Strömfjord could be defined behind the hills. In the central ground was our own fjord, less deep, more rounded with Pingo like a Pilot Peak on the western horizon, yet now less conical and with snow drifts on its northern

face. The Inland Ice still had a tongue protruding down Isortok and one down Südliche Strömfjord but looked like a retreating giant sullenly releasing his grip upon the hills. At our feet lay a cast off caribou horn, memorial of the struggle of adaptation between ice and life. The gnats stalked in the tundra when a 15 mi. breeze was blowing but when it fell slightly, they returned to hopeless. They are good emblems of Persistence. Sometimes are a jet of buzzing objects against your face or into your eyes; again they swarm in swarms of legs. but not vicious

August 1 - Near Head of Lake Affley where portage to Lake Discovery Begins. A long route by land up and along the ridges. Ridges to contours preferred. Hills rounded as in New England. The smoothest and lowest yet seen in Greenland. Large winding lakes fill the depressions of English lake country. Inland Ice lies now nearer and less awesome. All drains lead to it. We are making NE toward the tongue of Isortok.

Smooth Hills

At portage to Lake Discovery or rather on its shore is an abandoned Caribou

camp and a stack of abandoned bones. Larry says that caribou are still abundant in other districts of Greenland. But caribou and ptarmigan are protected here. Blueberries need no closed season. Are crushed by our feet along the trail.

Age of Bone: The Eskimo boys have a pocketknife with a swivel of bone. It is perfectly made. Is it copied from one of iron? They are carrying leather or rather hide (seal?) to make half-soles for their native shoes. They are singing again this afternoon in their tent while pears are being brought up Lake Affley. It sounds like Ellen Harrison's prayer meeting singing.*

Summer in Greenland Read

This is green Greenland. I am lying on my bed on the tundra in the sun while cumulus and stratus clouds send down rainstreamers toward the sea. A goose honks overhead, a loon on the other lake calls to its mate and a russet breasted bird flies inquisitively about. It is a scene of Sabbath thoughts and stillness, the antipodes of "Greenland by the Arctic Seas".

*Later: It was Sunday - a quiet, warm sunset with gentle peace at the lower end of the lake.

Contents by Elizabeth Hughes Gill Trust

Sky pink and blue in opal effects. Esquimo boys as merry as Americans, and given to joking. Nathaniel laughed till he cried. They were delighted to paddle the canoe - Peter is quite expert, and they throw well - spear-throwing fashion.

Aug. 2. Camp 8 Interlaken or Kettle Saddle Lake (now named Harold H. Emmons).

Kardlingesuit. Abraham advised caching the canoe at camp 7 unless he could come ahead with Gould to explore. So all advanced under packs. From the heights it was evident that by two short portages we could have advanced half way to Interlaken.

The Lake Discovery of yesterday turned out to be Kardlingesuit, which paralleled Lake Affley and the chain of lakes up which the boys brought the packs in the canoe. A short portage at the junction, where stones and a cache of caribou horns give mute evidence of vanished caribou, would have given a further water route to the NE.

But the trail of the day was easy. The first traversed the hill-tops like a huntsmen's outlook trail and

was hard except when descending to meadows of moss. Low hills, rounded surfaces, lakes. We are now under a cloudless sky between two shallow lakes. The water tastes of vegetation in which it is soaked or steeped. Is it brackish or alkaline?

"The Steppes"

The Ice Cap is now less than 10 mi. away. The air is increasingly clear. The ground is luxuriant where water courses exist, but is dry the rest elsewhere. The climate seems Californian. Is there a dry and a wet season? How is the snow derived? From the Ice Cap? The intervening mountains would prevent. The precipitation is not exceeding light, for the tundra is still moist, the soil is cracked by sloughing on steep slopes. The tundra is deep and yielding. Precip. measurements at Camp Little and Holstenborg and a snow survey here might furnish comparison and evidence.

Sloughing: Is it ice action? Or rather slipping of the tundra on the waterlogged clay that underlies it and overlies even the unvegetated slopes. The instability at Interlaken on the edge of the lake indicates this. Gould calls it soil-flow.

Soil flows

Caribou: One sharp trail crossed our course
Tern: this morning and caught Hasbrouck's (?) sharp
eyes. He killed two terns (?) on a lake.
Their food is very hot. Yet Abraham
brought me a share. I signi-languaged
that the boys must returned for another load
were hungry and should have it. Dear old
Abraham. He is a man among men.
I could hug him; and I think he would
understand.

Aug 3.

Camp 9. Mountain Valley Camp. Within 5 miles of the
Inland Ice at Isortok Tongue. Belknap, Peter and
Enoch gone back for more packs. Poles, supplies
& will be brought up to our 10th camp & the
established tomorrow. Wide undulating valleys
lie behind us with lakes as usual. Eastward
should look like the Green Mountains of Vermont,
if pictures of latter are true. Verily this is
Indian Summer, mild sun and wind, sky
with few clouds, nights frosty, no storms

Slogan: The Hobbs' Party always fights, The Hobbs'
Party never Quits. Ten days to Ice cap, but
we'll reach it, even if Belknap's suggestion
that we send someone around to head
it off has to be carried out. (semper fugientem
Italiane sequimur) and the packs are

heavy and must be relayed. Archer H. gone ☆ learn out the advanced way; Gould H. H. ☆ photograph the glacier tongue. (Wind day 7 P.M.

Bugs: Flies kept busy to clean themselves at 12 m.

Perhaps this is nearly the optimum wind. And temp 46.8° F. at 9 pm last night with wind even at only 5½ mi. seemed ☆ put them ☆ rest.

NO: Bugs did not stay put.

Stunt: The boys who want for pacers, did not want to make a trip back from ice front for poles, crampons, geometry, and petroleum. So the three brought in pacers for five. Too bad I did not use glasses on them even when I saw them, I could have aided. But B— explicitly said that they would not bring heavy pacers. So I did not look for the mis-mag signal I at first asked them ☆ use, and which they later used in vain. In fact, after seeing them I lay down ☆ catch up on my sleep. This is the second for heavy packing, espec. on beachy and soft ground, all honors ☆ little Belknap ("the little devil") and the overall but hoary natives Peter and Enoch. all but Abraham, Nathaniel, and I have had a strenuous day. But A— was told ☆ stay back, H— was laid up by a blister on the bottom of his foot. But we all had a hard forenoon and the final trek tomorrow.

Aug. 5 At the Rim of the Inland Ice.

Yesterday we set out determined ☆ make the Inland Ice our next stop, and relay our second packs next day. Ten whole miles we bore our packs up soft valleys by little lanes until we entered the country of the Rim, with slopes a little steeper and ridges slightly rougher, but still with blue bells and blue berries, the ox-eyed daisy, the dainty star, soft luxuriant moss, softer ☆ tread upon than

kings carpets when Abraham proudly led us thru a defile and upon a shelf from which we gazed upon an ocean of ice stretching beyond the eyeball in waves and curves that simulated the sea. Only it was more majestic

Tues. Aug. 10: On Way Out: We have learned much in a little. We found the Inland Ice kindly to crampons. There were few fissures but many high ridges. Skates or ski or snowshoes would have been useless, esp. where the tongue is filled by transverse and intricate ridges. Farther south the ridges ran parallel far out upon the ice.

The lateral moraines reminded me of a paving company's gravel pit and the dusty side of the glacier of the Snow Sheds in winter. We merely put on our crampons, climbed the gravel banks and mounted the sloping side of the ice, an eighth of a mile and the ice was clean and dazzling white, with pools of water and tiny streams running down every ice ravine. Ridges towered quite above our heads. The ice-mountaineering and firm footing after the tundra became exhilarating. Without crampons we should have been reduced to cutting steps with chances for much slipping. In fact we should have been very slow and practically helpless. As it was, I "leaped from peak to peak" with impunity as Gould caught me by his "more".

Mt Chapin rose above the waves of ice like a

+ Sandstone system. Tie added here

mountains from a temperature zero, made suddenly to stand with its crest in air.

A Picture we failed to get! But the view downward from Mt Chapin was a landscape of labyrinthine lakes and promontories jutting far out into the sea of ice that rose slowly and with long undulations along the skyline, like a sea. Storm and shortness of provisions forced us away without a panorama. It was the Land's End View of the Inland Sea and best expressive of it.

The Evening: Superman these little fellows in strength but recklessness of consequences. Peter and Enoch were sent back from the front to bring up half of the packs left behind in Valley Camp. It was a long day's march even in one direction. The boys were advised to take two days for the trip. But they insisted on making it in one and came back that evening bearing double loads each but with bodies badly strained and knees injured by the strain. So with eating. They eat all they are given - even concentrated pemmican - and then go hungry until more is found.

Rations - Crackers, Erbswurst, pemmicans and tea, if sufficient in quantity, keep out dreams of corn bread, ham, and beans. Blueberries are always at hand to supplement rations. They grow in this acid peaty soil in remarkable size and abundance

Spading Bank - 2 camps daily

Theory of weather
Summary, wind ridges

"The Gates" - Taseersuaq - Sunday Aug. 15 -

Two camps daily have brought us in one week from the Ice Cap to the foot of Taseersuaq or one day from home (Camp Little). Exact time Sunday noon to Saturday night. Passing canoe 16 mi. by Gould saved three score miles back landing were carrying packs.

The "Gates" are scinically the finest view on the route save the Ice Cap itself which is sui generis. On the N. a majestic Gibraltar and the south a Rubican Point with deep coal waters. Green and russet clad their sides.

Down lake to W. of Gates the flat-topped ridges plane by plane close the lake like a low amphitheater wall, Reddish-brown and bluish-gray rock colors and purple atmosphere add richness and softness of color espec. when mirrored by the lake, a great outstretched synchine gives a touch of rigor and quaintness

Life is furnished by the drone of the insects by day, and the occasional call of the fowl espec. the friendly loon by night. The night scene is heightened by the long tongues of fog stealing thru the passes upon the lake.

Lake terraces cut thru in a deep V by a mountain stream add a geological touch While Pingo, out of sight from here, sends down his long flank and connects with the Gibraltar rock, which Abraham calls Pingo-Nua - Does this mean

Sunset Aug. 15. Sunset ~~was~~ saffron; hills copper gold; ranges luminous with atmosphere; lake mirrors all. The infinite and the perfect brood over all.

Pingo. Thumb? Such hills are of massed fingers and extended thumb might indicate.

South Arm of Tasserssuak

Nordenjölds "unknown" but easily charted by the camera from the ridge E. of its south or upper end. a narrow entrance but expanding shallow lake, in color much like Emerald Bay and a part of the main lake only by virtue of its near. The intervening shore between the two arms is narrow but furnishes a good balloon field from which to start balloons with a view to retrieving them on the two arms of the lake. The valley to the S. with its dotted-in lakes has a long axis stretching far to the distant ranges, with only three lakes of medium size at wide intervals. The view down upon this valley may in effect correspond to that from Lookout Mountain, except that our stream is tiny.

Panorama and 5×7 views taken

Views We didn't Get!

The prize series of the Inland trip: viz (1) the evening view of the surface of the Inland Ice from above Camp Conley, (2) the panoramic view of labyrinthine lakes, jutting capes, and wide expanse of Inland Ice from Mt. Chapin, (3) the view from Butte near Dry Camp of Nordenjölds between Route and in opposite direction the Rumpfläche with Tasserssuak showing on the S. and Pingo in central W. with coast ranges beyond, the two together representing the entire sketch from sea to Inland Ice, (4) Close Views esp. of Intricate Cirri on Tasserssuak, (5) Sunset in Storm at Tasserssuak Gate (6) Autumn Colors on Inverland Hills.

The Esquimo and Pingo:

I wonder if the natives dread Pingo as they do the Inland Ice. Abrahamm has been on the ice and wants to go with sled party next season if American boots are furnished him. H— and P— yesterday assented to going up Pingo today with party but P— had no enthusiasm this morning and for some reason N— failed to come from the tent until party had set out. He looked apologetic or dejected. Did Abrahamm forbid or N— lose courage? I am remaining in camp to take hourly readings of aneroid at base camp & check Belknap's readings enroute. I plan to go up alone tomorrow. The idea of a meteorological station on Pingo seems to have vanished. If natives will not pass, plan is necessarily impossible.

Foods: Strangely the pemmicann, rabbenrot, pilot bread (crackers) and tea furnished a diet, when eaten without rationing, that quieted all dreams of mashed potatoes and gravy and the hunger for blueberries. The change back to beans, bacon, coffee, jam, cornbread at Camp A, T, made possible by Belknap's trip in advance to Dry Camp where cache had been made, was without fond anticipation or unusual satisfaction. I believe that we could live indefinitely on the diet.

The Atmospheric Circulation of Holstenborg Interland -

A Provisional Basis for Study

Circulation: Two dominant forces: ocean on West, Inland Ice on East, both cold, with warmer land surface between,

there is a surface

Consequently, a wind movement from ocean upon land and likewise wind movement from ice upon land. The normal frontier between these two surface movements is the divide between Tasserssuaq and Aussigsivit Tasiat. The afternoon breze for the western part is, therefore, a sea breeze, for the eastern an ice breeze, the former blowing up slope, the latter down slope as in Sierra. However, there seems to be a prevailing wind movement at the altitude of cirri from the sea upon the ice, with return downward draft from the ice when a low center along the coast furnishes the vacuum. This latter may be considered a weather rather than a climatic movement. This is more intense than the Ice Breeze, which might be considered slope draft, tho occasioned by difference in temperature. The evidence of prevailing westerly winds or sea breeze on the Coast and the cornices on the snow clad range south of Holstenberg. The evidence of the Ice Breeze is the landward direction of the brush on the hills overlooking the Ice Cap. (cf. timberline on Mt Rose). However, this evidence is not as copious as could be desired. The preponderance of the sea and the ice probably oscillates with barometric changes.

Clouds: Cirri seem to be the prevailing type of cloud moving slowly toward the Ice. Cumuli are frequent espec. along the frontier where the damp air of the sea meets the colder air of the Ice. cf. above Pingo where elevated mass accelerations convection and condensation along the frontier can be seen a zone of stratus where the sky over the sea and the Ice is clear. Rain clouds are seen more

frequently over Pingo than elsewhere, the storm centers are occasionally seen elsewhere in the Hinterlands.

Rainfall: The term "steppes" may be correct, but certainly can not be considered as meaning "desert" or even "semi-arid". Rain had not fallen frequently but rather scantily during July and August. Yet the size and number of the lakes indicate a season of considerable precipitation, probably snow. The moderate temperatures, low wind movement, and run-off obstructed by glacial pockets may conserve the precipitation beyond normal and thus make a scanty precipitation appear copious. Only a snow survey can tell. There seem at least to be a wet and a dry season.

Why?

Camp Little - Sunday Aug. 22

a long time between entries, but life is becoming routine on the down trips and work at base camp.

Eskimos - Eskimo have hearts, Abraham and Wattendel received death-news at Inarnark. They were sad and dejected but did not weep. I could not resist patting them gently on the shoulder to show that I understood. Their gloom & effusiveness and lowered cheerfulness during the afternoon was full reward.

Aurora Borealis - The "Aroma Borealis" so prominent at Sarfangnak has faded in the presence of the Halo Borealis which I have learned to admire. There are now three taboo subjects for light gossip; Kaya (Kaage), Janess (for they're my girls) and Eskimo.

Storms - Snow fell in a light flurry on Pingo Aug. 15 August 20-21 and 21-22 snow fell on the passes about us. Yesterday two depositions of snow fell above 2000 ft. W. fiord, and a snow flurry observed at Camp Little. Last night a light cover of snow were on the heights above and S. of camp. Today from Mt. Bunten snow drifts were visible on the higher passes to the N and on Pingo, i.e. from 2500 to 4500 ft. elev. In Sierra snow falls in September in similar amount above 8000 ft. Is this Greenland snow-storm usual? How long before winter will set in?

Landscape - Sunset at the "Gate" on Tasseruak Sunday Aug. 15 is my answer to the human longing for immortality. To have seen it is full compensation for having lived and felt men are short lives with complete satisfaction. No more shall I claim superiority in landscape for the West. Greenland fascinates me with her forms and colors. Ascanyan, who saw this

Sunset & Gate Pass by Still the one thing to do after seeing this unbelievable

landscape from Camp Little, said that he had seen many sunsets in jet parts of the world but none such as this. What of the fiord and distant hills had been our "Gates" and golden walls? Last night there was another saffron sunset, but mostly a touch on a cloud here & there above a snow-sprayed ridge shaded in blue.

Ascanyan's Camp on Paul's Knob, Mama Hill, or Radio Point is a place of vision of fiords, peaks, cliffs, and sky. He is quite loth to leave the spot for the balloon field at Taissumarsoc. This is his only outfit since coming to Greenland, but he is quite content.

Old Friends - To surprise Ascanyan and Fergusson and put my arms about them was a treat. They had sent up 57 balloons, handled radio and camp and had kept sweet despite cold and loneliness. The natives had called as had Dr and Mrs Alsen, and messengers from the Governor. I have been detailed as Fergusson's assistant to relieve Ascanyan royal.

At Home - I have finally erected my own tent and have Florence and all my possessions under cover. It is better so. It is a refuge from rain and cold, and makes a warm study when the wind blows. Everyone now has a tent and "Fergussonville" with one lone tent has now become a suburb of Camp Little with five tents and an evaporation plant in the foreground.

Birds - The gulls were riding at anchor in the Bay last night. Have they left the "roosery"?

Water - The waterfall has been dry now approx. 10 days, but the creek is still nearly as high as before. Will it last out the season? The tundra is a good reservoir.

Trip to Middle and South Arm of Fiord - This plan made an inland trip may be carried out tomorrow if weather is fair. Gould and I are to take the dory and perhaps canoe. My admiration for "Larry" grows me even anticipations. He now feels that he would like to spend winter in Greenland. I hope we can and will, especially if I am to be here.

Sleeping Bag:- as cozy as a squirrel's nest.

Blessings of Blessings many when I go to bed:
"God bless Louise", who made it; "God bless Florence", the everpresent; "God bless the Chappelles", who are snuggled in my coat pockets, sharing my trip.

Twilight and White:
How soon the twilight comes now and the southern darkness. The birds (or some of them at) are still here. It seems colder now, it rains more. Our eternal summer and daylight are waning. One wanders less afield after sundown.

The darkness deepens much and for bidding. Now it must be.

Sunset on Fiord, Aug 23:
Face of the Sky: "Face of the Sky" can be applied without reservation to Greenland waters. Early evening: Blue and opal hues ice grey. As twilight deepened the silhouette of the dory at anchor on a silver bay with pearl-yellow afterglow toward the distant shore. Mountain-rim beyond in black silhouettes capped with fleecy-cumulous and fretts of stratus clouds against a pearl yellow glow. Sound of oars and voices and three dots of native boats passing down fiord with falling tide a silver lane traversed ripples of the sky's blue, mirrored upon the waters. The dory lies in the center of a mirror of gold tinted silvers. Finally, all sounds stilled save those of sleeping.
See photo of face thousand in cloud.

Autumn Snow and Summer Frost Line:
Snow storm on passes is ushering in autumn apace and every storm adds more. The colors of tundra are growing brighter. The reds are becoming Venetian and crimson. Large splotches of color are showing across fiord. The leaves

of the brush are falling. And underneath even at the depth of 16 in. thaws the dismal frost line with timber water at 35°F; yet nature is soft and colorful and the sun and quiet air are genial. Even here the fang grows may to fantasy. We rub our eyes at the wonder of it.

August 24-27.

Calder; clear, cold, ozone. Elixir of Arctic in my out-of-doors sleeping bag. Ice in evap. pan 3 mm. as estimated by Ferguson. How like the top of Mt Rose in September?

Mountains NW of fiord covered by snow above 1500 ft or height of wall directly across from Camp Little. Temp. of water of Radio Point 42°F. (Thu Aug. 17 temp. off N. Head 51.5°F.) Why?

Trip to Middle Arm of Meligian Fiord Aug. 24-28:

Weather Study - Started with Gould for S. Arm to study topography and beach lines but had weather studies thrust upon us. The barometer was rapidly falling. An E. wind blew down the Central Arm and forced Gould to beat up this arm rather than cross in the trough of the sea to the Southern Arm.

At head of Middle Arm were held bound by rain for 40 hours, thus exceeding any previous record of 36 in the Esquimo Hut at Contact Pass.

Tues. Aug. 24. barom. low (after lunch 29.42. ~~Com. 29.34~~) Wind from E until afternoon. Morning sky cirrus crowded changing to cirro-stratus. In afternoon lower stratus moved rapidly eastward and wind changed to W. blowing strong until Thursday when calm ensued at noon. Bar. then 29.92 ~~Com. 29.87~~. Tues. eve sunset over San Jacinto resembled a "forest fire". Wed. Nimbo-Stratus as far as noticed from bag in tent. Thurs. sky somewhat open in W. In evening alto-cum., cumulus, and fracto-cum in W with strato-cum. in E. Bar. 29.94 ~~Com. 29.88~~.

Surf seen in protected bay pounded until Thursday evening. Rainfall est. at 0.50 in. No cans set out Tues. night and can set by Gould Wed. was dumped

thoughtlessly to fill covering time at streams such as life. No gage set at Camp Little until Wednesday. Residual precip. there 8.5? mm. from evap. meas. total prec. must have exceeded 0.40 in.*

NB — This is almost identical with storm on ice. Low bar. with clear wind from E, oscillating with rising bar. & W with moisture and rain. Weather finally balanced & clear with continuance of high barometer with restoration of normal sea and ice breezes.

This may clear up Ferguson's confusion. In eastern U.S. rain precedes falling barometer, in western U.S. rain follows. Here clear weather immediately follows a falling bar. and rain the shift of bar. from low to high. During the present storm, the barometric change was unusually pronounced and the rainfall the heaviest of the season.

* Thurs. Aug. 26 9:30 am. Bar. 29.83 at 7:15 Wed. eve Bar. 29.99 (~~Bar 29.94~~) Wind E but almost calm with fracto-cumulus. Earlier alto-cumulus.

Surface of water in bog hole near fireplace 35.0+°F Lay on this tundra for 36 hours. Returned to Camp Little Marconi: Breaking 36 hours held up in Esquimo tent at Contact Pair McRose. Camped over spring bog Sou'wester but full of rainwater and head half. Rain coat over pack bags with camera outside. So took rest cure for 40 hrs. Tundra delightful to tread upon with bare feet. Not over cold despite water of 35° F. at tundra roots and oozing up under our tread. Rain sounded far more copious on tent than really was. Wind, rain, gulls, ravens, and loon furnished our voices. Larry brought the pork.

Wed.: Breakfast, canned salmon, crackers, jam, butter. Cold water in tin can to drink. Too wet to cook.

Dinner, Embarrass and crackers served hot by Larrie in bed.

Surf-rammocked mid-tide

Note — On comparison with meas. bar Aug. 29, no variation

Thurs.: Breakfast, crackers, butter, and raisin Cambridge.
Dinner (Up and dressed) Cooked Vegetables ad lib. and tea, crackers and jam
Note- Have moved tent and dried bed and hat. Sannie was up Wednesday and walked twice across peninsula to abandoned eskimo village at head of other arm of fiord. Evidently this village like Etivnok has just been abandoned for winter ~~home~~ at the end of the fishing season.
To-day (Thursday) he discovered two large lakes beyond a Gibraltar Gate much resembling that at Tasersuac. These combined lakes about the third largest yet seen this summer.

Friends again - Aug. 27-28.

An may home met off Gray cliffs a little flotilla of four kyiaks just coming from a call at Camp Little: Abraham, Enoch, Nathaniel and one of the two hired earlier in the season. Joyous moans of recognition. Nathaniel had brought one of the smokers, the one for Doctor Hobbs.
Doctor H. and Belknap had gone to climb our high peak above the waterfall seen on our flight trips to Twin Peak. They returned with a lost baloon sonde - The highest recond for Greenland 25,000 ft. approx.
At dawn Peter came from Sarfanguak with a letter from Mr. Olsen. He slept in my tent under Florence's hospitality - She would have loved to do it.
Another Baloon Sonde.
Happy, too happy at yesterday's recovery (an impossible chance), another was sent today. But the valve again froze (?) down and the pound train of two large balloons,

a valuable meteorograph, and three trailing red balloons to serve as pantoons if the meteorograph came down in the water passed from sight like a binary star in daylight far to the S.E. We shall never see them again. Next time attach your fuse to the envelope of the balloon or keep the balloon captive. The lesson is worth the $150 cost.

Sunsets: Every evening one. Last night the altocumulus clouds were touched on the underside by pink and suggested a gigantic gymnasium hair net with its diamond interlacing. It was strange yet pretty.

Autumn Colors: The tundra across the fiord now suggests pink potatoes in russet brown.

Sept 11 - A crisp morning on our Western mountains after a sunny October day. "When the frost is on the pumpkin." Such is this morning in Greenland.

Leaving: I could always stay here. There is nothing essential that I crave. Three lines of news quite enough. But I would enjoy a bath and a shave and shall have them tomorrow. Butter and sugar gone. Balloon letter gone. Film nearly gone. George now in Pond Inlet only 4 days away. So guess we better be starting too.

Can't enjoy life on nervousness and expectancy. We are due to meet the Marinsky at Halsteberg Sep. 5 and much remains to be done.

Journey to the Sea - Sep. 6.

Harold Olsen is a rare character and our Abraham and bayer. They came to see us off and the boys would have gone all the way to Hg.

Permission was granted me to ride in the day down the fiords behind the motor boat to take water temperatures.

Sarpsborg: Friends again, returned for season from Norway. Olsen's home as clean and cosy as my mother's. Mrs Olsen, a native, as is her husband, as fine a hostess and as refined as any I our country. And her daughter as vivacious as any American girl.

Halsteberg.

A picturesque town, in reds, blues and brown, seated at the base of a Matterhorn - with landlocked harbor and islets lying nestled behind islands and reefs.

Here we camped on the Thunder above the Kaukan but we were shared the home and board of the Governor. It was "home" to me, the more so because of the generosity and comradeship of its occupants — Governor Bishop, third of his line. The governor, his young wife three years out from Denmark and Lillepere, our "little Governor" of two years, and a nurse, born on the western islands of Denmark, out for the winter.

Church Service

Two Episcopal Church transported to Greenland Now I understand missionaries. Language of service Esquimo but the music, the full voiced and hearted singing were universal. Congregational singing rarely better. Music much like pipe organ and well played. Service long because of confirmation class and examination. Music abundant - Esquimo musical. One forgets their costume; it's so diverse and attractive. Types: Old Daniel Boone in front, Abraham in rear - White smocks, darkest fine faces of pastor's assistants. Spittoons, like sawdust boxes of Richmond Virginia. Children in gallery. Pictures softer, richer and more natural than those in Catholic church at Godthaab. Danish Pastor intoned service well and with devoutness and reverence, but our Pastor (also asst. principal and David Olsen's son-in-law) a

jayed
ex-Jayed
damn
condemn

nature, possessed both dignity and cadence. He quite won me and lifted the service to heights.

Sacrament: I planned to go to Sacrament next day, when all children attaining 14 years, were to be confirmed into the church. The little class had answered the examination the previous day so earnestly and naturally (once evidently reciting some text at length; she was, I think, a little girl who could memorize rather than think), that I should have enjoyed seeing the sequel. But I was busy copying records. However, when at lunch at camp we became the center of a reception that completely won us. Dressed in gala attire and nature with earnestness, a little troupe of initiates advance to clasp our hands in brotherly love. Tiny and larger, they came; then other celebrants until nearly a hundred had shaken our hands as we stood, hats in hand and paid them the deference of distinguished guests. Fergusson, bless him, got out the cakes of sugar and gave

the younger a treat. The occasion was one of uplift for us — and sounded the central note of Christianity.

Tobacco. Tobacco seems to be the central physical joy of the native as music is his spiritual. Even some of the tiny infants have cigarettes between their fingers. Chewing as well as smoking is indulged in.

Music and Nature: No music but the eternal hills for weeks. Then the old masters at Gov. Bishop's with the strange of the old tone. As we walked back to camp in the night, I could not help comparing Music and Nature, one artificial and from the instinct of man, the other the sheer majesty of nature. Both supreme. "What is man that thou are mindful of him?"

Radio — We are at the top of the world and other lands swing below us. While we are in twilight, Denmark is 4 hrs in darkness and America still in full afternoon. Some listen in for Copenhagen and

wait until for toward midnight for sounds of music from America. But the radio would not function while we listened expectantly.

Norse Ruins: On the NW edge of Hvalsey Bay, just within the outer islands, are level ocean-level terraces on one of which old stones are found laid in foundations. The ruins are old and attributed to Norsemen. They are situated somewhat like Qunae, except the latter is N. of the outer point of Bay of Naples. Certainly an inviting place for early mariners who sought rest in this bit of green between the jutting ice-capped hills.

Oldest Building in Greenland:

What more natural than for Hvalsey to be the oldest settlement in Greenland or site of the oldest buildings. Old church dated by some as 1753, another as 177-, still another as 1800, etc. Quaint, pleasing with slightly curved lines of roofs as shown at gables. Tarred to make them weather proof but painted over the tar in various

reds, browns, blues, white. The oldest of square-cut logs another of stone, but most of boards. The oldest, the church, had many pillars within and was painted a dainty blue — quite as attractive in its way as the Mormon Tabernacle. Cliffs at water edge and rocky hills and mesas and which buildings were perched gave all a northern aspect

Nights again. The nights being the stars and the darkness. The latter is mixed and one retreats to refuge before it. Mid night always means darkness, yes probably, determines we should have had days of more than twelve hours, unless perchance time was divided only by the people of the temperate zones. Nor however the circling sun is the Esquimaux dial for expressing time.

Moon. The course of the moon has been low toward S. horizon all summer, it will accordingly be high during the winter and

should furnish light during the arctic night. Thus the nights will be less severe.

A Wet Night at Hq! - Tuesday to Go.

Sunday scudding clouds and a film of snow on the peaks with a fresh sea outside - Winter is slowly stealing in and any storm now may bring the winter snow. It's getting time to go.
Monday morning was one marked by warning nature who announced a vessel to the south. The Norwegian had passed Hakluyt and was now beating up the coast. The sailors call it down (when going N.).

Monday afternoon the SW wind brought the heaviest rain of the season with a long sizing of the Antrupt and a dash for the tents. It moved in with ferocious. A snow flake fell. Visions of snow about us never almost fulfilled for the snow mantle Tues. morning reached far down the slopes. It was time to go.

Farewell! - Tues at 3 pm we set forth with friends of old leaving new friends of new escorting us in their motor boat to the headland. Dear friends all - and long waving as they returned to their northern home and I to my southern land, feelings were mingled between longing to stay and eagerness to go.

Green and Snowy Greenland!

How quickly out of the green and into the white! Abrupt mountains, glacier crowned. Daring skilloos, appreciative discoverers.

Flag Half Mast!

As we came out a Norwegian steamer passed in, with flag lowered, and dory gone, and boats broken. The night

before had been one of battering by the seas. She had accidently lost one or more of her fishermen and was seeking shelter where ordinarily forbidden because poaching on Greenlands fisheries.

Afloat! The vast and rolling sea is calling me again. The sound is in my ears - I'm sleeping in the outboard motor boat on deck and can see the topmast rocks is swaying curves against the clouds and stars - Tin dollars on a berth below would not tempt me.

Night Sights Aurora B. Wind it is at night to hear the flailing of the sail, the sound of the pumps - The dull boom of the rising sea roused me to look over the gunwale. Murky clouds curtained the horizon and back of them rose shafts of white light even to the zenith. There seemed to rise from Hudson Bay, the land of the magnetic pole. Others had seen the Aurora during the late ascendancy, but this was my first. I lay down again until roused by the ringing on deck of the ship's company, roused to hoist the main sail,

Sails Only: One evening the engine suddenly raced. The propeller was gone into the depths of the sea. Above Hudson Strait - dependent upon winds, No chart. We settled down to the new routine with wind and weather our chief concern. No repairs possible short of St Johns, Newfoundland and this a thousand miles away.

Norwester:

The barometer was 30.08 when we left Halstenburg, and rose to 30.10 or higher. On Thursday the barometer had fallen to 29.9- and Friday was 29.88 and Sat. 8:30 am 29.33, Since then the pressure has slowly risen 29.57 Sunday morning and 29.63 this Monday morning a half gale, a leaping boat, wind veering to SE. Light winds Sunday changing to strong NW wind Sunday night and alto-cumulus clouds this (Monday). Rain Sat, overcast Sunday.

(Barometer 30.08 when we left Halstenburg Tuesday
Sunday night 29.9- Pressure 29.88 Friday
Monday 8:30 am 29.33 - rose, slowly, to
later 29.57 Sunday morning and 29.63 this Monday morning)

× as the height of the gale came Friday night), aboard aboard the schooner I was by the galley stove leaning against the bulkhead when I lay over with the ship upon my back while pans

shot as if from Maggie's hand against the stove. A roar of laughter shook both Billy, the cook, and myself. A second shock acted like a knuckle, shooting jam, bread, dishes, flour, sugar in and yet. This was too much for Billie, who set to work to classify the wreck. In the main cabin everything moveable was shot across the room and the door. The men had boarded themselves up in their bunks. Florence arrived smoothly by the floor route beneath my cot bed safely pinioned between the table and davenhill bunks.

The boat creaked but sped on leaving a wide wake. At midnight there was the sound of pumps, followed by hurrying feet, then apparent calm and talk of "shore", I thought. The day dawned with the captain jubilant and honoring Robert Peary as "a chip of the old block" for standing watch while others slept. Only Streeter beside was mentioned in the brief roll of honor.

Waterlogged Billboard entitled "a man, and a camera could have saved a picture of the road" - Mazo Wild, "Thought she sounded funny when up" - Uncle of Seiffen Town

Monday, Sept. 13.

Temperatures of water

43°F. at Holsteinsborg, then 41.5 down Davis Strait and approx. 44 in the open sea, until Sunday evening when the temp. suddenly dropped to 37½ and has continued so to day. See detailed mess. But does the Labrador current begin so far south?

Icebergs - Icebergs have been with us since Saturday, tho the temp. even rose toward shore and fell decidedly only Sunday afternoon. Pinnacles, turrets, plateaus, fragments - Today we are passing thru a never-ending procession, under a sunny sky and in sluggish sea. How delightful to walk out, to dine out, to eat without racks, and have a special meal. How shivery cold the air yesterday and today - yet the water temp. is the same, and for b. that of the air. But the wind has gone and the sun returned. So human climate needs different measurements than the climate we usually study.

Log: mainly current, NNE, ship's progress

Course: Not so long ago - only it seemed so. Three days by dead reckoning with a sluggish log and southward current. We have run to Labrador Coast to catch current and then gone consistently S-SW (Magnetic)

Today, observation & sun at noon placed us 20 mi. off Twillingate & 90 mi N of Indian Harbor and 30 mi. S. of Hopedale at Hamilton Inlet. Not at all bad. Six days out and 225 mi. from Belle Isle. On course N, 6 days from Belle Isle to Hg but hindered by ice. On course S, aided by current but disdained by propeller. Mighty fortunate this far. Donnevey, Capt. S. has taken 42 days from Twillingate to St Johns. So hold your breath -

Land - low hills inshore but above the remaining coast line, jagged like a lighthouse off the coast. Wind very light but current bore us in during afternoon until high cliffs Easton and other islands outside of Twillingate off our bow. Yet N of places with boat idly drifting stemforward x S.

From here land on starboard all the way - a dark sunset & slight midst of bergs.

Tues. Sept. 14 - Labrador

Wind fresh after midnight. Denis Putnam and I maintained day hours in the outboard motorboat. In morning racing along an isle of icebergs - 10 on inside - as if reviewing the surrendered German Fleet. It had been a hard night for the crew. I had been (Tuesday & Thursday this July 25)
The mirror of clouds had covered the sky tho barometer was still rising.

Harrison: a mountain outline was on starboard stern - Cape Harrison and islands ahead. Uncle Tom now began to recognize points where all but Jack had spent their lives as fishermen. Seven Hat Island [redacted] like a "Beefeater's Hat" at London Tower.

Ships ahead: Two ships, scarcely distinguished from ice bergs ahead. We headed in. Why? Indian Harbor? Full sail, ships racing - 11 knots an hour. (Hooray! from some at table when they heard the report)

Earth's Birth

We race up the channel, geysers of spray rising from icebergs and reefs. Wireless station on far mountainside overlooking sea. Sails drawn in and eased off quickly. Passes almost barred by reefs, even rock moats,

The outer island is bare and raw as if just risen from the primaeval sea of corroding chemicals. Quite like expectancy in this land of achaean rocks.

Indian Harbor:—

In channel one encounters the first schooner towing a large whale boat, then another heading in behind a point 2 more toward the nearer entrance to Indian Harbor. The islands look like Goat Island in S.F. Bay. The hillsides bear somewhat tamer, one little lighthouse and yawl and cut throat point. Three schooners moored behind the point. Indian Harbor 8 miles up. Our pennant AMNH is flown from the mast as we speed by behind islands that cut down the heavy swell of the open sea but leave us with full sail spread.

Hamilton Inlet: Turn to starboard Skeleton Hamilton Inlet 100 mi. into Labrador where Billie, the Cook, has spent the winters in a lumber camp on Lake Melville at Northwest Brook. 1½" logs 14ft at butt and 70ft. long. Grenfell mission here and at Indian Harbor.

To Belle Isle: 24 hours to Belle Isle if best record made. Now pursuing two schooners with full sails set. Must overtake them in our lane. Now in open sea, but very elated some

Strange to change the company of icebergs for human ships. It takes somewhat from the wildness of the sea with its sweep and swirl and limitless breadth. To know its limits is to enter into its spirit, to fear it is to dread.

If daylight lasted could take inland passage to Belle Isle. Some boats two days and

[illegible] nights. Most fishermen do not want a "chart from the anchor" - Uncle Tom, but run by their personal knowledge of the coast. We have [illegible] one - 6 sails, 2 motor boats, heavy laden, cod codline, oil & Shreds and

We are now approaching the islands forming the SE point of Labrador - Wayback behind them, then Belle Isle - wish we could stop at Battle Harbor, the capital of the Land God made first.

Woman Ice Bergs!

a few bergs low out off Sandwich Bay below Hamilton Inlet - Prongs, pinnacles, flats, smoothed, tilted, small - Some grounded, most floating but progressively smaller - None of the winter type - all water worn and capsized - Uncle Tom says that they do not enter Belle Isle Straits but may drift down E. Newfoundland coast -

Thurs, Sep. 16 - Belle Isle Strait.

Beating - knots an hour against wind and tide - In sight of Belle Isle all night; Problem whether to turn back and run for St. Johns.

Sunset: the icebergs are attractive for their soft tints of gold and pearl gray which outlines the low rounded coast line

of Labrador and by its ~~mine~~ haze gives depth to the inlets between and beyond the islands. One can ~~not~~ the evening radiance ~~for~~ a subject and color like "Capri" -

Sailing lights: The ships are increasing as we leave Indian Harbor. I see radio masts along the coast to Battle Harbor, one ship with 7 sails, heavily laden for home passed us in the light breeze yesterday. Our sailing lights are now out again on deck ready for display if any ship approaches. One whaler (whales only in form) was seen far off on horizon.

Ice: Ice still persists in the form of one floe into Belle Isle Strait. But off Battle Harbor one of largest bergs was seen stranded. It was water crusted completely. Had it turned over? Its form and "entrance canal" reminded me strongly of one of Saarinen's austere buildings.

Who owns Labrador?

The crew say that Newfoundland

claims all of Labrador for 3 miles from coast, because used for decades by its fishermans and maintains all the lights there. That Belle Isle is the first light maintained by the Commission.

Aurora: Every night since leaving Halifax the crew say they have seen the Aurora. But the past two nights the display has called all the ship's company to deck. Curtains hanging and swaying rapidly in the heavens lighted by it were by pink lights and colored green, and purple and pink by a spot light. Again a cloud or "milky way" across the sky or several joining in a crown or canopy at the zenith. After the cloud resembled a spiral nebula and frequently the curtains seemed made of vertical pillars like Giant's Causeway or the pillars of the retina of the eye. The display began at early darkness and was still somewhat active at 9:30 pm

Monday - Sep. 20 - Somewhere in Gulf of St Lawrence
Head winds, a light boat, shortened sail, tacking to and fro, gaining little southing. Tried to make Harbour at Point Rich on Saturday but vessel would not come

round by the head and the captain drove out into the sea. The legs & our course are appox. 10 hrs long, the ship running out into the Gulf at night and back toward Newfoundland in the day.

The prevailing wind at this season is westerly and no one can guess from barometer only when it may change. The barom has fallen from 30 to about 29.8, not enough to cause any decided storm movement with relation of wind. Haziness, fog and clouds give a semblance of storm.

Landscape. The sea today looked like beaten silver, as often on Tahoe, rolling in silvered crests with slopes flattened by the rising wind and sheened by the sun breaking thru the clouds.

Lance au Loupe. Friday morning we drifted from the fog in Lance au Loupe on the Labrador side of Belle Isle Straits. Terraced headlands, rolling hills, crescent bay, white houses all orderly along the strand, fishers

boats speeding out to their tasks,
a telegraph line running west toward
a lighthouse (whose had come for
warning that led us in) and the
police at home. A wire was sent
to Mother: "Homeward bound. All well.
Tell President Clark."

Three cemeteries on beach, Wesleyan
Church of England, Catholic. Men will
fight for a creed. Schools Wesleyan,
and Church of England, Scotch-Irish
settlers as in Newfoundland. The
French seem to be further up stream.
Is the racial difference between
the Newfoundlers and the French of Quebec
any reason for former's refusal to join
the Dominion?

Smells - The next mind record to come
in afternoon and we set sail.
To see a remarkable sunset.
a long point and lighthouse and
wrecked warship at its foot, against
a sky of burnished gold changing
to crimson, - seen from the
forestays of a ship rising and
falling on the long slopes of sea.

Saturday night a moon sunset & similar colors occurred. Point Rich with lighthouse shone east on dancing shore.

When Home? A week or more if Sidney with this wind or with change of wind two days at most. But such thoughts are often lost in the loss of calendar dates. We are active with MS and reading and keeping fit. One can not hope for fast voyage without power. We have had a chance to understand the meanness and persistance of the wind sailor.

Off North Cape, Sidney. Wed. noon Sep. 21.

A Nor'easter. Five days from Lanse au Loup! Such is life aboard a sailing vessel. It may take a week, it may take a day. Monday night we headed again for the open Gulf but Tues morning we awoke to find the ship under balanced sail (wing and wing) leaping like a grey hound toward the south. The barometer

leaping down the sea while other ships lagged in.

had fallen but slightly (Sunday 29.98, Monday 29.85). However, under autumn conditions this may have been sufficient warning. At least at midnight the wind fell to a calm preceding a half gale from the NE.

Curling swells were passing, into which our sails drove the boats nose. To broach to too suddenly would be dangerous. So sail was shortened by lowering main sail, and heaven throat.

The sea soon became an expanse of spindrift driven from every crest or exposed face by the rising gale. Mountainous swells fell just short of the ship's stern or rose in froth on the beam.

The stay or riding sail was made ready in case we must turn and ride out the gale, if it became too fierce to run before it. And it was finally raised, but rather to change the course more directly toward Cape Ray and Sydney, made possible by the lightening of the wind.

At dark, however, came a scene that

beggared description. The gale had risen again, forcing the lowering of the foresail. Another pyramid breaking amidships over the second boat. Strident voices, artillery-like flapping of the canvas, which threatened to throw the struggling men into the water. Beating rain. Finally silence.

Battened hatches. Hot, reborn dungeon. Rolling pitching ship with everything movable shifting to and fro. Sudden Troubled sleep. One desperate roll and sickeningly slow recovery. Then call to raise foresail, clawing to sion and timbers to let in the light. And we were off Cape Ray. Thus in one day and two nights we had traversed Newfoundland, after taking four days to gain perhaps 60 miles.

"A continuation of the norwesters is taking us in once daylight day 90 miles from Cape Ray to Sidney. Leaping down the lane past St Paul's, North Cape, Smoky Head,

Leaping down the lane while steamships lagged in.

we race the swells which would roll a day like thistle-down until at the Sahara gates the bright light suddenly flashes out in the gathering darkness and the wind dies down as we creep in the moonlight to our anchorage. 16 days out of Halstensfang. Blest be the Norwester! To have seen it and have ridden in its lap was worth a life-time.

A Dance in the Forecastle.

Jim had been quite confidential as we neared home and stated that he would mend battles while the Captain mended the ship. A loan of $4.50 from Uncle Tom to the three boys and a trip to town to a drug store (?) suggested by him started things. As I started up the companionway to go to bed, a corpse animated only at the arms slid down over my shoulders. It was Jim aided over the side by Ralph and Joe. Larry and I were going to bed on the deck for our last breath

of sea air and visions of sky. But pandemonium combined of accordian, clog dancing, and attendant shouts made the cave plancing quiver beneath us. We felt like pop corn in a spider. Soon Will, the first mate appeared from the stern: "You fellows cut that out and go to bed" down the companionway. a protest from Tom for their rights and an exploding volcanoe of profanity and curses for captain, Mate and everybody from Jim. How so much malted profanity could explode from one mouth is still a mystery. Next Morning Jim with his few bundles and narwhal ran went ashore for goody bonus loot, little money for family of small children, and seeking another job. A man of physical power and devotion to work, but "ready to rip a throat"; only I don't believe that he would. I liked him and his dare-devil spirit. We haven't yet had that day ride, I offered

to take with him when he nearly sunk our pontoon at Camp Little.

Bumping Home -

How I pined for the leaping Merrimac as my elbows daily became sores in the Pullman aisles. How large is the first, how narrowed the other. It's the macrocosm and the microcosm of life, the large and the petty, the sweep and the jostle, the view turned outward and the view turned in. In one you grow, in the other you fuss.

Montreal and Doctor Barnes.

Again in the city of the mountain park and sequestered campus. A wonderful hour seeing sunsets in color and glass slides taken by direct photographic process - almost as delicate as in nature itself and the demonstration of destroying icebergs by thermite - merely a process of disintegration within 36 hours. This is an achievement in the face of attempts by dynamite and the Literary Digest

demonstration of "It can't be done".

And the welcome by Mr Chalifoux of the Schawinigan Power Company and invitation to return Christmas to fly over the St. Maurice Basin, "Breaking Home Ties".

So feel we all of us, and especially Larry, Billy, and I at parting in Detroit.

Reflections -

1500 miles without deck and running lights! The world had been left to darkness and to us. No other ships and the icebergs wouldn't get out of our way in any case.

Far easier sailing than Kite? had when bringing home the meteorite from Cape York. The even the compass failed to function.

Time meant little except that "every day in every way" we grew more tranquil. Is this then the Lotus Eaters lethargy of the Odyssey? Perhaps it explains why it took an Ice age to drive men to activity and to progress. The winter storms

drove us South quite against our will.

Yet we have brought our mood with us, and shall keep it to ease the fret and hurry of overspeed that has marked our course.

A Month Later.

Is it all a dream? So long is the trail we travelled and varied the scenes that the end of the trail is a haze in which dreams rather than memories are stalking. Even yet I am waking in unrealities and am only now acquiring the tardiest alertness to the immediate present.

Music is still like intoxication after these months of intense and prolonged silence; my nerves jade readily under the excitation of music. Music is one of the grandest of earth's phenomena but necessitates some sacrifice in the comfort of the elemental sounds and silences.

Same day, like Odysseus, paddle

Donnell legs are not. Start or continue against current and strong wind.

on my shoulder, I shall go to the remote places of earth to tarry awhile and then on. Donnell says: "Pearls before swine". But life is richer there, for you are nearer yourself and the eternals, and people need you there as here.

I can understand now why life was slow when man was solitary and has sped up since man commingled. It is progress but at a price.

After all the age of the monks was one of the great ages — a preparation at least for the hectic life now. Life is sometimes too much with us, except at the Top of the World.

Nov. 4, 1926.

J. E. C.

BLACK FLIES

BLACK FLIES

Barometric Readings

Sunday Aug. 15. 1926

The Gates - Tennessee -

	Pressure [in.]	Temp. [°F.]
8 a.m.	29.74	49.0°
9 a.m.	29.77	58.0°
10 a.m.	29.77	66.0°
11 a.m.	29.77	64.0°
12 Noon	29.74	58.0
1 p.m.	29.81	90.0
2 p.m.	29.81	91.0
3 p.m.	29.77	75.0
4 p.m.	29.69	57.0

The Iceland Fisherman by Pierre Loti (Trans. by W. P. Baines) Stokes Co., New York.

Wed. Eve

Evap for

Temp of Soil Cloth end 37° - depth 2 in
other hold 39°

– Sep. 2 –

Tundra frozen rather firmly underfoot. Frost line going down to meet eternal frost. Ice in can and buckets.

– Sep. 3 –

Coldest and most ice. Small bay holes being covered by ice.

Presence of moss in winter may counterbalance loss of leaves.

Rainfall

July 14	.02
" 15	.31
" 16	.13 = 0.46 in

— Cont from End —

3 a.m. 41.0° 39.0° Clds 1%; Trade-clouds NE; Also SE-S and in W. Clds in SE-S and W are really gathering fog bands and lie below crests of ridges forming shores of Lake,

Bar 29.72 (46°)

Fog clds W.* Wind NE 4 mi.

* Later: Fog bands now moving W with general circulation. Some of bands are really old and show rim of water.

6 a.m. 41.6° 40.0° Clds 10%; Trade-clouds NW-W-SE. Trace in E.

Bar, 29.73 (47°) Clds NE - Wind NE 8½ mi.

One bar of fog at W. and of trees.

9 a.m. - Photographing -

10 a.m. 52.0° 47.0° Clds 5%: Cumu. in NW-NE Trace in S and W.

Bar, 29.82 (70°) Clds NE. Wind W. Trace.

12 Noon 61.0° 49.5° Clds 3%: Cumulus mostly in N (Pingo) and S, E. Trace in W.

Bar. 29.81 (74°) Clds E of N - Wind S 13 mi

(Bearing Camp)

2:30 p.m. 62.0° 49.4° Clds 3%: Cumulus mostly S W N NE.

Bar 29.82 (74°) Clds NE, Wind E of S. 19 Mi.

Near Old Camp near Waterfall (of Camp No 1)

6 p.m. { 59.0 / 56.0 } 49.0 Sun on camp / 46.5 (Sun behind range) Clds T. In N.

Bar. 29.74 (60°) Wind E of N (down side canon of valley) 5 mi.

9 p.m. 52.2° 44.0° Clds 0%.

Bar. 29.73 (53°) Wind E of N (down side canon from V- valley) 7 mi.

Tues, Aug. 17

~~12 M Midnight~~ 1:30 a.m. — 41.0 — 38.0 — Clear

Wind - Calm, 0.

3 a.m. — 38.0° — 36.0° — Clear Cloudless

Bar. 29.69 (35°) — Wind Calm 0

{ Frost on Covering boat and rain coat
Dew on tundra

Sky rosy N & E. Sunrise nearing.
"Reekie" birds singing. Other "chirping" sounds seem more frequent this morning.
All no near home 9.

6 am — 48.0 — 43.0 — Clear - 0% Cloudless

Bar. 29.73 (37°) — Wind E - Movement T

At East End of Portage at Itavnok.

9:35 am — 58.8° — 49.0° — Clear. Cloudless

Bar. 29.83 (66°) — Wind E 4 mi.

Note - decrease in elevation! or rising barometer?

W. End of Portage

12 Noon — 65.0 — 51.0 — Clear - cloudless.

Wind W (up valley from fjord)*
Movement T

Bar. 29.88 (75°)

Later! Now 10 min, later wind E.
Probably "variable."

"Pot-Hole"

Fiord - Off Belknap Island (or more exactly) 52.0°

" - Off N. Head of University Bay 51.5°

" Aug. 24. Off Radio Point 42° F.

" Aug. 27 at Boat Landing (4 S.P.M.) 45°

Correction for Barometer Noon Aug. 18 -

Mercury 29.73 in.

Aneroid 29.78 in (66°)

Correction — .05 in. *

N.B. Aneroid Metric, change mi. to kms.

* Sunday, Aug. 29, Corrected, 0 -

Meteorological Observations on Trip to Inland Ice.

Monday July 26 –

Psychometer + Temperature

		Dry °F	Wet °F	
July 27 – 6 a.m.	Camp 1 – Falls.	49.5	42.5	(E. of Itivnek)
	Camp 2 – Head of Tasermiut.			
5:20 p.m.		58.8	49.0	Tasermiut 49.0 5 h.m. Wind since noon
	Wind fresh W. all clds W.			
8:10 p.		29.20 in. Barom.		
9:15 p.		52.0	43.0	Tasermiut 45.5. 9:15 Wind still fresh.
				Depth of Tasermiut?
July 28 6:30 a.		47.0°	45.0°	Tasermiut 47.0° Wind quiet.
	Upper clds W; lower E but clear or milky.			
8:45 a.		29.35 in.		
9:04 a.		51.0°	47.0°	9:10 a. 54.0°F. Calm + rippling. Shallow water Insolation?
	Sky clear except in E.			
9:40 a.		29.43 in. (72°F.)		
12:13 p.		64.0+	50.5°	9:20 49.0 In blue water.
	Clds: cumulus + strato cum. in east, but from W. too. In South: stratus + "cirrus" from W.			
	Wind: W + light.			
Camp 3. Ready to quit.				
+ Summit of Pass. 350 ft.? above Tasermiut. Trail NE.				
4 p.m.		58:0	47.0°	Wind W. Fresh. Two local storms: one to N, other to W. near Pingo. Other clds strato-cumulus, moving from W.
7:20 p.		50.0	44.0°	Wind W. Clds 50%. Strato-cumulus and cirro-cumulus?
	Bar. 29.13 in.			
10:00 p.m.		43.0°	39.0°	
July 29 1:30 a.		46.0°	42.0°	Raining slightly. Sunrise red
4:30 a		44.0°	42.0°	3/4 cloudy, big bergs.
8:50 a.		56.8°	48.0°	Strato-cumulus W. 20%.

9 a.m. Bar. 29.30 in (55°F.)

Noon Camp 4 Augpagiagait Tasiat (Little) Large lake further E.

12 noon 58.5° 47.5° Wind E. light. Clds Cum. + Fracto-Cumuli From E.

Temp. of lake. 60°F (but little + shallow just above).

Bar. 29.15 in. (70°).

4:15 p. 57.0° 49.8° Surface wind E and feeble. Clds fracto-cumulus, E and slow.

Bar. 29.10 in (64.0°)

Query: Another storm over Pingo and very nearly overcast + westward. Does Camp Little lie in cloud zone and the region E. of Pingo in sun? Also presence of ocean? If so, ecological station on eastern lobe of Tasiaussaq far preferable.

6:15 p. 54.0 47.0° Wind E.

Lake 58° but wind from center of Lake | clds 10/10, an W. horizon. Fracto-cumulus medium E but clear.

all glittering (lake 1 mi. long).

9 p. m. 44.8° 41.0° Light breeze, clds 5/10.

July 30 – 12:40 a.m. 38.8° 37.0° Tiny breeze; clear. Moon Third Quarter

2:15 39.0° 37.0°

4:00 a. 40.0° 38.0° Sun just up. Light breeze. Clds E clear.

7:0 a.m. 48.0 44.0° Light E. clear.

9 a.m. 54.0 47.5° " E T

Bar. 29.10 in (75°)

9:55 a. (Au tunil) Tem. of Head of Little Aaya. T. in current of brook from large A.T. 55.6° F Little A.T. shallow and readily warmed up. Calm shallows 60°; wind-stirred shallows from up lake 58°F.; intake water from Big lake, 55.6° F.

10:15 a. Water at lower end of Big A.T. 58.6°F. Stirred by E. breeze

On Trail-W. side of large A.T.

Noon. 57.0 47.5° Clds 3/0, Frosty-cum. E but very clear. Tiny lunge to calm on lake. E.

Camp 5. Head of Anyaiviait Taiat

Mosquito Ipanyak
" Net Ipanyak-eit
Caribou - Nedlik
Fish - Ikalusk
Body - Chimik
Sakardlik - Tarrum
Itirnok -

Camp Little =

in W. Frosty-cum but light

of Lake 45.3°.

eh and mind.

their source.

seemingly barren

higher,

ea still

oming?

idly at

ad hills

%, Surface wind

T + E.

% in W.

mind light. E.

calms in SW.

butter just

by light of setting

s. cum; 25/0 clds

s. cum

" "

uns in SW.

clds in NE tinged

with moving red.

3:45 a. 36.0° 34.0° Clds 2/0, Wind T.

7 a. m. 48.5 43.0 "

8 a.m. Bar. 29.03 in. (53°) Wind 0.09 mi. (1 min.)

On Trail. W. side of large A.T.

Stream. 57.0 47.5° Clds 3/0, Fresh cum. E but very clear. Tiny large N cum on horiz. E.

Camp V. Head of Ruyaniant Taciat

254 p.

Temp.

Temp

M.B.: Te

Clouds: c

or rath

bunch

presen

Caribo

Camp

and

6 p.m.

Bar

9 p.m.:

July 31:
12 midn

2 a.m.

3:45 a. 36.0° 34.0° Clds 3/0, Wind T.

7 a.m. 48.5 43.0 "

8 a.m. Bar. 29.03 in. (53°) Wind 0.09 mi. (1 min.)

45.3°

wind.

ance.

by heavy

m,

ill

?

at

ills

fine wind

light. E.

in SW.

just

of setting

25/0 clds

SW.

clds in NE tinged with morning red.

Tri. Pages 5 + 6 + 8.

Tri. 9, 10, 11

12, 13, 14

No roads - Trails No. 6.

Social Thrift

"Far West Coast"

Economy of nature

Semele + Zeus - Danger - Immortality.

The Full Life.

Odyssey race.
Circe &c

On Trail. W. side of large A.T.

Noon. 57.0 47.5° Clds 3%, fracto-cumu. E but very clear. Tiny lake to S also on lake. E.

Camp 5. Head of Ruppiciant Tarn

2.54 p. 60.5° 47.0°
Bar. 29.00 in (72.0°) clds 5%, mostly all in W. fracto-cumu, wind W but light

Temp. of lake (edge) 59.0° F. (2nd bay).
Temp. of mountain stream flowing into head of lake 45.3°.

N.B.: Temp. of lakes affected greatly by depth and wind. Better get temp. of streams near their source.

Climate: Above Tasmanian hills becoming increasingly barren or rather dry in midsummer. Snows are higher, bunch grass is luxuriant but dry. Timber still present. But clay knobs are plentiful. Wyoming? Canadian country. Study: (1) precip. and (2) humidity at Camp little and here. Why the rounded hills and gradual slopes of clay?

6 p.m. 58.6° 47.8° Clds 5%, Surface wind light + E.

Bar 28.92 in. (58° F.)

7 p.m.: 46.4° 40.0° Clds 5% in W. Surface wind light. E. Sunset colors in SW. Eastern buttes just touched by light of setting sun.

July 31:

12 midn: 37.6° 34.0° Clds | alto-cumu: 25% clds. cumu

2 a.m. 38.0° 34.0° " Sky pure in SW. clds in NE tinged with morning red.

3:45 a.m. 36.0° 34.0° Clds 2%, Wind T.

7 a.m. 48.5 43.0 "

8 a.m. Bar. 29.03 in. (53°) Wind 0.09 mi (1 min.)

Half-way up Pass

9:10 a.m. 58.0° 48.4° 48.4° Clds 10%,
Cirro-stratus + Blizzard W.
Wind W. 6 mi.

* Was forced to descend to the stream of yesterday for water. Found that it was almost hidden by moss and boulders. Hence, the low temp. or rather protection from sun or insolation.

Camp 6. down end "Lake Offley".

11:50 a. 56.0° 45.0° clds 40%,
Strato-cumu. (lower) Thick in E. Clds (lower) E. Surface wind E. 12 mi. cirro plus E.

Temp. of Lake 59.0°

NB: Temp. of tundra has evidently caused cooling of stream at Lake A.T. Almost entire flow is underground from Offley to A.T.

Bar. 28.50 in. (64°)

3:00 p.m. 54.0° 45.8° Clds 50%. Heavy all in west, with rain streamers toward Pingo. Wind W. 6 mi.

Bar. 28.50 (57°) fracto-stratus practically stationary.

Note - Tundra on slopes of butte S. of Offley very thick. lichens abundant. More moisture here?

6 p.m. 52.0° 45.0° Clds 90%, Wind E 12 mi

Strato-Stratus, Strato-cumu. moving slowly from E, the condensation started in W.

Bar. 28.53 in. (56°) down

Lake 57°. Wind down lake.

9 p.m. 45.6° 41.0° Clds 90%.
Dk E. rain streamers.
Surface wind E. 3 mi.

Aug. 1 -
12:15 a - 41.0° 37.0° Clds 30%
Mostly in E. Wind E 3 mi.
3 a - 39. 36.0° Clds 30%.
Strato-cumu. mostly E.
Wind E - 4½ mi.

6 a.m. 47.0° 42.4° Clds 20%

In W. stratus, in E. strato-cum.; cirrus overhead.

L upper wind W, slow; lower E 14 mi.

Lake 54.0°*; in shallow outlet 55.0°

Bar. 28.53 in (53°) * Cooled by wind stirring lake, probably.

Temp. of water under tundra 36.0° (in side of open hole 6 in. deep in lee of rock and beneath 1 ft of tundra.

Local drainage from Prospect Peak, 2 miles or more per miles. Of ice under tundra at Camp Little. Yet vegetation of moss thrives.

9 a.m. 54.0° 47.0°

Clds 60%, in far NE + overhead to S.W. Clear 5° mi zone in middle NE - Strato-cum or strato-cumulus, or stationary, lower clds NE, moving slowly from NW. Surface wind E 5 mi.

Cirr. stationary all night.

Note*

Camp 7. Near upper End of Lake (temporary) near portage to Lake Diadem at Caribou Pass.

1 p.m. 58.0° 48.8° Clds 60%, strato-cum. Prec. stationary. Surface wind E 2 mi.

Bar. 28.50 in. (64°) at (reg. camp)

3 pm 54.4° 47.4° Clds 60%, clear in E. Rain streamers in S.W. Mostly strato-cum. Movement slow from E. Surface wind NE. 7 mi

Bar. 28.53 in (60°)

6 p.m. 52.0° 46.0° Clds 70%, clear in E Strato-cum., rain streamers on S W horizon. Clds stationary. Surface wind N - 9 mi.

Lake 53°

Bar. 28.50 (54°)

Note. Clear over Ice Cap all day.

* Note - One hill-top surveyed from Lone Affley - met. Local rain during prevalence of storm to N over mts.

Solar [illegible] - [illegible]
Opal effect

9 p.m. 40° 36.6° Clds 10% in W
altocumm, few stratus
in E. Wind NE 3 mi/h

Monday Aug. 2
12 midnt 36.0° 32.0° Clds 2%, Vapor
rising from lake and its
inlet, calm. No stars,
Moon only. Frost.

3 a.m. 32.6 32.0 5% Cirrus
over N, E, SE.
Wind NE 5 mi.
Ice in can 1/8 in. Hills
and flat white with frost.
Sun just peeping over hills
Vapor still rising.

6 a.m. 46.0 41.0 Clds T. Wind NE
6 mi.

Lake 48.4° - Supercooling during night 4.6° F.
Bar. 28.47 in (48°)

On Trail above upper End Kardlingosuit
51.4 48.0 Clds 5% in S.
qam? Bar. 28.10 (54°) Wind NE. 5 mi.

Camp 8. "Interclavium", renamed Lake Harold H. Emmons,
12 noon 60.0 48.8° Clds 10% in South
but mostly filmy stratus
* [In sun 65.0° 50.5° with wind 5 mi.]
Psychrometer not shielded

Bar. 28.33 in (60°). Wind NE 5 mi.

* "Temp. in shade" in Greenland, where
there is no shade, is an anomaly. So at
Gould's suggestion, the temps in sun (both dry
and wet temps.) will be taken occasionally.

Same temp. quite like shade temp. Why?
Wind movement only 5 mi. The movement of the
sling psych. is higher. What is the rel. humidity?

3 p.m. 60.0° 48.0° 5%. Thin stratus in SE
Wind E 2.5 mi.
Bar. 28.23 in (66°)

6 p.m. 57.0 48.0° Filmy stratus in W. 10%
Bar. 28.28 in. (62°) Wind NW 8 mi.
Lake 56.0° light breeze across lake (no outlet but feeds 1 mi or more long)

9 p.m. 46.8° 42.0° Clds 5% in S.W.
Wind W 5½ mi.
Bar. 28.28 in. (54°)

Note: Sun went down behind range at 8 p.m.

Tues. Aug. 3

12 midn. 34.0° 30.0° Clds T in S.W.
Wind — Calm

3 a.m. 31.0° 32.0° Clds 10%. mostly in N.
mostly cirro or cirro-stratus
Vapor arising from lake, fast,
ice ¼ in. Calm.

6 a.m. 46.0° 40.0° Clds 5% in N mainly - Cirro-strat
Bar. 28.23 in (36°) Wind N - 5 mi.

7:15 Lake - 54.0° - Night cooled 2°F.

9 a.m. 53.0° 44.8°

Bar 28.17 in (52°) Clds 10% mostly in N + E
Cirro-stratus - N+NE 1 mi.

.07

Arctic, Camp 9

Camp 9 - Mountain Valley.

12:15 p.m. 56.6 47.0° Clds 50% Cerro-stratus or rather strato-cirrus in NE to SE, Cumulus with funnels below in W.

12:50 - Wind N 6 mi.
Bar. 28.32 in (66°)
water in small pond (no outlet, very shallow) 61.2°
NB. wet (waterlogged) moss under tundra 1 finger length deep near margin of pond 35°; water oozing up under pressure 35°. Hills all dry and mountain valley small. No snow. Tundra a good insulator like wet burlap on a water jar

1:30 p [In sun (without whirling) 59.4 52.0 Wind 8 mi
In shade - whirled 59.0 50.0]

3 p.m. 60.6 48.6 Clds 20%; alto-cum in N, and S.W. cirrus hgt from NE & S.W. - also a milky way streak in S.
Bar. 28.27 (70°) Wind NE 12 mi.
alto-cum. clds from NE but slowly.

6 p.m. 56.0 44.6 Clds 5% - Cirrus in E, alto-cum. in W.
Bar. 28.33 (63°) Wind NE 13 mi.

Sunset in NW. Sun touched western hills 8:30 p.m.

9 p.m. 43.0° 37.2° Clds 3%, around horiz. E, N, W & SW Strato-cirrus.
Upper air SW; lower E 1 mi.

Wed. aug. 4 - [illegible] 36.0° 33.0° Clds 1% -
12:10 a.m. Strato-cirrus NW & NE
Wind E 6 mi.

3 a.m. 36.0° 33.0° Clds 3%; low band on SW horizon, cirrus in NE
Wind E 5 mi.

Sunrise just occurred - on NE over mountains sunrise 3:10 a

6 am 44.5 40.0 Clds ½% in NE Strato-cirrus + 1 band alto-cum.

Bar. 28.40 (52°) Wind N 6½ mi

[Risen .07 in over night]

Lake 52.4°

On trail up Terraces leading to Ice Cap Camp.

9:30 a. 54.0 36.0 Prec. calm.

Bar. 28.33 in (54°)

On Trail near Ice Cap Camp

12 Noon 57.0° 47.0° Clds 3%, E & S. Cirrus

Bar. 28.27 (72°) Wind NW 6 mi.

[In sun 63.8° 50.8° without whirling]

N.B. Only 7 degrees warmer in sun than in shade if wind = whirling.

Bulb 59.5 48.5 when whirled in sun

and 58.8 47.4 when in shade but not whirled

On Trail overlooking Ice

3 p.m. 52.0° 43.2° Clds 50% Strato-cirrus + cirrus, with long band of strato-cumulus on S. horizon. Wind W 7 mi.

Bar. 27.83 (70°)

S. hazy.

Mortimer E. Cooley,

Camp 10 - Edge of Inland Ice. *[S & W sky cut off partially by canon walls]

6:10 p.m. 49.0 41.0 Clds 50%, Strato-cirrus in masses with open sky both over ice cap and over land to NW - SW,

Surface Wind NE 5½ mi

Cirrus clds SW - cloudy -

Bar. 28.07 (50°) Dial anem. 7:30 p.m. 535.2 mi.

* 9 p.m. 45.0° 39.0° Dial anem. 540.3 mi. [av. 3⅓ mi.]

Strato-Cirrus 50%, haze over Ice Cap.

Movement from SW clouds; surface wind N-NE

Bar. 28.03 (40°)

Sunset completed 9:15 p.m. [Purplish pink haze over Melish ice] streaking from right line a rippling rosy sea.

* Weather Station set up this evening with pair of caribou hooves for base for anemometer and red silk flag for wind vane. Fishpole gives azimuth.

→ But NW - SW sky not visible for beyond Zenith.

Thurs. Aug. 5

12 mid. 40.0 36.0 Clds cirrus

w strato-cir. 5% in NE

Wind W-S.W. Dial 552 ?

Mostly calm.

Ice deep blue. Moon in N-NE. Sky thinly flecked by sun.

3:20 a.m. 41.0 36.0 Clds T - Stratus and alto-Cumu. in NE-SE

Tiny bank on horizon in E

Wind E Dial 548.5 av. 1.3 mi.

Sunrise 3:10? NE by N. (at 3:30 cloud 6 diams up)

6 a.m. 46.0 40.0 Clds 30% cirrus and strato-cirrus on E horizon and E, W, + S. clds

Upper air W; Wind NE Dial 553.4 mi. av. 2 mi.

[7:42 a.m. Balloon Ascension 1]

9 a.m. - Absent with others to visit ice-edge.

12 Noon 56.2 46.5 Strato-cirrus bands mainly in E, S, W.

* Upper air W, lower E. Dial 594.2 mi.

av. 7.6 mi.

Bar. 28.07 (68°)

[12:43 p. Balloon ascension 2] Ice in general SE

3 p.m. 55.0° 45.0° Clds 20% NE & S, W

Strato-cirrus,

* Upper air S; lower SE Dial 623.8 av. 9.9 mi

6 p.m. 53.0 44.0 Clds 60%,

Stratus in E, Cirrus everywhere

Upper air S-SW Lower E-SE Dial 655.5 av. 10.6 mi.

Bar. 27.98 in (56°) Lake 58.0°

* as determined by cloud movement.

9 p.m. 52.0 43.7 Clds 90% stratus mist
cirrus texture

Bar. 27.92 (53°) Clouds from E-SE. Wind SE. Dial 6950 Alt. 13,2

Sunset 9:15 p. Colors in NE
9:30 - Tendency toward lenticular clouds in N. Views from Tongue Point
Sunset colors brilliant as seen from Point
Delaverge, opals, agate with little bar forms and
Styles.
Wind very strong from SE at Point

Friday Aug. 6

12:15 am 52.0 42.5 Clds 70% Tracts rotate
many directions. Thin
Wind SE. Dial 758.0 mi = 1914 ft
Low gumps - Slight
Warm glaciers still pouring silently on the above
a mirror only deeper in the color of the sky.
Alex Kerman.
Sea light water blue
Heavy Clouds - Gray blue
Filling clouds Pearl gray 153.5
Sky or sky blue 123.8
For 14 Sq = Sky to p. bearing 31.7
1/0.6 Three bays, mists in alps

3 a.m. 51.0 42.0 Clds 90% 70%
Tracts - stratus in long bars, sweeps, mist
a veils of lacy like cirrus stratus fringes
like a curved radiating from N
Wind SqE Dial 816.2 = 21.2
Sunrise 3:10 thereabouts.

above base, a mist of mists also gray.
Snow more gray with dark depressions
Low (Clds sweeping from E to
Rather all like movement N & west look mist.
Low upper clds have another & quicker Bar 27.90 (49°)
movement, apparently not fast.

6 a.m. 53.0° 44.0° Clds 90%
Fracto-stratus with elongated lenticular shapes at all points of compass. Cirrus background.

All clds SE, mod, rapid. Wind E of E to SE Dial 875.3 mi
Bar. 27.98 in. (54°)* Very gusty: aver. 19.7 mi.

Inland Ice ripples and shimmers under passing clouds like surface of water.

*Barometer: Fell from Noon yesterday 0.09 to 6 p.m. and 0.06 further to 9 p.m. = and 0.02 in more to 3 a.m. = total 0.17 in.
But to 6 a.m. has regained 0.08 in.
From 6 to 7:10 has regained 0.01 = 0.09.
Later: and at 9 a.m. has fully recovered.

9 a.m. 56.6 45.8 Clds 15%, in N, E & S.
Fracto-stratus with fringe to leeward verging into cirrus.

Clds E & S;
Bar. 28.08 (74°) Wind SE. Dial 928.8 mi,
aver. 17.8 mi.

12 Noon 55.0° 44.4° Clds 70%
Stratus to fracto-cumulus, with a few lenticular forms. Stratus NE to SE, cirrus upper ground, esp. overhead & W.
Clouds S - Wind E-SE. Dial 986.8
Bar. 28.03 (63°) aver. 19.3 mi.

3 p.m. Instruments packed and with expedition on Inland Ice.

Eye Observations: Wind very strong on Ice from E and S, often blowing us off our balance made unsteady on ice slopes and ridges already because of heavy snow. Dust from the flood plain filled the entire canon and rose above its walls. On returning to land, the sand of the lateral moraine cut our faces. When going along slopes with the wind, we were turned around by the wind-vane tail made by our pack.

numerous in west and north.
Query; what part did the change in pressure have? Need a weather map of Greenland or Arctic.

6:40 p.m. 51.0 42.0 Clds 95%.
Barred stratus, radiating from - stratus with lenticular tendency, lenticular clds numerous in west. Much cirrus background or rather ground to the stratus have flocculi or fibrous texture.
Clouds S & E. Wind - S & E. Obs. veloc. 18.5 mi
Died next 7:48 p. at 0.
Bar. 28.05 (54°)

9 p.m. 48.8° 41.0° Clds 80%
Stratus & Barred Stratus N & SE
Lenticular T. cirrus effects
One lenticular in W about 7 pm was a double tri- or quadruplane. Flocculi overhead.

Clds SE; wind SE. Dial (9:20 p.) 44.8 mi. av. 17 mi. "Gusty"
Bar. 28.07 in. (48°)
Sat. Aug 7
12:15. 48.0° 39.8°

Clds SE Wind SE Dial 98.0 mi av. 17.7
3:15 a.m. 48.0 40.0 Clds 70%; Stratus in long banks, lower in E, traces of Cirro fracto-cumuli with cirrus effects.
Clds E & S. Wind S & E. Dial 136.0 av. 12.7
Sunrise 3:18 over thin banks clds still gusty but growing milder
Bar. 28.09 (44°)

6 a.m. 49.0 41.0 Clds 95%. Sky mottled Strato-cumuli effect. Faintly clearer in E-NE.

Clds - milling back and Wind S.W Dial 168.3
Bar. 28.10 (46.0) fast slowly, av. 12.8 mi.
8 a.m. (Going again on Ice)
51.0 44.0 Clds 95%, alt - cumulus (?) almost nacreous (flocculi) Stratus on horizon NE to E. Dial 190.7 mi
av. 11.2 mi 22.4
Clds - very slowly milling. Wind SE
Bar. 28.13 (53°)

12 Noon — Bot. side of Glacier Lake adjacent to Ice Cap. S. of Lake Camp.

49.0 44.6 Clds 50%, mainly cirrus evenly distributed. Horizon, W cut off by mountain wall.

Bar. 28.47 (72°)

Water in Glacier Lake at least with gray water and contiguous to Ice Cap 50° (well stirred by wind) — yes, it is fed at its head directly from the Inland Ice *

Clds E Wind 6 mi. NE

Bar

In Sun — 66.0 54.0 Luncheon.

"Waves are drowsy" Dr. Hobbs, a good place to bask in the sun on the warm hillside on the beaches with the lake plashing on the rocky shore

* Temp. of stream flowing from Inland Ice in rapid current ¼ mi. 42° i.e. ¼ mi. distant from ice front.

On Inland Ice — Off mo Chapin.

4 p.m. 43.5° 39.0° Clds 95%, stratus except first 2 hrs in NW. Overcasting & covered within abt hour. Previously cirrus floats.

Bar. 28.10 (49°)

Running water on Ice 32.0 Wind mile 5 pt E — 13.5 mi.

9:00 pm at Camp Cooley. 48.0 42.0 Clds 100% — 95 Thin Stratus a few long thin banks and some flocculi

Dial reset 246.0 mi. *

Bar. 28.13 (52°) Clds S ½ very clear Wind — Calm

Supper

* Must have been misread Prob. was 195.0 mi.

Sunday, Aug 8. Tirrel - Overslept. 52° prob incorrect. Cent 48 diff. to read even in day.

1:40 am - 52.0° 40.0%* Clds 90%.

Cirrus in NE over horizon with streaks of stratus, Charles Law's stratus & stratus with phacts for glamdy.

Clds stationary. Wind W - Dial 245.2 mi, Anem. T Prot. 195.2

Bar. 28.13 in (44°)

Note. Sky very muddy E of N with cirrus clouds in NE merging from pink to delicate blue. Island in a grey blue vapory sea. with narrow blue rim of clear forming its eastern horizon. Just on edge special shading of clouds. The air feels like rain, but psychrometer does not verify this. However, circle seen round sun yesterday from ice-cap.

3:55 a. 46.0 42.4 Clds 90% Long bars in E with mackerel sky behind. Elsewhere mackerel thickening into stratus, Dark in west.

Clds stationary

Bar, 28.18 (45°) Wind calm, Dial 245.7 Anem. T last drift is SW, 195.7

Note - Sunrise like Grand Canon - Beam of light touches now one place, then another which stand out suddenly from the rubble. Rises up.

6:15 a.m.

47.0 44.0 Clds 95% Stratus with pleacuti in E & stratus in W.

Clds stationary. Drift of air W. Dial 196.2

Bar. 28.18 in (50°) Anem. calm. Av. 0.2 mi

* Wind - anem. dial must have been smeared except for tenth last night. The cups have practically been stationary all night.

2.3 | .50 | .2

In Chinese ice much higher than yesterday.

900 .83 2700

1 in = 900

9:15 a.m. 47.0° 44.6° Clds 98%

Stratus mist in few horizontal rifts on E. horizon. Only occasional frosty-crumbs.

Clds stationary - Wind E but very light Dial 198.0 mis
av. 0.06 mi

Bar. 28.20 (52°)

12 Noon 47.0° 44.0° Completely overcast

Stratus modulated on under side a streak of lighter cloud on NE ¾ E horizon.

Bar. 28.23 (53.0°) Wind E by N Dial 200.7
av. 1.0 mi.

On Trail Back -

3 p.m. 48.0° 45.0° Overcast - Fracto-str.

Sprinkling since 6 p.m.
Evidences of rain from Ocean ✕ and over Cape at least to horizon.

Bar 28.20 (53°) Wind NE 3 mi.

Camp 1 - (Return)

Last limit Place In 6 p.m. 46.5 44.4 Overcast and sprinkling - One clear spot on horizon W-NW.

Bar. 28.38 in (52°) air draft E. Calm.

NB. Blackflies up and very active since 3 a.m.

9:24 p.m. 44.5 42.0° Clds 100%

Fracto-stratus in W; clearing stratus with fracto-meanings. Sprinkling ceased

Bar. 28.37 in (50°) Wind: Drift E. Calm.

✕ i.e. has already practically cleared

Monday Aug 9 -
12 mi bright
44.0° 41.8°

Clds 100%
Fracto-stratus - in W & frost - melt during [illegible] during day has ceased & sky has cleared decreasingly and has now ceased

Bar. 28.37 (47°)

Wind - Kept E. Calm

Nota - Too dark to read any instruments without artificial light. This making also practically illegible in present light. NB. Fracto-stratus retires, and stays, in mornings, they are as low as in afternoons.

3 a.m. 43.5 41.0 Clds 100%, fracto-stratus

Bar. 28.37 (44°)

Drift SE stronger than at midnight but Calm (a.m., does not turn)

NB. Visibility near very good.

6 a.m.
46.8 44.0 Clds 80%

[Precip. T. Moisture and fed mostly evap.; also in tundra]

Clear in W - alto-cum in bands in W - uniform cloudiness, cirrus textura - few fracto-stratus below strato-cirrus in E.

Bar. 28.38 (44°)

Wind E. 6 mi -

NB. A one-day storm. Normal again.

On Trail NE of Valley Camp - (name?)
9:00 a.m.
53.0 47.0 Clds 60% - long. bars & stratus breaking into alto-cum. or floccule. Clds tuning [illegible] long. bars or lenticulosque

Bar. 28.50 (58°)

Wind N. 3 mi.

Clds very slow S.W.

On Trail near Valley Camp.
12:00 Noon 61.0° 51.0° Clds 10%

Cumu. in W. Strato-cirrus with tendency toward elongated particular - NW to E.

Clds stationary & wind E 9 mi.

Bar. 28.62 (66°)

On trail approaching Lake Emmons.

3 p.m. 59.4 49.0 Clds 20% occasional
Rank of Cum. in W-SW, tracts - cum N to E & S
Tendency in E & S a wide flaring plume.
Bar. 28.54 (62°) Wind E, 15 mi.

Note - Tendency of cumulus in W over Pingo & shower, clds & almost nimbus

Camp 2 (Return) Lake Emmons.

6 p.m. 55.4 47.0 Clds 60%

In NE cirrus and alto-cum. with rounded or twisted contours. E to S and NW stratus, dark and centering in storm over Pingo.

Bar. 28.60 in (57°) Clds E; Wind E-SE 12 mi.
Lake - {Cloth covered 56° / Uncovered 55°} why? air temps. is lower.

9 p.m. 48.0° 44.0° Overcast, tracts - cum, clearing slightly in ~~SW~~ W.
Raining lightly since 6 p.m. Now ceasing
Bar. 28.60 in (52°) Wind E. 1½ mi.

Tues. Aug. 10.

12 Midnight 44.0 41.0° Clds 10%, tracts - str mainly in E of remnant ~~SW~~ forming stencils ~~SW~~ in W + SW.
Bar. 28.58 (46°) Wind SE 9 mi.
Clds travelling rapidly NE, i.e. upper cir SW.

Note - One star visible (in S)

2:45 a.m. 42.0° 39.0° Clds 10%
In W alto-cumulus, and lower rolls of tracto-stratus, a few reaching round horizon to N.

Bar. 28.57 (40°) clds SW - Wind SE 2 mi.

Rain →

Note - Sky ~~glad~~ completely round horizon
NB: Storms travel in from sea. Is this the source of moisture for these "steppes". Seems to be.

6 a.m. 49.0 43.0° Clds 95%; Clear in E. Elsewhere fracto-stratus forming to alto-cum toward E and SW. 9 mi.

Bar. 28.63 (46°) Clds SW

Note: Rise of temp with cloudiness.
Precip. 0.03 in (can, notch on pencil.

7:30. Wind veering N to W. Sky in western horizon green, above blue, On trail - Slight W by S breeze. 9 a.m.

47.2 43.2 Clds 90%, Arcs of cirro-cum in W, (stratus) Clear on E horizon. In E and zenith cirro-cum & alto-cum.

Bar. 28.43 (49°) Clds westerly Wind W. 10½ mi.

On Trail (Old Camp 7 - Offley Traverse)

12 Noon. 49.6 45.0 Clds 95%. Cirro-cum in W. horizon, Elsewhere fracto-stratus tending to nimbus in W and N.

Bar. 28.77 (50°)

Clds SW; Wind NE T.

On Trail to S. End of Offley (On S. side of hill). Near Offley.

3 p.m. 53.0 45.8 Clds 50% Clear N-NE over Ice. Cumulus in S-SW over Sea. Fracto-stratus overhead.

Bar. 28.30 (66°) Clds S.W. Wind SE 3 mi.

NB: at 3 p.m. Clear over Inland Ice and well-developed cumuli over Sea. Between sky was covered by stratus cloud grown denser as it approached the region of the Ice.
Query: Is not this the key to the atmospheric moisture?

Camp 3 (Foot of Lake Offley) On old Camp Site.

6 p.m. 54.5 45.5 Clds 50% - Clear in W haze? in far E. Elsewhere alto-cum with fracto-stratus below.

Bar. 28.77 in (63°) Clds SW. Wind SE 7 mi.

9 pm. 41.8 38.4 Clds 3/10
Stratus and Cumy thin
banks over Ice in E & NE
Clear here & Clear
Wind S & SW Sur. calm,

Bar. 28.67 in (36°)

Wed. Aug 11
1/2 midnight 35.0° 35.0° Clds T
2 Cumy to Strato-Cumy for E,

Bar 28.65 in (27°)

Wind 0 - calm perfect.

Note. Tower Affley and sight of water
over valley ~~at~~ proof. After long
5 min & minutes in perspective
same water on after Affley. Dark white and
sky & & pearl gray and Lemon. And here
ster in E 45° toward Zenith
Reflection & mountain line on Affley
plain. Surface of Ice above Mountains
yes in Chatham Sky in Fog - Cirrus ?
Possibly Cirrus Sky

2:00 am Fog rising in cloud at and & notch
& E as if over Inland Ice. Sky have been
nearer.

2:30 am Fog has now filled basin of Affley
and obscures sky and nets. Everything
white ~~with~~ frost. Cirrus not near by seen.
34.6 32.6

Bar. 28.63 (28°) Fog E Wind E-SE 5 mi.
Film of Ice in Cans.

6:15 am (after Breakfast)
46.0 42.6 Clds T on E Horizon,
Bar 28.67 in (42°) Wind E 1½ mi.
Tundra now fairly dry.

On Trail near upper End of A.T. Isthmus

9 a.m. 54.0 46.0 Clds T.

Wind Calm except dr. ashore up from A.T. i.S.W

On Trail - W side A.T. 12 Noon 56.8° 49.0 Clds T. and Cumulus

Bar. 29.38 in (70°) Draft on A.T. i.o NE Calm

In Camp at Little A.T.

3 p.m. 60.5° 50.0° Clds 1/10 alto-cumulus widely scattered.

Clds milling. No formation Wind E (Down Lake) 10 mi.

[69.0 59.4 (Umbrelled)] Sultry today on trail; calm there.

Bar. 29.38 (83°)

Lake 62.5° (Note - One may up near 99° but wind had been blowing. Today lake only rippling)

6 p.m. 57.0° 49.0° Clds 8/10. alto-cumulus Mainly in NE to S,

Bar. 29.30 (64°) Clds milling Wind NE 10 1/2 mi.

Lake 60.3° (Stirred by wind!) 49°

9 p.m. 48.0° 44.0° 1/10. Stratus with cirrus markings in SE stratus in S.W. 5 both Heliotrope colored.

Bar. 29.27 (49°) Wind NE 1 1/2 mi.

Thurs. Aug. 12

12 Midnight 43.0 40.0 Clds 15/10 Stratus NE to S - 6 Wt. Cirrus after sunset Wind N, 5 mi. since 4 also

Palais Nichols (P.) Stars faint - but can be seen

3 a.m. 41.0° 38.8° Clds 30/10 Cu. NE + SW Wispy stratus in NE, no cirrus or alto-cumulus in S.W.

Bar. 29.27 in (43°) Dew moderate Wind NE (Down Lake) 4 mi.

1.7
6
10.2

1.75
6
10.50

6 a.m. 45.2° 42.0° Clds 15%.

Stratus mist cirrus effects (mare's tail + (incanus?) alto-cum) in NE-E-SE.

Traces in NW and SW.

Bar. 29.29 (46°) Wind NE 12 Mi.

Lake 58.2°

On Trail Nog Camp on Trail (uptrip)

9 a.m. 57.8 48.0° Clds 5% Stratus on E horizon changing toward zenith to cirrus

Wind N 6 mi. ~~Stratus~~ shifting to cirrus.

Bar. 29.58 in (66°).

In sun [68.0° 57.0° unshielded] near surface of tundra. Felt cooling effect of breeze when calm. But prac. calm for most on tundra

On trail approaching Tasserssuaq

12 Noon 72.0° 55.0° Clds 10%; Stratus on E horizon

Sac. 69.0 54.0 thickening along horizon to SE and becoming cirrus on W.

[In sun 73.0 57.0 unshielded]

Wind S-SW (from Tasserssuaq) 6 mi.

Bar. 29.78 in (79°)

Direction changed near old camp at head of pass.

Query: Is this the frontier between Sea and Ice Breeze?

Old Camp Tasserssuaq

3.00 p.m. 63.0° 53.0° Clds 10%; alto-cum. and cirrus in W; occasional cumulus S to E and NE.

Bar. 29.93 (80°) Cumulus W; Cirrus E (but very slow and fragmentary milling here E)

Lake (stirred by wind) 55°F. Wind NW (upLoma) 20.7 mi.

Note - wind and seating of sun on shores true me back to Tahag Also air and water are as cold.

This must be a sea breeze. This is the frontier of Sea and Ice Winds.

NB. Study high barometer.

Day Thermometer Readings

July 27 - 1926

Sheep 1.

Hour	Dry	Wet
6 a.m.	47.5	42.5

6p.m. 54.0° 49.0° Clds 30%; clear in W. Alto-cumu. SW-W-N-NE. Strato-cumu. in N. Clear in E.

Bar. 29.92 (56°) Clds W. Wind W 15½ mi.

9 p.m. 47.0° 44.0° Clds 20%: Thin filmy stratus in W; alto-cumu overhead; Clear in E

Bar. 29.93 (51°) Clds W (very low) Wind W, 6 mi.

Friday Aug 13 — 12:25 a.m. Midnight. 2.25 Forecast: Calm & variable 43.0° 44.0 Clds 1/10 W at SE Strato-cumu. Wind W ½ mi NNW to SE Strato-cumu

3 a.m. 43.0 41.0 Sky overcast by fog riding above lake approx as high as the pilot house 50 ft above water. Drift NW (current and up lake) Calm

Bar 29.92 (43°)

4:30 a.m. Fog on surface of lake. Either side of lake cleared about three miles N leaving seaboard. Navigation difficult. Blue navy steam past N W. (42 Geese in bird)

6 a.m. 43.0° 42.0° Fog. Thin overhead. Clearing above lake. max ap from 50 ft. Sky above apparently clear. *

Bar. 29.92 in (45°) Drift E. Calm.

Lake 50.2° * Thin Stratus zone in for E.

7:30 a.m. Breeze from W.

Open Lake (East End) 48.4°

9 a.m. Enroute W. along S. Shore of Lake.

12 Noon — Midway W. Side of Lake. Clds 1% NW-W. Cirrus and group of cumulus over Gimlet NE-E Thin Stratus. Wind NW 2.5 mi.

Bar. 29.84 (60°) 52.8° 48.0

3 p.m. - Absent from boat photographing with Dr. Hall.

In Camp - S. Shore of Tassersuaq across point E. from S. Arm.

6 p.m. 55.2° 48.3° Clds 20%: facto-cumulus, S-W-N-NE; alto-cumulus in NE. In E clear except slender band of stratus and two small banks of facto-cumulus.

Bar. 29.81 (68°) Clds rolling & slow E; Wind W-SW 8 mi.

Note. Wind freshened about 2 p.m. and has continued.
Query: How much was wind delayed by falling barometer?
No reversal in expected direction resulted - it was either calm or W.

9 p.m. 44.8° 41.0° Clds T in NE + NW.
Bar. 29.78 (45°) Wind W 3 mi
or 29.79?

Sat. Tides. Aug. 14. ~3

17:5½ Midnight 35.0 34.2 Clds 10%; Bank clds - cum. on NE hills
alto - cum. or cirro-cum? overhead
Fog bank S. edge of lake.
Wind SW 4 mi.

3 a.m. 39.2° 38.2° Fog resting on crest of hills completely covers Lake, but is almost as high as clouds on W. horizon facto-cum.
Bar. 29.73 (38°) Fog W. Wind S.W 2½ mi.

6 a.m. 41.0° 40.0° Overcast by fog resting on higher hills. Entire lake clear below it.
Bar. 29.78 (42°) Direct E* (i.e. from Lake) calm
1 Lake 49.0° Later: * But fog is W

South End of South Arm of Tassersuaq

10:10 a.m. 47.5° 45.0° Clds 90%: alto-cumulus but cumulus NW-NE
Bar. 29.78 (64°) Clds S (slow) Wind - Variable - T
1 Lake 53.0° (Very shallow for long distance from shore)

E. of and
On Peak 1050 Ft. above S. Arm Tasserenaak.

12 Noon - 50.8° 44.0° Clds 60%: Clear in E-NE
Cumulus NW-NE over Rings
Alto-cume. SW-SE with cumulus
and nimbus in far S.E.

Bar. 28.54 (62°) Wind W-NW - 5 mi.

Note - Wide view upon W. end of Tasserenaak with
S. Arm and Gibraltar Gate and Rings.
Balloon field between the two arms.

3 pm. S. End of S. Arm of Tasserenaak.
58.0 50.0° Clds 70%: Clear in E
Alto-cumulus elsewhere, except
cumulus NW-E

Bar. 29.74 (64°) Clds milling - Wind W-SW 12½ mi.

1 Lake at Gates 49° (in deep water)

Camp Nuglenjakd on Lower Tasserenaak (Visibility of any point toward E.)

6 pm. 54.0° 49.0° Clds 60%: Clearest W + E
Elsewhere Strato-cume, above alto-cume
above cirrus, in SE cumulus.

Bar. 29.74 (60°) Clds W & S. Winds SW-W 15½ mi.

9 pm. 44.0° 41.2° Clds 10%: Strato-cume in SW + NE
Alto-cum. in SE.

Bar. 29.73 (50°) Clds S. Wind E (down pass to Lake)
Earlier from W. 5 mi.
Fog beginning to slip down over Gates into Tasserenaak.
Note. New moon above purple hills at end of Tasserenaak.
waves rolling as in Pontus

Sunday Aug. 15
(1:00 Midnight 41.0 39.0 Clds 10%:
1:10 am. Stratus in far W; alto-cum in NE and S.
Shutter and S.
Wind E 5 mi.

Vapour from beach.

3:45 am. -
39.0 37.0 Clds 10%: alto-cum in W and E,
fracto-stratus in S,
Fog banks to W. and of Lake and
one long banks reaching from
pass over S. Gate of Lake,

Bar. 29.68 (38°)
Clds SW Wind E 1 mi.

6 a.m. 43.0° 40.0° Fog as yesterday about T = 2000 ft high above Lake. Covering / complete
Later: Height / Appear. that of ridges.

Bar. 29.68 (42°) Fog W · Drift E - T

9 a.m. 46.4° 44.0° Clds 90% Tops of fog on hills. Alto-cum. except narrow zone above first of T mountains is clear. Below alto-cum, considerable fracto-cumulus.

Bar. 29.77 (58°) Clds NE. Wind SW-S Calm

12 Noon 50.0 46.0° Clds 30%: alto-cum. S-SW; cumulus with fracto. base NW.; Cum N-NE.

Bar. 29.74 (58.0°) Clds SW Wind SW. Calm.

3 p.m. 56.0 48.6° Clds 75%; clear in E except bands of cumulus; in S. alto-cum; SW to NE cumulus becoming numbers below. "Thunderstorm" conditions (?)

Bar. 29.77 (75°) Clds Wind NW 15 mi.
(just previously, calm but lake was showing effect of wind elsewhere)

Starting to sprinkle.

6 p.m. 51.0° 48.4° Clds 95%; fracto-stratus underlying alto-cumulus (?) Rain plumes SE showing - Cond of considerable chance.

Bar. 29.72 (54°) Clds NE Wind NW 2½ mi.

T = Rain + 0.01 in first ½ hr. Lake nearly calm again.

9 p.m. 48.0 46.2° Clds 100%; fracto-cum, N-nimbus in SW.

Sunset saffron. Hills copper gold. Rays luminous with atmosphere. Lake mirrored all colors.

Bar. 29.70 (49°) Lake SW - Clds NE. Surface Wind NE (has just veered) 4 mi.

Monday Aug. 16
12 N. Midnight 45.0° 43.0° Clds 80% alto-cum in NE.

Wind NE 6 MPH

Clds shifting - Clear in NE except T
Cum not now visible

IMPROVED TABLES

AND

INFORMATION

DIRECTIONS FOR USE OF TABLES

TABLE No. 1.

Distance of slope stake from side or shoulder stake for any width roadway, slope 1½ to 1. If ground is nearly level, the cut or fill at side stake is located by the double entry method in left column and top row. The number in body of table in same row and column gives distance from side stake to slope stake. If ground is not level estimate the difference in elevation between the side stake and slope stake, lower target by this amount if cut, elevate if fill. Add this amount to cut or fill and find distance in table. Set up rod at this point, and line of sight should cut target. If it does not make the slight adjustment necessary.

TABLE No. 9.

To find Tangent and External for curve of any other degree, divide by degree of curve and add correction found in column of corrections.

Degree of curve with a given I may be found by dividing tangent, (or external), opposite I by given tangent, (or external).

The distance from a point on the tangent to the curve is very nearly the square of the tangent length divided by twice the radius.

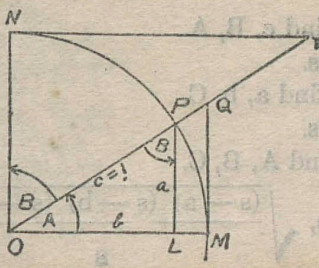


Table II

TRIGONOMETRIC FORMULÆ.

$\angle A = \angle MOP \qquad \angle B = \angle PON = \angle OPL$

$R = OB = c = 1$

$$\sin A = \frac{a}{c} = \frac{a}{1} = a = \cos B = LP$$

$$\cos A = \frac{b}{c} = \frac{b}{1} = b = \sin B = OL$$

$$\tan A = \frac{a}{b} = \frac{MQ}{OM} = \frac{MQ}{1} = MQ = \cot B = MQ$$

$$\cot A = \frac{NT}{ON} = \frac{NT}{1} = NT = \tan B = NT$$

$$\sec A = \frac{OQ}{OM} = \frac{OQ}{1} = OQ = \csc B = OQ$$

$$\csc A = \frac{OT}{ON} = \frac{OT}{1} = OT = \sec B = OT$$

$$\text{vers } A = \frac{LM}{OP} = LM = \text{covers } B \#$$

$$\text{covers } A = \frac{OP - LP}{OP} = OP - LP = \text{vers } B$$

$$\text{exsec } A = PQ = \text{coexsec } B$$

$$\text{coexsec } A = PT = \text{exsec } B$$

$$\sin \tfrac{1}{2} A = \sqrt{\frac{1 - \text{Cos } A}{2}} \qquad \cos \tfrac{1}{2} A = \sqrt{\frac{1 + \text{Cos } A}{2}}$$

$$\sin 2A = 2 \sin A \cos A \qquad \cos 2A = \cos^2 A - \sin^2 A$$

$$\text{Law of Lines} \quad \frac{\sin A}{a} = \frac{\sin B}{B} = \frac{\sin C}{C}$$

$$\text{Law of Cosines} \quad c^2 = a^2 + b^2 - 2ab \cos C$$

$$\text{Law of Tangents} \quad \frac{a+b}{a-b} = \frac{\tan \tfrac{1}{2}(A+B)}{\tan \tfrac{1}{2}(A-B)}$$

Table II—Continued

TRIGONOMETRIC FORMULAE (continued)

In any triangle:

Given a, b, C; to find c, B, A.

Use Law of Lines.

Given A, B, c; to find a, b, C.

Use Law of Lines.

Given a, b, c; to find A, B, C.

$$\text{Let } \frac{a+b+c}{2} = s, \quad \sqrt{\frac{(s-a)\ (s-b)\ (s-c)}{s}} = r$$

$$\cos \tfrac{1}{2} A = \sqrt{\frac{s(s-a)}{bc}}$$

$$\tan \tfrac{1}{2} A = \frac{r}{s-a}$$

$$\tan \tfrac{1}{2} B = \frac{r}{s-b}$$

$$\tan \tfrac{1}{2} C = \frac{r}{s-c}$$

Area of a triangle:

$$\text{Area} = \tfrac{1}{2} ab \sin C$$

$$\text{Area} = \sqrt{s\,(s-a)\,(s-b)\,(s-c)}$$

PRISMOIDAL FORMULA.

$$\text{Vol.} = \frac{h}{6}(B+b+4M)$$

h = altitude; b, B = bases; M = midsection

Table III

INCHES AND FRACTIONS OF AN INCH IN DECIMALS OF A FOOT

	0	1	2	3	4	5	6	7	8	9	10	11	
1/16	.0052	.0885	.1719	.2552	.3385	.4219	.5052	.5885	.6719	.7552	.8385	.9219	1/16
1/8	.0104	.0938	.1771	.2604	.3438	.4271	.5104	.5938	.6771	.7604	.8438	.9271	1/8
3/16	.0156	.0990	.1823	.2656	.3490	.4323	.5156	.5990	.6823	.7656	.8490	.9323	3/16
1/4	.0208	.1042	.1875	.2708	.3542	.4375	.5208	.6042	.6875	.7708	.8542	.9375	1/4
5/16	.0260	.1094	.1927	.2760	.3594	.4427	.5260	.6094	.6927	.7760	.8594	.9427	5/16
3/8	.0313	.1146	.1979	.2813	.3646	.4479	.5313	.6146	.6979	.7813	.8646	.9479	3/8
7/16	.0365	.1198	.2031	.2865	.3698	.4531	.5365	.6198	.7031	.7865	.8698	.9531	7/16
1/2	.0417	.1250	.2083	.2917	.3750	.4583	.5417	.6250	.7083	.7917	.8750	.9583	1/2
9/16	.0469	.1302	.2135	.2969	.3803	.4635	.5469	.6302	.7135	.7969	.8802	.9635	9/16
5/8	.0521	.1354	.2188	.3021	.3854	.4688	.5521	.6354	.7188	.8021	.8854	9688	5/8
11/16	.0573	.1406	.2240	.3073	.3906	.4740	.5573	.6406	.7240	.8073	.8906	.9740	11/16
3/4	.0625	.1458	.2292	.3125	.3958	.4792	.5625	.6458	.7292	.8125	.8958	.9792	3/4
13/16	.0677	.1510	.2344	.3177	.4010	.4844	.5677	.6510	.7344	.8177	.9010	.9844	13/16
7/8	.0729	.1563	.2396	.3229	.4063	.4896	.5729	.6563	.7396	.8229	.9063	.9896	7/8
15/16	.0781	.1615	.2448	.3281	.4115	.4948	.5781	.6615	.7448	.8281	.9115	.9948	15/16
1	.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167	1.000	1
	0	1	2	3	4	5	6	7	8	9	10	11	

Lineal feet
Lineal yard
Square inch
Square feet
Square yar
Acres
Cubic inch
Cubic feet
Links
Links
Feet
360° = 21
Radius =
Arc of 1°
Arc of 1′
Arc of 1″

$\pi = 3.14$

$\frac{\pi}{4} = 0.$

$\frac{\pi}{6} = 0.$

$\sqrt{\frac{4}{\pi}} =$

$\frac{\pi}{6} = 0$

$\frac{4.\pi}{3} =$

Curvat
Curvat
Differe

Probab

Error
Due t
1. I
2.
3.
4.
5.

Ho
Ve

R =

C = dist
glass to center of instrument.
a = angle of elevation for mid Reading

90.

1 Tanjur Abaharam Sakkaiah
2 Tanjur Erok Jonathan
3 Tanjur Piter Stain
4 Tanjur Nathaniel Sakkaiah

26/1 1926.

Sarsangnam

pattukampa kin

kitk!

tasin

TABLE IV

USEFUL RELATIONS.

Lineal feet	$\times .00019$	= miles
Lineal yards	$\times .0006$	= miles
Square inches	$\times .007$	= square feet
Square feet	$\times .111$	= square yards
Square yards	$\times .0002067$	= acres
Acres	$\times 4840$	= square yards
Cubic inches	$\times .00058$	= cubic feet
Cubic feet	$\times .03704$	= cubic yards
Links	$\times .22$	= yards
Links	$\times .66$	= feet
Feet	$\times 1.5$	= links

$360° = 21600' = 1296000''$

Radius = arc of 57.2957790°

Arc of 1° (radius = 1) = .017453292

Arc of 1′ (radius = 1) = .000290888

Arc of 1″ (radius = 1) = .000004848

$\pi = 3.141592654$ $\qquad \sqrt{\frac{1}{4}} = 0.564190$

$\frac{\pi}{4} = 0.785398163$ $\qquad \sqrt[3]{\frac{6}{\pi}} = 1.240700982$

$\frac{\pi}{6} = 0.523598776$ $\qquad \pi^2 = 9.869604401$

$\sqrt{\frac{4}{\pi}} = 1.128379167$ $\qquad \frac{1}{\pi^2} = 0.101321184$

$\frac{\pi}{6} = 0.523598776$ $\qquad \sqrt{\pi} = 1.772453851$

$\frac{4.\pi}{3} = 4.188790205$ $\qquad \frac{1}{\pi} = 0.3183099$

Curvature of Earth's surface = about 0.7 feet in 1 mile

Curvature in feet = 0.667 (Dist. in miles)^2

Difference between arc and chord length, 0.05 feet in 11½ miles

Probable error of a single observation = $0.6754\sqrt{\frac{\Sigma v^2}{n-1}}$

Error in chaining of 0.01 feet in 100 feet:

Due to—

1. Length of tape error of 0.01 feet
2. Alignment. One end 1.4 feet out of line
3. Sag of tape at centre of 0.61 feet.
4. Temperature difference of 15°
5. Difference of pull of 15 lbs.

STADIA REDUCTION FORMULÆ.

Horizontal Distance = $R - R \sin^2 a + C \cos a$

Vertical Distance = $R \frac{1}{2} \sin 2a + C \sin a$

R = Reading $\times \frac{\text{distance from Object glass to cross hairs}}{\text{distance between cross hairs}}$

C = distance from Object glass to cross hairs + distance from Object glass to center of instrument.

a = angle of elevation for mid Reading

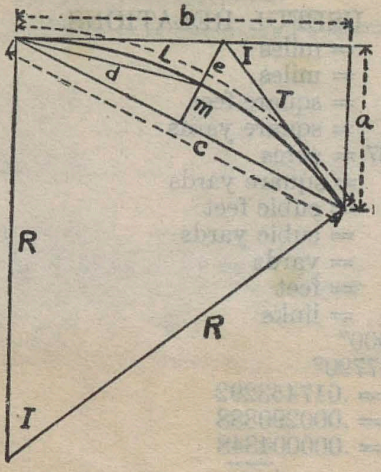


Table V

CURVE FORMULAE FOR SIMPLE CURVES

Compiled by J. Calvin Locke, C.E.

(1) $c = \sqrt{2Ra}$ (2) $c = \sqrt{a^2+b^2}$

(3) $c = \sqrt{2R\,(R-\sqrt{(R+b)\,(R-b)}} = \sqrt{2R(R-\sqrt{R^2-b^2})}$

(4) $c = 2\sqrt{m\,(2R-m)}$

(5) $c = 2R \sin \frac{1}{2} I$ (6) $c = 2T \cos \frac{1}{2} I$

(7) $e = R \operatorname{exsec} \frac{1}{2} I$

(8) $e = R \tan \frac{1}{2} I \tan \frac{1}{4} I$ (9) $e = T \tan \frac{1}{4} I$

(10) $b = \sqrt{a\,(2R-a)}$

(11) $b = \sqrt{\left(c+\frac{c^2}{2R}\right)\left(c-\frac{c^2}{2R}\right)} = \sqrt{c^2-\frac{c^4}{4R^2}}$

(12) $b = R \sin I$ (13) $b = a \cot \frac{1}{2} I$

(14) $R = \frac{a^2+b^2}{2a} = \frac{c^2}{2a}$ (15) $R = \frac{d^2}{2m} = \frac{c^2+4m^2}{8m}$

(16) $d = \sqrt{R\,(2R-\sqrt{(2R+c)\,(2R-c)}} = \sqrt{R(2R-\sqrt{4R^2-c^2})}$

(17) $d = \sqrt{2Rm}$ (18) $d = 2R \sin \frac{1}{4} I$ (19) $m = \frac{d^2}{2R}$

(20) $m = R \mp \sqrt{\left(R+\frac{c}{2}\right)\left(R-\frac{c}{2}\right)} = R \mp \sqrt{R^2-\frac{c^2}{4}}$

(21) $m = R \operatorname{vers} \frac{1}{2} I$ (22) $m = R \sin \frac{1}{2} I \tan \frac{1}{4} I$ (23) $m = \frac{1}{2} c \tan \frac{1}{4} I$

(24) $a = \frac{c^2}{2R}$ (25) $a = R - \sqrt{(R+b)\,(R-b)} = R - \sqrt{R^2-b^2}$

(26) $a = 2\,R\,(\sin^2 \frac{1}{2} I)^2$ (27) $a = R \operatorname{vers} I$ (28) $a = R \sin I \tan \frac{1}{2}$

(29) $a = b \tan \frac{1}{2} I$ (30) $a = T \sin I$ (31) $T = R \tan \frac{1}{2} I$

(32) $I = \frac{L}{R} \times 57.295780$ (33) $R = \frac{L}{I} \times 57.295780$

(34) $L = IR \times 0.01745329$ (35) $L = \frac{8d-c}{3}$

(36) Area Seg. $= \frac{LR - R^2 \operatorname{Sin} I}{2} = \frac{LR - Rb}{2}$

TABLE VI

SINES, COSINES, TANGENTS, COTANGENTS

deg.	sin 0′	tan 0′	sin 10′	tan 10′	sin 20′	tan 20′	sin 30′	tan 30′	sin 40′	tan 40′	sin 50′	tan 50′	deg.
0	0000	0000	0029	0029	0058	0058	0087	0087	0116	0116	0145	0145	89
1	175	0375	0204	0204	0233	0233	0262	262	291	291	320	320	88
2	349	349	378	378	407	407	436	437	465	466	494	495	87
3	523	524	552	553	581	582	610	612	640	641	669	706	86
4	698	699	727	729	756	758	785	787	814	816	843	864	85
5	872	875	901	904	929	934	958	963	987	992	1016	1022	84
6	1045	1051	1074	1080	1103	1110	1132	1139	1161	1169	190	198	83
7	219	228	248	257	279	287	305	317	334	346	363	376	82
8	392	405	421	435	449	465	478	495	507	524	536	554	81
9	564	584	593	614	622	644	650	673	679	703	708	733	80
10	736	763	765	793	794	823	822	853	851	883	880	914	79
11	908	944	937	974	965	2004	994	2035	2022	2065	2051	2095	78
12	2079	2126	2108	2156	2136	186	2164	217	193	247	221	278	77
13	250	309	278	339	306	370	334	401	363	432	391	462	76
14	419	493	447	524	476	555	504	586	532	617	560	648	75
15	588	679	616	711	644	742	672	773	700	805	728	836	74
16	756	867	784	899	812	931	840	962	868	994	896	3026	73
17	924	3057	952	3089	939	3121	3007	3153	3035	3185	3062	217	72
18	3090	249	3118	281	3145	314	173	346	201	378	228	411	71
19	256	443	283	476	311	508	338	541	365	574	393	607	70
20	420	640	448	673	475	706	502	739	529	772	557	805	69
21	584	839	611	872	638	906	665	939	692	973	719	4006	68
22	746	4040	773	4074	800	4108	827	4142	854	4176	881	210	67
23	907	245	934	279	961	314	987	348	4014	383	4041	417	66
24	4067	452	4094	487	4120	522	4147	557	173	592	200	628	65
25	226	663	253	699	279	734	305	770	331	806	358	841	64
26	384	877	410	913	436	950	4462	986	488	5022	514	5059	63
27	540	5095	566	5132	592	5169	617	5206	643	243	669	280	62
28	695	317	720	354	746	392	772	430	797	467	823	505	61
29	848	543	874	581	899	619	924	658	950	696	975	735	60
30	5000	774	5025	5812	5050	851	5075	890	5100	930	5125	969	59
31	150	6009	175	6048	200	6088	225	6128	250	6168	275	6208	58
32	299	249	324	289	348	330	5373	371	398	412	422	453	57
33	446	494	471	536	495	577	519	619	544	661	568	703	56
34	592	745	616	787	640	830	664	873	688	916	712	959	55
35	736	7002	760	7046	783	7089	807	7133	831	7177	854	7221	54
36	878	265	901	310	925	355	948	400	972	445	995	490	53
37	6018	536	6041	581	6065	627	6088	673	6111	720	6134	766	52
38	157	813	180	860	202	907	225	954	248	8002	271	8050	51
39	293	8098	316	8146	338	8195	361	8243	383	292	406	342	50
40	428	391	450	441	472	491	494	541	517	591	539	642	49
41	561	693	583	744	604	796	626	847	648	899	670	952	48
42	691	9004	713	9057	734	9110	756	9163	777	9217	799	9271	47
43	820	325	841	380	862	435	884	490	905	545	926	601	46
44	947	657	967	713	988	770	7009	827	7030	884	7050	942	45
45	7071	1.0000	7092	1.0058	7112	1.0117	133	1.0176	153	1.0235	173	1.0295	44
deg.	60′ cos	60′ cot	50′ cos	50′ cot	40′ cos	40′ cot	30′ cos	30′ cot	20′ cos	20′ cot	10′ cos	10′ cot	deg.

deg.	sin 0′	tan 0′	sin 10′	tan 10′	sin 20′	tan 20′	sin 30′	tan 30′	sin 40′	tan 40′	sin 50′	tan 50′	deg.
46	7193	1.0355	7214	1.0416	7234	1.0477	7254	1.0533	7274	1.0599	7294	1.0661	43
47	314	.0724	333	.0786	353	.0850	373	.0913	392	.0977	412	.1041	42
48	431	.1106	451	.1171	470	.1237	490	.1303	509	.1369	528	.1436	41
49	547	.1504	566	.1571	585	.1640	604	.1708	623	.1778	642	.1847	40
50	660	1.1918	7679	1.1988	7698	1.2059	7716	1.2131	7735	1.2203	7753	1.2276	39
51	771	.2349	790	.2423	808	.2497	826	.2572	844	.2647	862	.2723	38
52	880	.2799	898	.2876	916	.2954	934	.3032	951	.3111	969	.3190	37
53	986	.3270	8004	.3351	8021	.3452	8039	.3514	8056	.3597	8073	.3680	36
54	8090	.3764	107	.3848	124	.3934	141	.4019	158	.4106	175	.4193	35
55	192	.4281	208	.4370	225	.4460	241	.4550	258	.4641	274	.4733	34
56	290	.4826	307	.4919	323	.5013	339	.5108	355	.5204	371	.5301	33
57	387	.5399	403	.5497	418	.5597	434	.5697	450	.5798	465	.5900	32
58	480	.6003	496	.6107	511	.6212	526	.6319	542	.6426	557	.6534	31
59	572	.6643	587	.6753	601	.6864	616	.6977	631	.7090	646	.7205	30
60	660	1.7321	8675	1.7437	8689	1.7556	8704	1.7675	8718	1.7797	8732	1.7917	29
61	746	.8040	760	.8165	774	.8291	788	.8418	802	.8546	816	.8676	28
62	829	.8807	843	.8940	857	.9074	870	.9210	884	.9347	897	.9486	27
63	910	.9626	923	.9768	936	.9912	949	2.0057	962	2.0204	975	2.0353	26
64	988	2.0503	9001	2.0655	9013	2.0809	9026	.0965	9038	.1123	9051	.1283	25
65	9063	.1445	075	.1609	088	.1775	100	.1943	112	.2113	124	.2286	24
66	135	.2460	147	.2637	159	.2817	171	.2998	182	3183	194	.3369	23
67	205	.3559	216	.3750	228	.3945	239	.4142	250	.4342	261	.4545	22
68	272	.4751	283	.4960	293	.5172	304	.5386	315	.5605	325	.5826	21
69	336	.6051	346	.6279	356	.6511	367	.6746	377	.6985	387	.7228	20
70	397	2.7475	9407	2.7725	9417	2. 7980	9426	2.8239	9436	2.8502	9446	2.8770	19
71	455	.9042	465	.9319	474	. 9600	483	.9887	492	3.0178	502	3.0475	18
72	511	3.0777	520	3.1084	528	3.1397	537	3.1716	546	.2041	555	.2371	17
73	563	.2709	572	.3052	580	.3402	588	.3759	596	.4124	605	.4495	16
74	613	.4874	621	.5261	628	.5656	636	.6059	644	.6470	652	.6891	15
75	659	.7321	667	.7760	674	.8208	681	.8657	689	.9136	696	.9617	14
76	703	4.0108	710	4.0611	717	4.1126	724	4.1653	730	4.2193	737	4.2747	13
77	744	.3315	750	.3897	757	.4494	763	.5107	769	.5736	775	.6382	12
78	781	.7046	787	.7729	793	.8430	799	.9152	805	.9894	811	5.0658	11
79	816	.1446	822	5.2257	827	5. 3093	833	5.3955	838	5.4845	843	.5764	10
80	9848	5.6713	9853	5.7694	9858	5. 8708	9863	5.9758	9868	6.0844	9872	6.1970	9
81	877	6.3138	881	6.4348	886	6. 5606	890	6.6912	894	.8269	899	.9682	8
82	903	7.1154	907	7.2687	911	7. 4287	914	7.5958	918	7.7704	922	7.9530	7
83	925	8.1443	929	8.3450	932	8. 5555	936	8.7769	939	9.0098	942	9.2553	6
84	945	9.5144	948	9.7882	951	10.078	954	10.385	957	10.711	959	11.059	5
85	962	11.430	964	11.826	967	12.250	969	12.706	971	13.197	974	13.727	4
86	976	14.300	978	14.924	980	15.605	981	16.350	983	17.169	985	18.075	3
87	986	19.081	988	20.206	989	21.470	990	22.903	992	24.542	993	26.432	2
88	994	28.636	9995	31.242	9996	34.368	997	38.189	997	42.964	9998	49.104	1
89	9998	57.290	9999	68.750	9999	85.940	9999	114.58	1.000	171.88	1.000	343.77	0
deg.	60′ cos	60′ cot	50′ cos	50′ cot	40′ cos	40′ cot	30′ cos	30′ cot	20′ cos	30′ cot	10′ cos	10′ cot	deg.

TABLE VII
RODS IN FEET AND INCHES

Rods	Feet Inches	Rods	Feet Inches	Rods	Feet Inches	Rods	Feet Inches	Rods	Feet Inches
1	16—6	21	346—6	41	676—6	61	1006—6	81	1336—6
2	33—0	22	363—0	42	693—0	62	1023—0	82	1353—0
3	49—6	23	379—6	43	709—6	63	1039—6	83	1369—6
4	66—0	24	396—0	44	726—0	64	1056—0	84	1386—0
5	82—6	25	412—6	45	742—6	65	1072—6	85	1402—6
6	99—0	26	429—0	46	759—0	66	1089—0	86	1419—0
7	115—6	27	445—6	47	775—6	67	1105—6	87	1435—6
8	132—0	28	462—0	48	792—0	68	1122—0	88	1452—0
9	148—6	29	478—6	49	808—6	69	1138—6	89	1468—6
10	165—0	30	495—0	50	825—0	70	1155—0	90	1485—0
11	181—6	31	511—6	51	841—6	71	1171—6	91	1501—6
12	198—0	32	528—0	52	858—0	72	1188—0	92	1518—0
13	214—6	33	544—6	53	874—6	73	1204—6	93	1534—6
14	231—0	34	561—0	54	891—0	74	1221—0	94	1551—0
15	247—6	35	577—6	55	907—6	75	1237—6	95	1567—6
16	264—0	36	594—0	56	924—0	76	1254—0	96	1584—0
17	280—6	37	610—6	57	940—6	77	1270—6	97	1600—6
18	297—0	38	627—0	58	957—0	78	1287—0	98	1617—0
19	313—6	39	643—6	59	973—6	79	1303—6	99	1633—6
20	330—0	40	660—0	60	990—0	80	1320—0	100	1650—0

TABLE VIII
LINKS IN FEET AND INCHES

Links	Feet Inches	Links	Feet Inches	Links	Feet Inches	Links	Feet Inches	Links	Feet Inches	Links	Feet Inches
1	0- 7.92	18	11-10.56	35	23- 1.20	52	34- 3.84	69	45- 6.48	86	56- 9.12
2	1- 3.84	19	12- 6.48	36	23- 9.12	53	34-11.76	70	46- 2.40	87	57- 5.04
3	1-11.76	20	13- 2.40	37	24- 5.04	54	35- 7.68	71	46-10.32	88	58- 0.96
4	2- 7.68	21	13-10.32	38	25- 0.96	55	36- 3.60	72	47- 6.24	89	58- 8.88
5	3- 3.60	22	14- 6.24	39	25- 8.88	56	36-11.52	73	48- 2.16	90	59- 4.80
6	3-11.52	23	15- 2.16	40	26- 4.80	57	37- 7.44	74	48-10.08	91	60- 0.72
7	4- 7.44	24	15-10.08	41	27- 0.72	58	38- 3.36	75	49- 6.00	92	60- 8.64
8	5- 3.36	25	16- 6.00	42	27- 8.64	59	38-11.28	76	50- 1.92	93	61- 4.56
9	5-11.28	26	17- 1.92	43	28- 4.56	60	39- 7.20	77	50- 9.84	94	62- 0.48
10	6- 7.20	27	17- 9.84	44	29- 0.48	61	40- 3.12	78	51- 5.76	95	62- 8.40
11	7- 3.12	28	18- 5.76	45	29- 8.40	62	40-11.04	79	52- 1.68	96	63- 4.32
12	7-11.04	29	19- 1.68	46	30- 4.32	63	41- 6.96	80	52- 9.60	97	64- 0.24
13	8- 6.96	30	19- 9.60	47	31- 0.24	64	42- 2.88	81	53- 5.52	98	64- 8.16
14	9- 2.88	31	20- 5.52	48	31- 8.16	65	42-10.80	82	54- 1.44	99	65- 4.08
15	9-10.80	32	21- 1.44	49	32- 4.08	66	43- 6.72	83	54- 9.36	100	66- .000
16	10- 6.72	33	21- 9.36	50	33- 0.00	67	44- 2.64	84	55- 5.28	101	66 -7.92
17	11- 2.64	34	22- 5.28	51	33- 7.92	68	44-10.56	85	56- 1.20	102	67- 3.84

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=10°	I	T	E	I=20°	I	T	E	I=30°
1°	50.00	.218	+	11°	551.70	26.500	+	21°	1061.9	97.577	+
10′	58.34	.297	5° C.	10′	560.11	27.313	5° C	10′	1070.6	99.155	5° C
20′	66.67	.388	T	20′	568.53	28.137	T	20′	1079.2	100.75	T
30′	75.01	.491	.03	30′	576.95	28.974	.06	30′	1087.8	102.35	.10
40′	83.34	.606	E	40′	585.36	29.824	E	40′	1096.4	103.97	E
50′	91.68	.733	.001	50′	593.79	30.686	.006	50′	1105.1	105.60	.013
2°	100.01	.873		12°	602.21	31.561		22°	1113.7	107.24	
10′	108.35	1.024		10′	610.64	32.447		10′	1122.4	108.90	
20′	116.68	1.188		20′	619.07	33.347		20′	1131.0	110.57	
30′	125.02	1.364		30′	627.50	34.259		30′	1139.7	112.25	
40′	133.36	1.552		40′	635.93	35.183		40′	1148.4	113.95	
50′	141.70	1.752		50′	644.37	36.120		50′	1157.0	115.66	
3°	150.04	1.964	10° C.	13°	652.81	37.070	10° C.	23°	1165.7	117.38	10° C.
10′	158.38	2.188	T	10′	661.25	38.031	T	10′	1174.4	119.12	T
20′	166.72	2.425	.06	20′	669.70	39.006	.13	20′	1183.1	120.87	.19
30′	175.06	2.674	E	30′	678.15	39.993	E	30′	1191.8	122.63	E
40′	183.40	2.934	.003	40′	686.60	40.992	.011	40′	1200.5	124.41	.025
50′	191.74	3.207		50′	695.06	42.004		50′	1209.2	126.20	
4°	200.08	3.492		14°	703.51	43.029		24°	1217.9	128.00	
10′	208.43	3.790		10′	711.97	44.066		10′	1226.6	129.82	
20′	216.77	4.099		20′	720.44	45.116		20′	1235.3	131.65	
30′	225.12	4.421		30′	728.90	46.178		30′	1244.0	133.50	
40′	233.47	4.755		40′	737.37	47.253		40′	1252.8	135.35	
50′	241.81	5.100	15° C.	50′	745.85	48.341	15° C.	50′	1261.5	137.23	15° C.
5°	250.16	5.459	T	15°	754.32	49.441	T	25°	1270.2	139.11	T
10′	258.51	5.829	.09	10′	762.80	50.554	.19	10′	1279.0	141.01	.29
20′	266.86	6.211	E	20′	771.29	51.679	E	20′	1287.7	142.93	E
30′	275.21	6.606	.004	30′	779.77	52.818	.017	30′	1296.5	144.85	.038
40′	283.57	7.013		40′	788.26	53.969		40′	1305.3	146.79	
50′	291.92	7.432		50′	796.75	55.132		50′	1314.0	148.75	
6°	300.28	7.863		16°	805.25	56.309		26°	1322.8	150.71	
10′	308.64	8.307		10′	813.75	57.498		10′	1331.6	152.69	
20′	316.99	8.762		20′	822.25	58.699		20′	1340.4	154.69	
30′	325.35	9.230		30′	830.76	59.914		30′	1349.2	156.70	
40′	333.71	9.710	20° C.	40′	839.27	61.141	20° C.	40′	1358.0	158.72	20° C.
50′	342.08	10.202	T	50′	847.78	62.381	T	50′	1366.8	160.76	T
7°	350.44	10.707	.13	17°	856.30	63.634	.26	27°	1375.6	162.81	.39
10′	358.81	11.224	E	10′	864.82	64.900	E	10′	1384.4	164.86	E
20′	367.17	11.753	.006	20′	873.35	66.178	.022	20′	1393.2	166.95	.051
30′	375.54	12.294		30′	881.88	67.470		30′	1402.0	169.04	
40′	383.91	12.847		40′	890.41	68.774		40′	1410.9	171.15	
50′	392.28	13.413		50′	898.95	70.091		50′	1419.7	173.27	
8°	400.66	13.991		18°	907.49	71.421		28°	1428.6	175.41	
10′	409.03	14.582		10′	916.03	72.764		10′	1437.4	177.55	
20′	417.41	15.184	25° C.	20′	924.58	74.119	25° C.	20′	1446.3	179.72	25° C.
30′	425.79	15.799	T	30′	933.13	75.488	T	30′	1455.1	181.89	T
40′	434.17	16.426	.16	40′	941.69	76.869	.32	40′	1464.0	184.08	.49
50′	442.55	17.065	E	50′	950.25	78.264	E	50′	1472.9	186.29	E
9°	450.93	17.717	.007	19°	958.81	79.671	.028	29°	1481.8	188.51	.065
10′	459.32	18.381		10′	967.38	81.092		10′	1490.7	190.74	
20′	467.71	19.058		20′	975.96	82.525		20′	1499.6	192.99	
30′	476.10	19.746		30′	984.53	83.972		30′	1508.5	195.25	
40′	484.49	20.447		40′	993.12	85.431		40′	1517.4	197.53	
50′	492.88	21.161		50′	1001.7	86.904		50′	1526.3	199.82	
10°	501.28	21.887	30° C.	20°	1010.3	88.389	30° C.	30°	1535.3	202.12	30° C.
10′	509.68	22.624	T	10′	1018.9	89.888	T	10′	1544.2	204.44	T
20′	518.08	23.375	.19	20′	1027.5	91.399	.39	20′	1553.1	206.77	.59
30′	526.48	24.138	E	30′	1036.1	92.924	E	30′	1562.1	209.12	E
40′	534.89	24.913	.008	40′	1044.7	94.462	.034	40′	1571.0	211.48	.078
50′	543.29	25.700		50′	1053.3	96.013		50′	1580.0	213.86	

$T = R \tan \frac{1}{2} I$ $E = R \operatorname{exsec} \frac{1}{2} I$

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=40°	I	T	E	I=50°	I	T	E	I=60°
31°	1589.0	216.3	+	41°	2142.2	387.4	+	51°	2732.9	618.4	+
10′	1598.0	218.7	5° C.	10′	2151.7	390.7	5° C.	10′	2743.1	622.8	5° C.
20′	1606.9	221.1	T	20′	2161.2	394.1	T	20′	2753.4	627.2	T
30′	1615.9	223.5	.13	30′	2170.8	397.4	.17	30′	2763.7	631.7	.21
40′	1624.9	226.0	E	40′	2180.3	400.8	E	40′	2773.9	636.2	E
50′	1633.9	228.4		50′	2189.9	404.2		50′	2784.2	340.7	
32°	1643.0	230.9	.023	42°	2199.4	407.6	.037	52°	2794.5	645.2	.056
10′	1652.0	233.4		10′	2209.0	411.1		10′	2804.9	649.7	
20	1661.0	235.9		20′	2218.6	414.5		20′	2815.2	654.3	
30′	1670.0	238.4		30′	2228.1	418.0		30′	2825.6	658.8	
40′	1679.1	241.0		40′	2237.7	421.4		40′	2835.9	663.4	
50′	1688.1	243.5		50′	2247.3	425.0		50′	2846.3	668.0	
33°	1697.2	246.1	10° C.	43°	2257.0	428.5	10° C.	53°	2856.7	672.7	10° C.
10′	1706.3	248.7	T	10′	2266.6	432.0	T	10′	2867.1	677.3	T
20′	1715.3	251.3	.26	20′	2276.2	435.6	.34	20′	2877.5	682.0	.42
30′	1724.4	253.9	E	30′	2285.9	439.2	E	30′	2888.0	686.7	E
40′	1733.5	256.5	.046	40′	2295.6	442.8	.075	40′	2898.4	691.4	.112
50′	1742.6	259.1		50	2305.2	446.4		50′	2908.9	696.1	
34°	1751.7	261.8		44°	2314.9	450.0		54°	2919.4	700.9	
10′	1760.8	264.5		10′	2324.6	453.6		10′	2929.9	705.7	
20′	1770.0	267.2		20′	2334.3	457.3		20′	2940.4	710.5	
30′	1779.1	269.9		30′	2344.1	461.0		30′	2951.0	715.3	
40′	1788.2	272.6		40′	2353.8	464.6		40′	2961.5	720.1	
50′	1797.4	275.3	15° C.	50′	2363.5	468.4	15° C.	50′	2972.1	725.0	15° C.
35°	1806.6	278.1	T	45°	2373.3	472.1	T	55°	2982.7	729.9	T
10′	1815.7	280.8	.40	10′	2383.1	475.8	.51	10′	2993.3	734.8	.63
20′	1824.9	283.6	E	20′	2392.8	479.6	E	20′	3003.9	739.7	E
30′	1834.1	286.4	.070	30′	2402.6	483.4	.116	30′	3014.5	744.6	.168
40′	1843.3	289.2		40′	2412.4	487.2		40′	3025.2	749.6	
50′	1852.5	292.0		50′	2422.3	491.0		50′	3035.8	754.6	
36°	1861.7	294.9		46°	2432.1	494.8		56°	3046.5	759.6	
10′	1870.9	297.7		10′	2441.9	498.7		10′	3057.2	764.6	
20′	1880.1	300.6		20′	2451.8	502.5		20′	3067.9	769.7	
30′	1889.4	303.5		30′	2461.7	506.4		30′	3078.7	774.7	
40′	1898.6	306.4	20° C.	40′	2471.5	510.3	20° C.	40′	3089.4	779.8	20° C.
50′	1907.9	309.3	T	50′	2481.4	514.3	T	50′	3100.2	784.9	T
37°	1917.1	312.2	.53	47°	2491.3	518.2	.68	57°	3110.9	790.1	.84
10′	1926.4	315.2	E	10′	2501.2	522.2	E	10′	3121.7	795.2	E
20′	1935.7	318.1	.093	20′	2511.2	526.1	.151	20′	3132.6	800.4	.225
30′	1945.0	321.1		30′	2521.1	530.1		30′	3143.4	805.6	
40′	1954.3	324.1		40′	2531.1	534.2		40′	3154.2	810.9	
50′	1963.6	327.1		50′	2541.0	538.2		50′	3165.1	816.1	
38°	1972.9	330.2		48°	2551.0	542.2		58°	3176.0	821.4	
10′	1982.2	333.2		10′	2561.0	546.3		10′	3186.9	826.7	
20′	1991.5	336.3	25° C.	20′	2571.0	550.4	25° C.	20′	3197.8	832.0	25° C.
30′	2000.9	339.3	T	30′	2581.0	554.5	T	30′	3208.8	837.3	T
40′	2010.2	342.4	.67	40′	2591.0	558.6	.85	40′	3219.7	842.7	1.05
50′	2019.6	345.5	E	50′	2601.1	562.8	E	50′	3230.7	848.1	E
39°	2029.0	348.6	.117	49°	2611.2	566.9	.189	59°	3241.7	853.5	.283
10′	2038.4	351.8		10′	2621.2	571.1		10′	3252.7	858.9	
20′	2047.8	354.9		20′	2631.3	575.3		20′	3263.7	864.3	
30′	2057.2	358.1		30′	2641.4	579.5		30′	3274.8	869.8	
40′	2066.6	361.3		40′	2651.5	583.8		40′	3285.8	875.3	
50′	2076.0	364.5		50′	2661.6	588.0		50′	3296.9	880.8	
40°	2085.4	367.7	30° C.	50°	2671.8	592.3	30° C.	60°	3308.0	886.4	30° C.
10′	2094.9	371.0	T	10′	2681.9	596.6	T	10′	3319.1	892.0	T
20′	2104.3	374.2	.80	20′	2692.1	600.9	1.02	20′	3330.3	897.5	1.27
30′	2113.8	377.5	E	30′	2702.3	605.3	E	30′	3341.4	903.2	E
40′	2123.3	380.8	.141	40′	2712.5	609.6	.227	40′	3352.6	908.8	.340
50′	2132.7	384.1		50′	2722.7	614.0		50′	3363.8	914.5	

$T = R \tan \frac{1}{2} I$ $\quad E = R \operatorname{exsec} \frac{1}{2} I$

TABLE X.

MIDDLE ORDINATES OF RAILS

Length of Rail (feet)

C ° ′	R Feet	30 Inch	28 Inch	26 Inch	24 Inch	22 Inch	20 Inch	C °	R Feet	30 Inch	28 Inch	26 Inch	24 Inch	22 Inch	20 Inch
0–20	17189	.08	.07	.06	.05	.04	.03	8	716.8	1.88	1.64	1.42	1.20	1.01	.84
0–40	8594	.16	.14	.12	.10	.08	.07	9	637.3	2.12	1.84	1.60	1.35	1.14	.94
1–0	5730	.24	.20	.18	.15	.13	.10	10	573.7	2.36	2.05	1.78	1.50	1.27	1.04
1–20	4297	.31	.27	.23	.20	.17	.13	11	521.7	2.59	2.26	1.95	1.65	1.39	1.15
1–40	3438	.39	.34	.29	.25	.21	.17	12	478.3	3.83	2.47	2.15	1.81	1.54	1.26
2–0	2865	.47	.41	.35	.30	.25	.20	13	441.7	3.05	2.66	2.30	1.96	1.66	1.36
2–20	2456	.55	.48	.41	.35	.29	.23	14	410.3	3.30	2.87	2.48	2.10	1.78	1.46
2–40	2149	.63	.55	.47	.40	.33	.27	15	383.1	3.54	3.08	2.68	2.26	1.91	1.57
3–0	1910	.71	.62	.53	.45	.38	.31	16	359.3	3.76	3.28	2.83	2.40	2.04	1.67
3–20	1719	.78	.68	.59	.50	.42	.35	17	338.3	4.00	3.48	3.02	2.57	2.16	1.78
3–40	1563	.86	.75	.65	.55	.46	.38	18	319.6	4.21	3.67	3.18	2.70	2.28	1.87
4–0	1433	.94	.82	.71	.60	.50	.42	19	302.9	4.45	3.89	3.36	2.86	2.41	1.98
4–20	1323	1.02	.89	.77	.65	.55	.45	20	287.9	4.70	4.09	3.55	3.00	2.54	2.09
4–40	1228	1.10	.96	.83	.70	.59	.48	22	262.0	5.16	4.44	3.84	3.30	2.80	2.29
5	1146	1.18	1.03	.89	.75	.63	.52	24	240.5	5.64	4.92	4.20	3.59	3.04	2.50
6	955.3	1.41	1.23	1.06	.90	.76	.62	26	222.3	6.07	5.29	4.58	3.88	3.29	2.70
7	819.0	1.65	1.44	1.24	1.05	.89	.73								

TABLE XI.

SHORT RADIUS CURVES

Radius Feet	Chord Feet	Central Angle	Deflection Angle	Deflection for 1 Foot
35	10	16-26	8-13	49.3
45	10	12-46	6-23	38.3
50	15	17-16	8-38	34.5
60	15	14-22	7-11	28.8
75	15	11-30	5-45	23.0
100	20	11-30	5-45	17.3
120	20	9-34	4-47	14.3
150	20	7-39	3-49	11.5
190	25	7-32	3-46	9.15
200	25	7-10	3-35	8.6
225	25	6-25	3-12	7.7
240	25	5-58	2-59	7.2
250	25	5-44	2-52	6.9
275	25	5-12	2-36	6.2
288	50	9-58	4-59	6.0
300	50	9-32	4-46	5.7
350	50	8-12	4-06	4.9
376	50	7-40	3-50	4.6
400	50	7-10	3-35	4.3
410	50	7-00	3-30	4.2

To find length of curve divide angle from P. C. to P. T. by central angle of chord, and multiply by length of chord.

TABLE XII.

INCLINED DISTANCE OF 100 FT. REDUCED TO HORIZONTAL

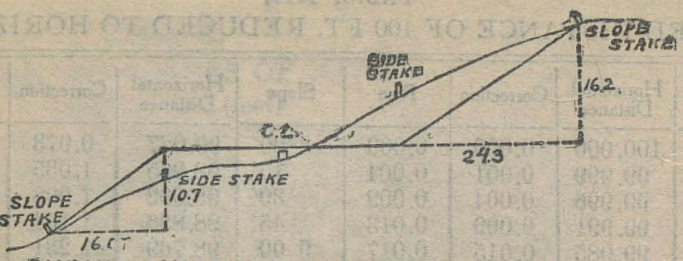
Slope	Horizontal Distance	Correction	Rise	Slope	Horizontal Distance	Correction	Rise
0°00′	100.000	0.000	0.000	8°00′	99.027	0.973	0.139
15′	99.999	0.001	0.004	15′	98.965	1.035	0.143
30′	99.996	0.004	0.009	30′	98.902	1.098	0.148
45′	99.991	0.009	0.013	45′	98.836	1.164	0.152
1 00	99.985	0.015	0.017	9 00	98.769	1.231	0.156
15	99.976	0.024	0.022	15	98.700	1.300	0.161
30	99.966	0.034	0.026	30	98.629	1.371	0.165
45	99.953	0.047	0.031	45	98.556	1.444	0.169
2 00	99.939	0.061	0.035	10 00	98.481	1.519	0.174
15	99.923	0.077	0.039	15	98.404	1.596	0.178
30	99.905	0.095	0.044	30	98.325	1.675	0.182
45	99.885	0.115	0.048	45	98.245	1.755	0.187
3 00	99.863	0.137	0.052	11 00	98.163	1.837	0.191
15	99.839	0.161	0.057	15	98.079	1.921	0.195
30	99.813	0.187	0.061	30	97.992	2.008	0.199
45	99.786	0.214	0.065	45	97.905	2.095	0.204
4 00	99.756	0.244	0.070	12 00	97.815	2.185	0.208
15	99.725	0.275	0.074	15	97.723	2.277	0.212
30	99.692	0.308	0.078	30	97.630	2.370	0.216
45	99.657	0.343	0.083	45	97.534	2.466	0.221
5 00	99.619	0.381	0.087	13 00	97.437	2.563	0.225
15	99.580	0.420	0.092	15	97.338	2.662	0.229
30	99.540	0.460	0.096	30	97.237	2.763	0.233
45	99.497	0.503	0.100	45	97.134	2.866	0.238
6 00	99.452	0.548	0.105	14 00	97.030	2.970	0.242
15	99.406	0.594	0.109	15	96.923	3.077	0.246
30	99.357	0.643	0.113	30	96.815	3.185	0.250
45	99.307	0.693	0.118	45	96.705	3.295	0.255
7 00	99.255	0.745	0.122	15 00	96.593	3.407	0.259
15	99.200	0.800	0.126	15	96.479	3.521	0.263
30	99.144	0.856	0.131	30	96.363	3.637	0.267
45	99.087	0.913	0.135	45	96.246	3.754	0.271

For each foot take one one-hundredth of each reading.

TABLE XIII.

MINUTES IN DECIMALS OF A DEGREE.

0 30″	.00833	10′30″	.17500	20′30″	.34167	30′10″	.50833	40′30″	.67500	50′10″	.84167
1 00	.01667	11 00	.18333	21 00	.35000	31 00	.51667	41 00	.68333	51 00	.85000
30	.02500	30	.19167	30	.35833	30	.52500	30	.69167	30	.85833
2 00	.03333	12 00	.20000	22 00	.36667	32 00	.53333	42 00	.70000	52 00	.86667
30	.04167	30	.20833	30	.37500	30	.54167	30	.70833	30	.87500
3 00	.05000	13 00	.21667	23 00	.38333	33 00	.55000	43 00	.71667	53 00	.88333
30	.05833	30	.22500	30	.39167	30	.55833	30	.72500	30	.89167
4 00	.06667	14 00	.23333	24 00	.40000	34 00	.56667	44 00	.73333	54 00	.90000
30	.07500	30	.24167	30	.40833	30	.57500	30	.74167	30	.90833
5 00	.08333	15 00	.25000	25 00	.41667	35 00	.58333	45 00	.75000	55 00	.91667
30	.09167	30	.25833	30	.42500	30	.59167	30	.75833	30	.92500
6 00	.10000	16 00	.26667	26 00	.43333	36 00	.60000	46 00	.76667	56 00	.93333
30	.10833	30	.27500	30	.44167	30	.60833	30	.77500	30	.94167
7 00	.11667	17 00	.28333	27 00	.45000	37 00	.61667	47 00	.78333	57 00	.95000
30	.12500	30	.29167	30	.45833	30	.62500	30	.79167	30	.95833
8 00	.13333	18 00	.30000	28 00	.46667	38 00	.63333	48 00	.80000	58 00	.96667
30	.14167	30	.30833	30	.47500	30	.64167	30	.80833	30	.97500
9 00	.15000	19 00	.31667	29 00	.48333	39 00	.65000	49 00	.81667	59 00	.98333
30	.15833	30	.32500	30	.49167	30	.65833	30	.82500	30	.99167
10 00	.16667	20 00	.33333	30 00	.50000	40 00	.66667	50 00	.83333	60 00	1.00000



DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING.

SLOPE 1½ TO 1. ROADWAY OF ANY WIDTH.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	0 00	0 15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	0
1	1.50	1 65	1 80	1.95	2.10	2.25	2.40	2.55	2.70	2.85	1
2	3.00	3.15	3.30	3 45	3.60	3 75	3.90	4.05	4.20	4 35	2
3	4.50	4 65	4.80	4.95	5 10	5 25	5 40	5.55	5.70	5.85	3
4	6.00	6 15	6.30	6.45	6.60	6 75	6.90	7.05	7.20	7.35	4
5	7 50	7.65	7.80	7.95	8.10	8.25	8.40	8.55	8.70	8.85	5
6	9 00	9 15	9.30	9.45	9.60	9.75	9.90	10.05	10.20	10.35	6
7	10.50	10 65	10.80	10.95	11.10	11.25	11.40	11.55	11 70	11.85	7
8	12.00	12 15	12.30	12.45	12.60	12.75	12.90	13.05	13.20	13.35	8
9	13 50	13 65	13 80	13 95	14.10	14.25	14.40	14 55	14.70	14.85	9
10	15.00	15 15	15 30	15 45	15.60	15.75	15.90	16.05	16.20	16 35	10
11	16 50	16 65	16 80	16.95	17 10	17.25	17.40	17.55	17.70	17.85	11
12	18 00	18 15	18.30	18 45	18.60	18 75	18.90	19.05	19.20	19.35	12
13	19 50	19 65	19.80	19.95	20.10	20.25	20 40	20.55	20.70	20.85	13
14	21.00	21 15	21.30	21.45	21 60	21.75	21.90	22 05	22 20	22 35	14
15	22 50	22 65	22 80	22 95	23.10	23.25	23.40	23.55	23.70	23.85	15
16	24.00	24 15	24 30	24 45	24.60	24.75	24 90	25 05	25.20	25.35	16
17	25.50	25 65	25.80	25 95	26.10	26 25	26 40	26.55	26.70	26.85	17
18	27.00	27 15	27.30	27 45	27.60	27.75	27.90	28.05	28 20	28.35	18
19	28 50	28 65	28 80	28.95	29.10	29.25	29.40	29.55	29.70	29.85	19
20	30 00	30 15	30.30	30.45	30.60	30.75	30.90	31.05	31.20	31.35	20
21	31 50	31 65	31.80	31.95	32 10	32 25	32.40	32.55	32 70	32 85	21
22	33 00	33 15	33 30	33 45	33.60	33 75	33.90	34.05	34.20	34.35	22
23	34 50	34 65	34.80	34.95	35.10	35 25	35 40	35.55	35.70	35 85	23
24	36.00	36 15	36.30	36 45	36.60	36.75	36.90	37.05	37.20	37.35	24
25	37.50	37.65	37 80	37.95	38.10	38.25	38.40	38.55	38.70	38.85	25
26	39 00	39 15	39.30	39 45	39 60	39.75	39.90	40.05	40.20	40.35	26
27	40 50	40 65	40 80	40.95	41.10	41.25	41 40	41.55	41.70	41.85	27
28	42 00	42 15	42.30	42.45	42.60	42 75	42.90	43.05	43.20	43.35	28
29	43 50	43 65	43.80	43 95	44.10	44 25	44 40	44.55	44.70	44 85	29
30	45 00	45 15	45.30	45 45	45.60	45.75	45.90	46.05	46 20	46.35	30
31	46.50	46.65	46.80	46 95	47.10	47.25	47.40	47.55	47.70	47.85	31
32	48 00	48.15	48.30	48 45	48.60	48 75	48.90	49.05	49 20	49.35	32
33	49.50	49 65	49.80	49.95	50.10	50.25	50.40	50.55	50.70	50.85	33
34	51 00	51.15	51.30	51.45	51.60	51.75	51.90	52.05	52.20	52.35	34
35	52 50	52.65	52.80	52.95	53.10	53.25	53.40	53.55	53.70	53.85	35
36	54 00	54.15	54.30	54 45	54.60	54.75	54.90	55.05	55.20	55.35	36
37	55 50	55 65	55.80	55.95	56.10	56.25	56.40	56.55	56.70	56.85	37
38	57.00	57.15	57.30	57 45	57.60	57 75	57.90	58.05	58.20	58 35	38
39	58 50	58.65	58 80	58.95	59.10	59 25	59.40	59 55	59.70	59.85	39
40	60 00	60 15	60 30	60 45	60 60	60.75	60 90	61.05	61 20	61.35	40
41	61.50	61 65	61.80	61 95	62 10	62 25	62.40	62 55	62 70	62.85	41
42	63 00	63.15	63 30	63 45	63 60	63 75	63 90	64 05	64 20	64.35	42
43	64.50	64 65	64 80	64.95	65.10	65 25	65 40	65.55	65.70	65.85	43
44	66 00	66 15	66.30	66.45	66.60	66.75	66.90	67.05	67.20	67.35	44
45	67 50	67 65	67 80	67.95	68.10	68.25	68.40	68.55	68.70	68.85	45
46	69 00	69 15	69 30	69.45	69.60	69.75	69.90	70.05	70.20	70.35	46
47	70 50	70 65	70 80	70 95	71.10	71.25	71 40	71.55	71.70	71.85	47
48	72.00	72 15	72.30	72.45	72.60	72.75	72.90	73 05	73.20	73 35	48
49	73 50	73 65	73.80	73.95	74.10	74.25	74.40	74.55	74.70	74.85	49
50	75.00	75.15	75.30	75.45	75.60	75.75	75.90	76.05	76.20	76.35	50

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