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Crater in ice of Makushin Volcano, Unalaska Island, photographed in 1907, and resembling the snow crater on Mount Baker described by Rusk in 1903. Photo Jaggar.

NOTES ON VOLCANOES OF THE CASCADE RANGE

For purposes of the volcanologist, every bit of information concerning craters or heat on mountains known to be volcanoes is of value. In Volcano Letter No. 363 there was published a review with maps concerning some of our northwestern volcanoes other than Lassen Peak. In "Tales of a Western Mountaineer" (Houghton Mifflin 1924) Mr. C. E. Rusk publishes notes made during mountain climbs on some of these volcanoes which are unusual and worthy of quotation.

The crater of Mount Baker or Kulshan is illustrated by a photograph taken about 1900 by the party of John A. Lee. This shows a circular crater opened through snow and ice, with fume rising, and with crevasses extending up a smooth nevé above it. In 1903 Rusk climbed the east side of the main peak of Mount Baker accompanied by George G. Cantwell. They went to Morovits Ranch, and camped at the timber line. The whole east side of the mountain is forbidding and covered with snow and ice. There are two peaks of which the southern is the lower. When well up the slope, on glancing upward, they saw large volumes of smoke rolling from between the two peaks. When they reached the top, it appeared that for several hours the smoke from the crater had been hidden from them by the south shoulder of the main peak. As they emerged from the chimney there burst into view a most thrillingly weird spectacle.

In a bowl-like depression immediately between the two peaks of Mount Baker there was a great orifice in the snow, perhaps 50 feet across. The west side was partly blocked with snow so that the opening was somewhat half-moon shaped. Two hundred feet away a semicircular crevasse swept halfway around the pit. Up from the unknown depths of this abyss black fume boiled out. It drifted away, guided by the shifts in the wind currents, until it dissolved in the upper air. Mr. Rusk speaks of the wild, unearthly loneliness of the scene, which "impressed us profoundly, for its counterpart perhaps does not exist on earth."

This description is astonishingly like that of the ice crater containing sulphur on the summit of Makushin Volcano in Unalaska (Page One). This was photographed and described by the reviewer, and the picture published, in 1908 (Technology Review, Boston, Vol. X, No. 1, Journal of the Technology Expedition to the Aleutian Islands 1907, by T. A. Jaggar, pp. 11-12). "The rim of the greater crater of Makushin was finally reached at 12:45 July 3, 1907. Within was an expanse of snow, probably two miles in diameter, through which three or four steaming vents have maintained openings. We saw a steaming cavity ahead to

the right. Examination proved this to be a new crater opening, a vertical cavity in the snow, 75 feet in diameter, with a 300-foot wall of bedded ice and snow behind it and sulphurous steam incessantly rising through it. A great tumble of snow or ice blocks rested in front of it, and, where the steam drifted across these, their white surfaces were yellowed with sulphur. An inner cone of bowlders and sand was seen beyond this pit and south of it. This was visited and found to contain a crater some 2,000 feet in diameter, with very active solfataras working on its northern side, and sulphurous coatings about the vents."

Rusk's climb was 11 hours from the timber line to the top of Mount Baker, and was presumably early in the season of 1903. When photographed in August 1906 by F. H. Kiser, the crater gave no sign of snow orifice, nor of smoke. There was only a slight depression in the snow and the remnant of a crevasse. Professor George Davidson saw Mount Baker in very active eruption in the early fifties.

Mount Rainier or Tacoma Volcano is described by Rusk as having a great crater from a quarter to a half mile in diameter inclosed by bare cliffs 30 or 40 feet high. The bottom is filled with snow which makes of the interior a comparatively level field. Around the rim are many small vents in the rock, from which jets of steam issue. In places, and at times, this steam melts the snow, leaving cavern-like fissures between the snow and the wall of the crater. The highest point of Mount Rainier is a dome of snow just west of the crater. Mr. Rusk writes: "I crossed the crater alone. On the farther side I was surprised to find lichens clinging to the bare rock surface. I found a jet of steam issuing from a small hole in the sloping face of the rock. I stooped to see if I could detect any odor coming from the place and received a little steam-scald for my pains. The rocks were quite warm, and I have no doubt one could place a frying pan over some of these orifices and there do considerable elementary cooking. I scrambled out of the crater and a short, easy climb brought me to Columbia's Crest, the actual summit."

Glacier Peak is a volcano 10,400 feet high, easy to climb, and Mr. Rusk reached the summit at 11 a. m. The old crater is directly on top, from one-quarter to one-half mile in diameter, broken down in many places, leaving craggy pinnacles around the circumference. One of these on the southern edge is the summit. The crater is filled by a big snow field. On the east the snow feeds into a great ice-fall, the chief branch of Cool Glacier. This peak was climbed by I. C. Russell, and is not described as steaming.

In the case of Mount Hood, the only mention of heat by Mr. Rusk is described from the summit, when, looking far below, near Crater Rock, he saw big jets of steam rising into the air and drifting upward to mingle with the fleecy clouds that were idling across the face of the peak.

During the exploration of Mount Adams, Rusk mentions on the north side a dry stream course that produced a glacial torrent. This started running in the middle of the afternoon, kept flowing part of the night, and was dry the next morning as a daily occurrence which is not explained. This is a part of the Klickitat drainage.

Going up Mount Adams by the southern way, Rusk's party found thousands of dead grasshoppers on a snow-filled saddle south of the first summit. There were also other insects as well as a humming-bird and a duck, each occupying its own little depression in the snow. Rusk states on different occassions, while climbing Mount Adams, he had found numbers of such birds and insects; and once his party found a dead mouse at an elevation of nearly 12,000 feet. One often finds live spiders crawling over the snow at high altitudes, and sometimes, but not often, live butterflies and other insects are seen. Rusk believes that the dead organisms are accounted for by gales of wind, or else during high flights these creatures are blinded by snow, when they fall bewildered and chill to death. It is an interesting question whether there could be any volcanic carbon dioxide or other gas to asphyxiate the insects.

From the pictures reproduced, the Klickitat Glacier must occupy the former crater of Mount Adams, between the summit and the Ridge of Wonders. Professor H. F. Reid, who has climbed among these volcanoes, expressed the opinion that some fused fragments of rock appeared less than 100 years old (Rusk, page 98).

The following are Mr. Rusk's comments on heat in the crater region of Mount Shasta. When he was turning down from the summit, in 1923, he writes: "I had read much of the so-called boiling sulphur spring, and when we were a short distance down the talus slope, a little to the west of where we had come up, we heard a mighty gurgling roar and saw steam rising from farther down the slope. This subterranean cataract appears to start well up the talus slope and only a little below the highest summit of the mountain. It rushes down nearly to the foot of the pinnacle and apparently turns and disappears along a depression between the main summit and another nearby peak just to the south. From the noise it makes, there must be a veritable river of it, and it is certainly forced upward through some internal chimney from a cauldron in the heart of the mountain. The whole thing would doubtless be invisible, had not visitors pricked its outer covering. The underground channel is overlaid by several inches of what seems to be a blue clay. Wherever holes have been gouged in this by the points of alpenstocks or other sharp insturments, the boiling water bubbles through, making animated little springs from which the steam floats away. We saw several of these. The loose rocks on top are so hot that it is hardly possible to hold the hand on some of them, and the whole clay surface is uncomfortably warm."

"I caught some of the boiling water in my cup and the taste was agreeable and rather sour, resembling lemonade. I drank a considerable quantity and suffered no ill effects. On the little flat just below where we sat were several rock inclosures that had been piled up for shelter by men who had spent one or more nights at this place. Even in a severe storm it is possible for a man to survive, as the heat of the rocks on the slope above the boiling spring would keep one from freezing." T.A.J.

TILTING OF THE GROUND FOR FEBRUARY

The following figures show the net amount of tilt by weeks at the Observatory on the northeast rim of Kilauea Crater, and its direction computed from the daily seismograms, by platting a curve smoothed by overlapping seven-day averages. This is the departure of the plumbline in seconds of arc, in the direction given.

February 2-8	.....1.4 seconds	SE
February 9-15	.....1.6 seconds	SW
February 16-22	.....2 0 seconds	SW
February 23-29	.....1.8 seconds	S

E.G.W.